Chester County Natural Heritage Inventory







Update 2015

PNHP
Pennsylvania Natural Heritage Program

Chester County Natural Heritage Inventory Update 2015

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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.

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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 Academy of Natural Sciences in Philadelphia, the Morris Arboretum of the University of Pennsylvania, Delaware Technical Community College, Lincoln University, Shippensburg University, Natural Lands Trust, Brandywine Conservancy, Friends of the State Line Serpentine Barrens, Muhlenberg Botanical Society, 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. Additional funding was provided by the Wyomissing Foundation.

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 Chester County.

The Chester 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 Chester County Natural Areas Inventory project of 1994 and the subsequent data review update of 2000. 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 Chester 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 Commonwealth'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 Chester County Planning Commission, has undertaken this project to provide a document and maps that will aid in the identification of these important areas.

The *Chester County Natural Heritage Inventory (CNHI) Update 2015* represents the known species of concern, including plants, animals, and natural communities in Chester 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 Chester 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 zone of potential impacts within the site's watershed (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 Chester County Natural Heritage Inventory – Update 2015 will be made available to each municipality through the Chester 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. Chester 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.

Chester CNHI Update Changes

The Chester CNHI 2015 Update report is meant to replace the original Chester County Natural Areas Inventory that was completed in 1994. The original 1994 report was based on two years of field work supplemented by existing data to inform the report. In 2000, a "desktop update" of the 1994 report was conducted to refresh the data in the report. No field work was completed specifically for the update; rather it relied on recently reported data to inform the update report. The 2015 update followed the basic model of the original 1994 project with two years of field work and existing data in the PNHP database used to inform the 2015 Update report.

Natural Heritage Area (NHA) Name Changes

The previous Chester County1994 and 2000 projects were referred to as County Natural Areas Inventories (CNAIs). We now refer to these projects as County Natural Heritage Inventories (CNHIs), to better reflect the name of the parent organization, the Pennsylvania Natural Heritage Program (PNHP). All of the sites of ecological significance are 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 constant flux. As habitats and land use patterns change, so do the species that occupy them. Periodic updates to the Chester 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 two previous reports. 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 representation of "Core Habitat" and "Supporting Landscape".

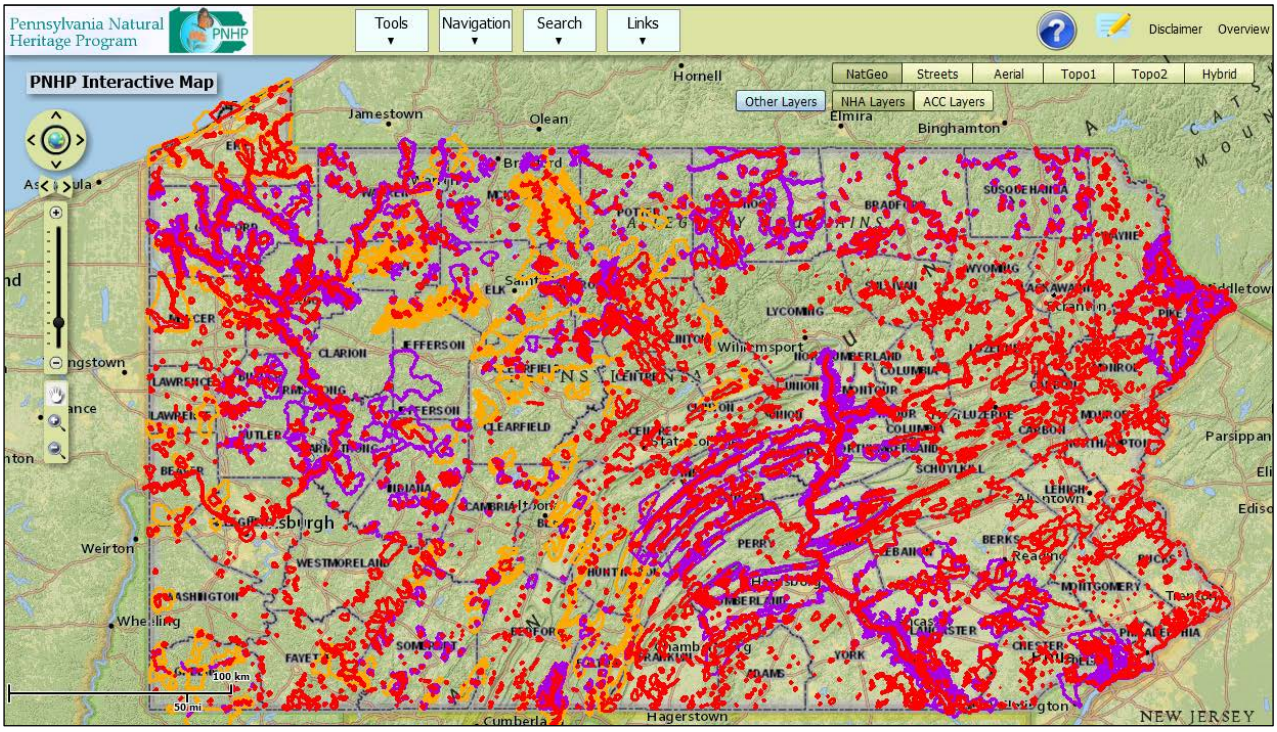
- Some species documented in the previous report, through additional fieldwork across the state, have been found to be more common than previously thought and have been delisted, and are no longer considered to be species of concern. If an area documented in the previous report only contained a species 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 "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, 2015, 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 1994 Chester NAI was organized by USGS quadrangle. The 2015 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 representing 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 Commonwealth 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), sixty 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 has 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 ninety percent of Pennsylvania's land area was forested. Today, sixty percent of the state is still forested, but much of this forest is fragmented by roads, utility rights-of-way, agriculture, and development. Only forty-two 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, such as mosses, lichens and fungi, and most insects, too little information is known of these species 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 CHESTER COUNTY

Chester 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 southeastern Pennsylvania. Major interstate highways linking Chester County to metropolitan centers have made commuting to Philadelphia and New Jersey feasible. As a result, Chester is now one of the fastest growing counties in Pennsylvania.

The scenic and natural environments that have attracted many people to the county are quickly being lost because of increased development. Thoughtful 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 classify 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.

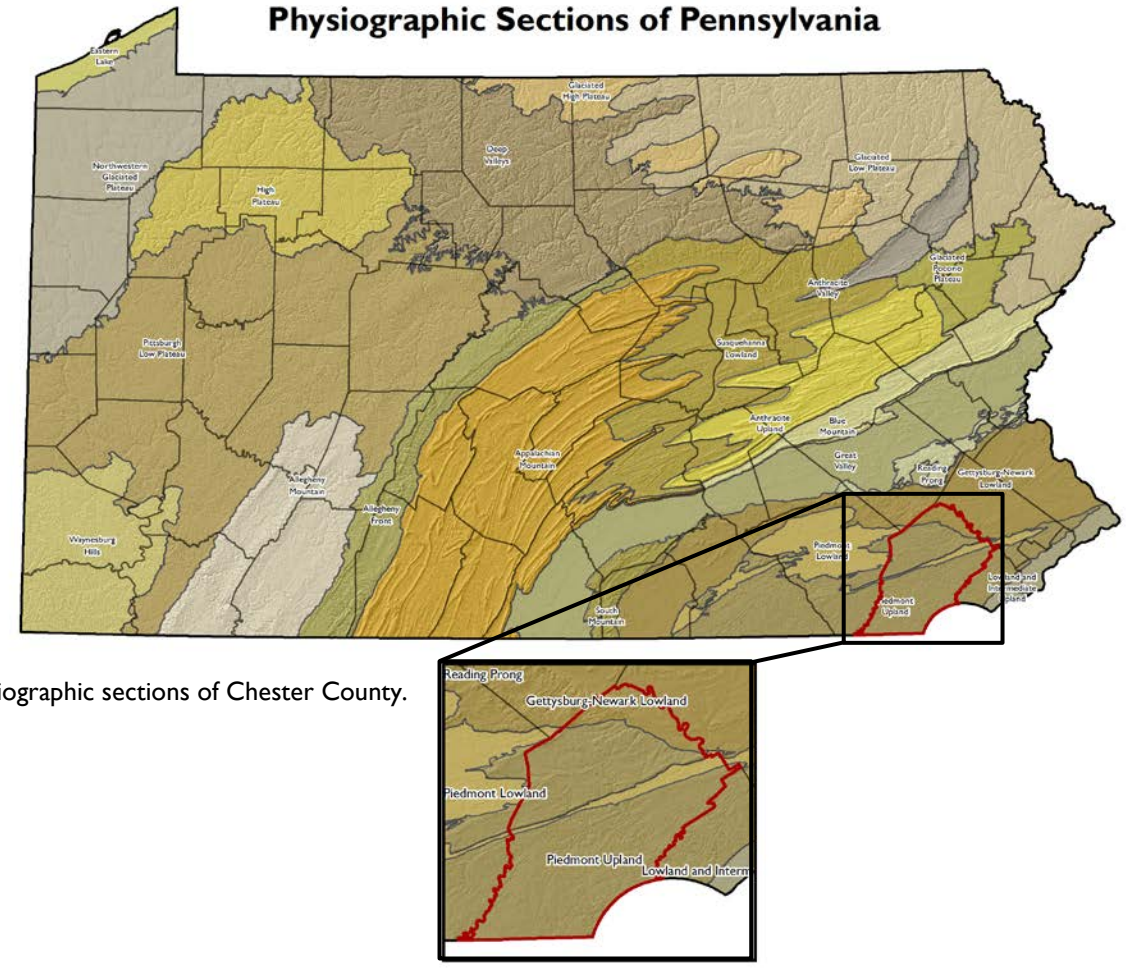


Figure 1. Physiographic sections of Chester County.

Piedmont Province

The county lies in three sections of the Piedmont Physiographic province. The Gettysburg-Newark Lowland section found in the northern corner of the county, covers about 10-15% of the county.. This section is characterized by a rolling landscape with occasional abrupt, low ridges. The rolling landscape is underlain by soft red sandstones and shales that have weathered and eroded; the rust color of the farmland soils in this area is the result of the bedrock color. Diabase, a hard igneous rock high in base minerals, comprises the ridges. A narrow band of the Piedmont Lowland section consists of a dissected valley of limestone and dolomite separated by broad low hills of shale and sandstone. The Piedmont Upland section makes up some 80-85% of the county's land surface. The bedrock formations consist of metamorphic and igneous rocks including schist, quartzite, slate, marble, granite and serpentinite. The bedrock was complexly folded and faulted during the mountain building time of the Allegheny Orogeny about 250 million years ago. The varied resistance to weathering and erosion of the different rocks has led to the hilly landscape of low ridges and narrow valleys (Marsh and Marsh 1989).

Watersheds

Most of the streams in Chester County are part of the Delaware River drainage basin, though the western edge of the county flows into the Susquehanna 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, such as the Chesapeake Bay, that is connected to a lake, sea, or ocean. Watersheds can be large, like that of the Delaware River, or small like that of the Mill 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.

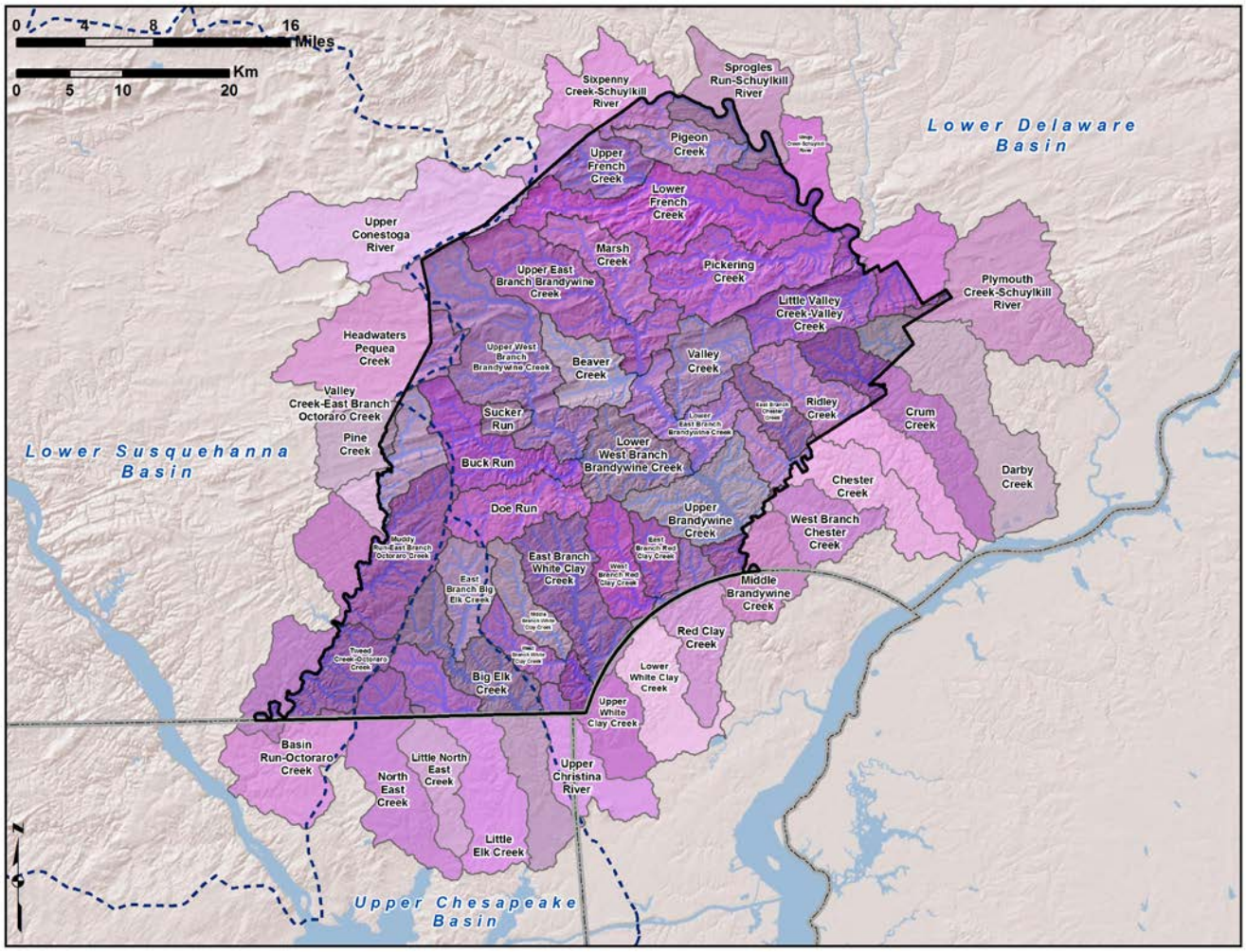


Figure 2. Twelve-digit (HUC12) watersheds in Chester County.

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 vegetation communities typically revolves around the dominant species, habitat, and growth form. Boundaries between community types in the field are generally less distinct.

The vegetation of Chester 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 Chester 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 Chester 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, introduced 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. Woodlands on south-facing slopes and ridgetops are apt to be dominated by oaks with lesser amounts of red maple, hickory, black cherry and beech. Tulip poplar may be a major component of these forests on the mesic slopes and along stream courses. Typical understory shrubs include maple-leaved viburnum on the uplands and spicebush on the seepage slopes and lowlands. Chestnut oak, along with red oak and scarlet oak, is characteristic of the drier hilltops. These shallow, nutrient-poor soils support an understory of ericaceous shrubs such as mountain laurel, blueberry, and huckleberry and a sparse herb layer.

Forested north-facing slopes with deeper, more mesic soils are typically dominated by beech, often with a diverse array of ferns and wildflowers such as bloodroot, hepatica, trillium and others. Stands of eastern hemlock (and occasionally sugar maple) are less frequent in the county, limited primarily to the cool north-facing slopes along streams. Deeper soils with a high percentage of clay and silt may remain moist throughout the year regardless of slope and aspect and are able to support a mesic forest cover.

In the southern portion of the county, especially along the Pennsylvania-Maryland border, there are several plant communities which are part of a serpentine barrens complex ranging from Serpentine Pitch Pine-Oak Forest to Serpentine Grassland. These globally rare barrens occur on serpentine bedrock overlain by a thin layer of soil which is often nutrient-deficient, lacking much calcium, nitrogen, or phosphorus, but high in nickel, chromium, and other metals. Serpentine barrens often appear as the name suggests with sparse herbaceous and shrub cover with scattered trees such as pines and oaks. Even so, they are home to a high diversity of specialized and rare plant and insect species that have adapted to life in such extreme environmental conditions. Disturbance such as fire affects the nature of the community and the degree to which the serpentine effect is expressed. If periodic disturbance is suppressed, the unique serpentine communities may succeed to the more ordinary Mixed Oak Forest community.

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.

Another natural disturbance, over-browsing by deer 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 new growth 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 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 4 shows forested areas of Chester 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.

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 (*Seiurus 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, 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 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.

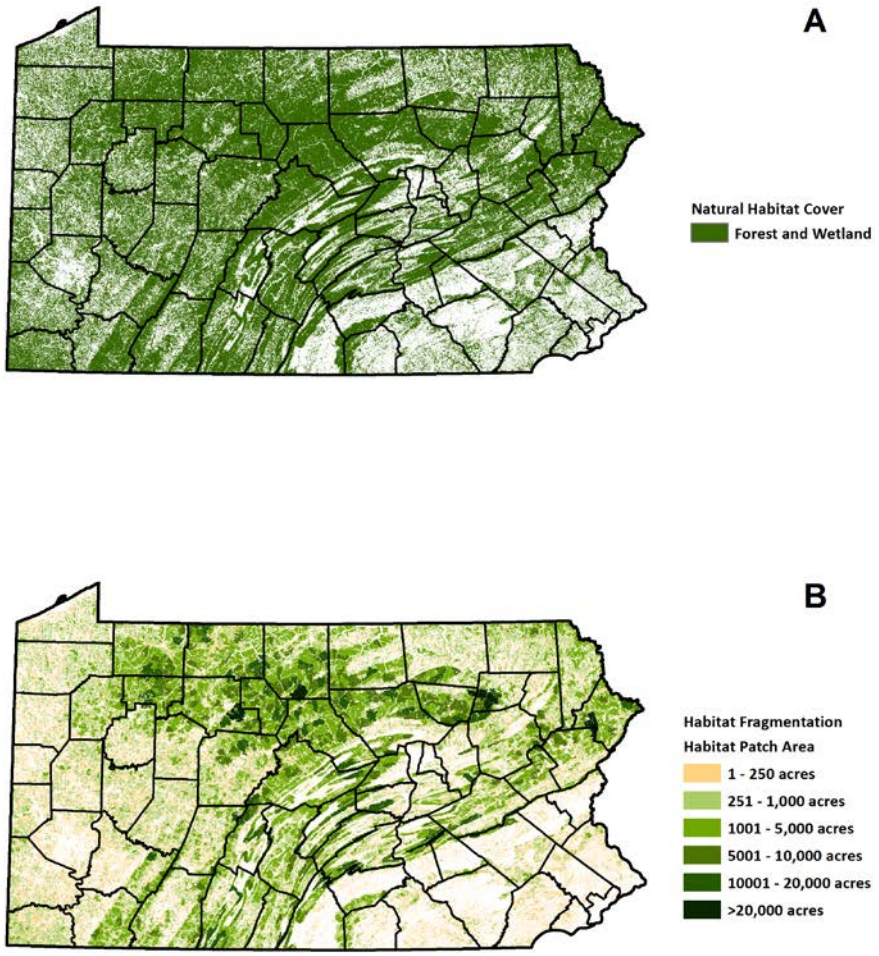


Figure 3. Forest and wetland areas of Pennsylvania shown at varying scales of fragmentation due to human-created linear landscape features.
A. Forest and wetland areas in Pennsylvania derived from the National Land Cover Data Set for Pennsylvania (USGS 2003).
B. Forest and wetland areas greater than 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).

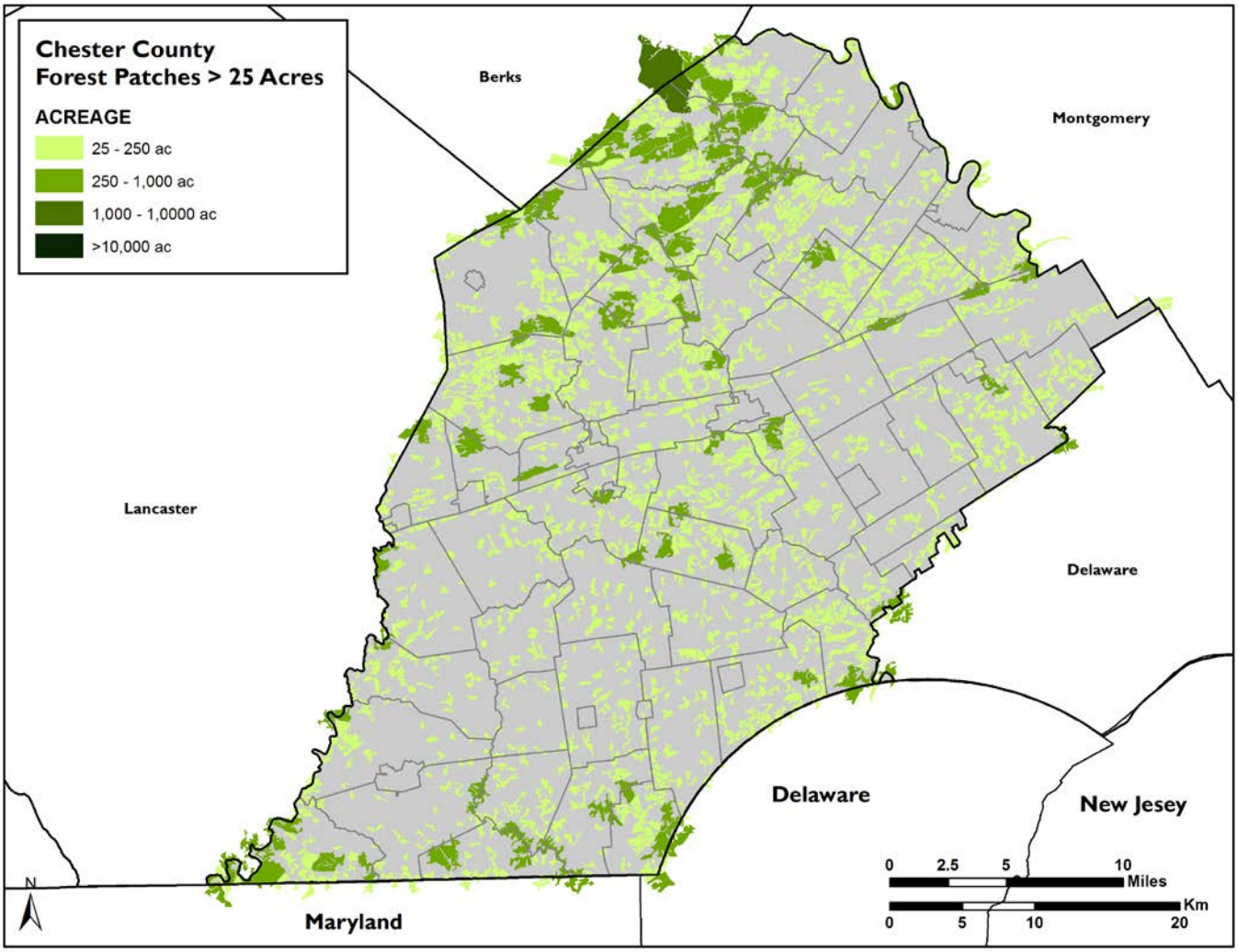


Figure 4. Forest Patches of Chester County. Many of the larger forest patches lay in the northern portion of the county.

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 Commonwealth 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 share 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 nonnative 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.

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 2007d).

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.

photo source: Connecticut Agricultural Experiment Station Archive

Hemlock woolly adelgid infestation along a hemlock branch.

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 1980's 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, or chemical methods.

Table 1. Significant invasive plant species with colonization potential in Chester 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*) Pachysandra (*Pachysandra terminalis*) 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 tree and shrub planting 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

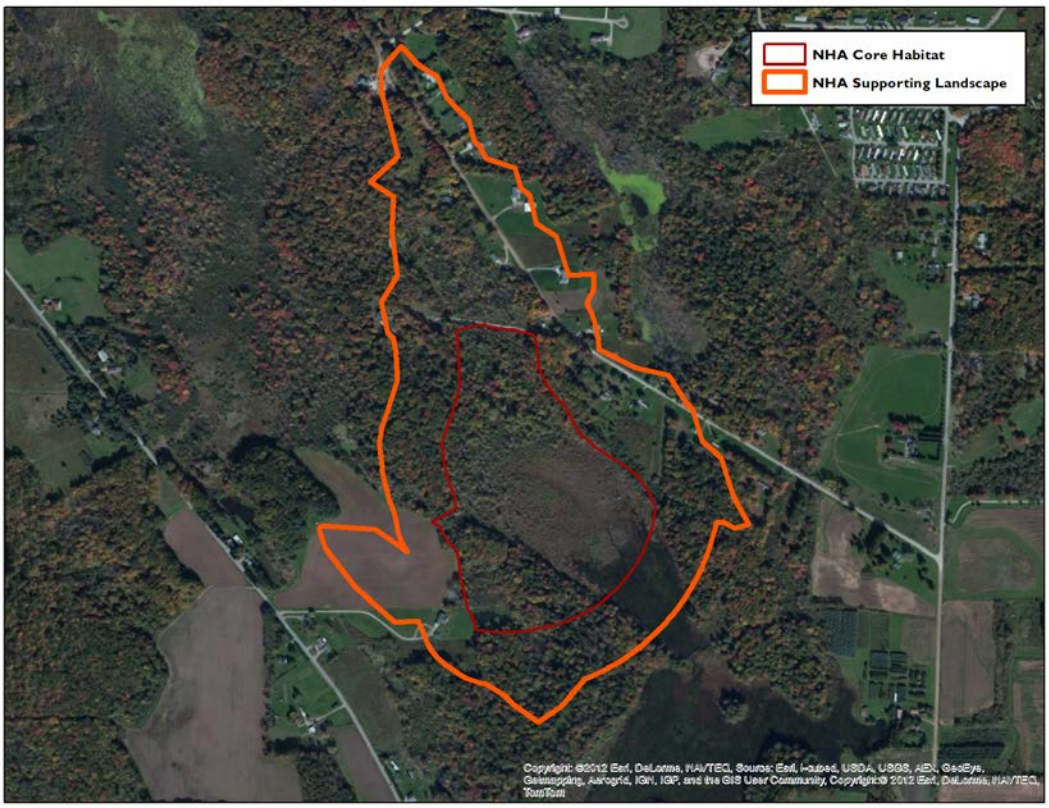
The following are an overview of the general methods used to create this report. For more detail about any of these methods please contact the Pennsylvania Natural Heritage Program.

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 NHAs 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). Sites with exemplary natural communities or exceptional native diversity were also selected for inclusion, even though they may not contain specific rare elements.

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 exactly 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 and contribution to biological diversity and ecological integrity 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 will help conserve the species, habitat, or site in question.
- Some information is considered non-sensitive, and therefore will be made broadly available, while other information is considered sensitive, and distribution 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.
- The release of sensitive information as defined above will be considered on a case-by-case basis, will be limited to those with a demonstrated need to know, and 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 sensitive species will be consistent with PNHP data sharing guidelines outlined above. These are presented as large, statewide, level sites 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 outlining the conservation priorities, threats and stresses, and conservation recommendations is presented for each site. 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 are 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, while 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 interest, while some species (e.g., many invertebrates) that are likely in the S1-S3 ranges are not yet tracked due to a lack of scientific information.

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.

Species Key

A series of icons are provided to provide a quick visual key to species present at a site, as well as help identify species with less than descriptive names. In the site account table, not all species will be represented in each site account table or geographic region.

Icon	Species Group	Description
	Plants	All plants including following plants, ferns, and mosses
	Amphibians	Frogs, toads, and salamanders
	Birds	--
	Fish	--
	Mammals	Tracked mammals including bats
	Freshwater Mussels	--
	Butterflies	Butterflies and skippers
	Moths	--
	Odonates	The dragonflies and damselflies
	Arachnids	Spiders and their kin
	Snails	Terrestrial and aquatic snails
	Tiger beetles	--
	Other Invertebrates	All other invertebrates not in the above groups
S	Sensitive Species	Species in any of the above groups that are not named by request of the jurisdictional agency
C	Communities	Natural communities and habitats

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 Chester 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 Chester County

There were 172 species and natural communities of concern documented in Chester 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/ .

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

Scientific Name	Common Name	Global Rank	State Rank	State Status	Proposed State Status
Mammal					
Lasionycteris noctivagans	Silver-haired Bat	G5	SUB	N	CR
Myotis septentrionalis	Northern Myotis	G4	S1	N	CR
Bird					
Ardea herodias	Great Blue Heron	G5	S3S4B,S4N	N	N
Asio flammeus	Short-eared Owl	G5	S1B,S3N	PE	PE
Cistothorus palustris	Marsh Wren	G5	S2S3B	N	CA
Haliaeetus leucocephalus	Bald Eagle	G5	S3B	PT	PT
Piranga rubra	Summer Tanager	G5	S3B	N	CA
Spiza americana	Dickcissel	G5	S2B	PE	PE
Reptile					
Clemmys guttata	Spotted Turtle	G5	S3	N	N
Glyptemys muhlenbergii	Bog Turtle	G3	S2	PE	PE
Opheodrys aestivus	Rough Green Snake	G5	S1	PE	PE
Pseudemys rubriventris	Eastern Redbelly Turtle	G5	S2S3	PT	CA
Regina septemvittata	Queen Snake	G5	S3	N	N
Terrapene carolina carolina	Eastern Box Turtle	G5T5	S3S4	B	N
Thamnophis sauritus	Eastern Ribbon Snake	G5	S3	N	N
Fish					
Percina bimaculata	Chesapeake Logperch	G1G2	S1S2	PT	N
Mussel					
Alasmidonta undulata	Triangle Floater	G4	S3S4	N	N
Lampsilis radiata	Eastern Lampmussel	G5	S2	N	CU

Scientific Name	Common Name	Global Rank	State Rank	State Status	Proposed State Status
Other Invertebrates					
Amblyscirtes vialis	Common Roadside Skipper	G4	S2	N	N
Anthocharis midea	Falcate Orangetip	G4G5	S3	N	N
Atrytonopsis hianna	Dusted Skipper	G4G5	S2	N	N
Callophrys gryneus	Juniper Hairstreak	G5	S3	N	N
Callophrys irus	Frosted Elfin	G3	S2	N	N
Euphyes conspicuus	Black Dash	G4	S3	N	N
Hesperia leonardus	Leonard's Skipper	G4	S3	N	N
Hesperia metea	Cobweb Skipper	G4	S2	N	N
Poanes massasoit	Mulberry Wing	G4	S2	N	N
Anisota stigma	Spiny Oakworm Moth	G5	S1S2	N	N
Apodrepanulatrix liberaria	A Geometrid moth	G3	S1S3	N	N
Artace cribraria	Dot-lined White Moth	G5	S1	N	N
Caripeta aretaria	Southern Pine Looper Moth	G4	S1S2	N	N
Catocala umbrosa	Umber Underwing Moth	G5	S1	N	N
Cisthene packardii	Packard's Lichen Moth	G5	S1S3	N	N
Cisthene plumbea	Lead-colored Lichen Moth	G5	S1	N	N
Citheronia regalis	Regal Moth	G4G5	SU	N	N
Crambidia pura	Pure Lichen Moth	G4	SU	N	N
Cyclophora nanaria	A Geometrid Moth	G5	S1S2	N	N
Elaphria cornutinis	A Noctuid Moth	G5	SU	N	N
Erastria coloraria	Broad-lined Erastria Moth	G3G4	S1	N	N
Hemileuca maia	Barrens Buckmoth	G5	S1S2	N	N
Holomelina laeta	Joyful Holomelina Moth	G4	S1S2	N	N
Hypagyrtis esther	Esther Moth	G5	S2S3	N	N
Idaea eremiata	An Idaea Moth	G4	S1	N	N
Idaea violacearia	A Wave Moth	G4	S1	N	N
Lagoa crispata	Black-waved Flannel Moth	G5	S1	N	N
Macrochilo hypocritalis	An Owlet Moth	G4	SU	N	N
Metaxaglaea semitaria	Footpath Sallow Moth	G5	S2	N	N
Papaipema marginidens	A Borer Moth	G4	SU	N	N
Parahypenodes quadralis	A Noctuid Moth	G4	SU	N	N
Renia sp. 1 nr. discoloralis	A Renia Moth	G4	S1?	N	N
Richia acclivis	A Noctuid Moth	G4G5	S1S2	N	N
Stygobromus pizzinii	Pizzini's Cave Amphipod	G3G4	S1	N	N
Sutyna privata teltowa	A Noctuid Moth	G5T4	S1	N	N
Tolype notialis	Tolype Moth	G4G5	S1	N	N
Xestia elimata	Southern Variable Dart Moth	G5	S2S3	N	N
Zale curema	A Zale Moth	G3G4	S1	N	N
Zale obliqua	Oblique Zale Moth	G5	S1	N	N
Zale squamularis	A Noctuid Moth	G4	S2S3	N	N
Zale submediana	A Zale Moth	G4	S2	N	N

Scientific Name	Common Name	Global Rank	State Rank	State Status	Proposed State Status
Invertebrates (continued)					
Zanclognatha martha	Pine Barrens Zanclognatha	G4	S1S2	N	N
Cordulegaster erronea	Tiger Spiketail	G4	S3	N	N
Ladona deplanata	Blue Corporal	G5	S1	N	N
Plants					
Cheumatopsyche vannotei	Vannote's Cheumatopsyche Caddisfly	GH	SH	N	N
Ageratina aromatica	Small White-snakeroot	G5	S3	N	PR
Aletris farinosa	Colic-root	G5	S1	TU	PE
Amelanchier canadensis	Serviceberry	G5	S1	N	PE
Andropogon glomeratus	Bushy Bluestem	G5	S3	TU	PR
Andropogon gyrans	Elliott's Beardgrass	G5	S3	N	PR
Aplectrum hyemale	Puttyroot	G5	S3	PR	PR
Arabis patens	Spreading Rockcress	G3	S2	N	PT
Aristida purpurascens	Arrow-feathered Three Awn	G5	S2	PT	PT
Asclepias variegata	White Milkweed	G5	S1	TU	PE
Asclepias verticillata	Whorled Milkweed	G5	S2	TU	PE
Asplenium pinnatifidum	Lobed Spleenwort	G4	S3	N	PR
Bartonia paniculata	Screw-stem	G5	S3	N	PR
Bouteloua curtipendula	Tall Grama	G5	S2	PT	PT
Carex bicknellii	Bicknell's Sedge	G5	S1	PE	PE
Carex longii	Long's Sedge	G5	S2S3	TU	PT
Carex lupuliformis	False Hop Sedge	G4	S1	TU	PE
Carex meadii	Mead's Sedge	G4G5	S1	TU	PE
Carex richardsonii	Richardson's Sedge	G5	S1	N	PE
Carex tetanica	A Sedge	G4G5	S2	PT	PT
Carex typhina	Cattail Sedge	G5	S2	PE	PT
Castilleja coccinea	Scarlet Indian-paintbrush	G5	S2	TU	PT
Cerastium velutinum var. velutinum	Field Chickweed	G5T4?	S3	N	SP
Cerastium velutinum var. villosissimum	Goat Hill Chickweed	G5T1	S1	PE	PE
Chasmanthium latifolium	Wild Oat	G5	S1	TU	PE
Chionanthus virginicus	Fringe-tree	G5	S3	N	PT
Chrysopsis mariana	Maryland Golden-aster	G5	S1	PT	PE
Cirsium horridulum	Horrible Thistle	G5	S1	PE	PE
Clematis viorna	Vase-vine Leather-flower	G5	S1	PE	PE
Corallorhiza wisteriana	Spring Coral-root	G5	S1	TU	PE
Cuscuta compacta	Dodder	G5	S2	N	PT
Cuscuta pentagona	Field Dodder	G5	S2	N	PT
Cyperus schweinitzii	Schweinitz's Flatsedge	G5	S2	PR	PR
Deschampsia cespitosa	Tufted Hairgrass	G5	S3	N	PT
Desmodium laevigatum	Smooth Tick-trefoil	G5	S1	N	PE
Desmodium nuttallii	Nuttalls' Tick-trefoil	G5	S2	TU	PT

Scientific Name	Common Name	Global Rank	State Rank	State Status	Proposed State Status
Plants (continued)					
Dichanthelium annulum	Serpentine Panic-grass	GNR	S2	TU	PT
Dichanthelium lucidum	Shining Panic-grass	GNR	S1	TU	PE
Dichanthelium oligosanthes	Heller's Witchgrass	G5	S3	N	PT
Dichanthelium scoparium	Velvety Panic-grass	G5	S1	PE	PE
Dichanthelium villosissimum var. villosissimum	Long-haired Panic-grass	G5T5	SH	TU	PE
Dichanthelium yadkinense	Yadkin River Panic-grass	G4Q	S1	TU	PE
Dryopteris celsa	Log Fern	G4	S1	N	PE
Elephantopus carolinianus	Elephant's Foot	G5	S4	PE	WATCH
Ellisia nyctelea	Ellisia	G5	S2	PT	PT
Eupatorium pilosum	Ragged Eupatorium	G5	S4	SP	N
Eupatorium rotundifolium	Round-leaved Eupatorium	G5	S3	TU	TU
Euphorbia purpurea	Glade Spurge	G3	S1	PE	PE
Festuca paradoxa	Cluster Fescue	G5	S1	PE	PE
Fimbristylis annua	Annual Fimbry	G5	S2	PT	PT
Gentiana saponaria	Soapwort Gentian	G5	S1S2	TU	PE
Gentiana villosa	Striped Gentian	G4	S1	TU	PE
Helianthemum bicknellii	Bicknell's Hoary Rockrose	G5	S2	PE	PE
Hydrastis canadensis	Golden-seal	G4	S4	PV	PV
Hypericum stragulum	St Andrew's-cross	G4	S2	N	PT
Ilex opaca	American Holly	G5	S2	PT	PT
Iris prismatica	Slender Blue Iris	G4G5	S1	PE	PE
Isotria medeoloides	Small-whorled Pogonia	G2	S1	PE	PE
Juncus biflorus	Grass-leaved Rush	G5	S2	TU	PT
Juncus dichotomus	Forked Rush	G5	S1	PE	PE
Juncus scirpoides	Scirpus-like Rush	G5	S1	PE	PE
Leucothoe racemosa	Swamp Dog-hobble	G5	S2S3	TU	PT
Linum intercursum	Sandplain Wild Flax	G4	S1	PE	PE
Lobelia puberula	Downy Lobelia	G5	S1	PE	PE
Lupinus perennis	Lupine	G5	S3	PR	PR
Lyonia mariana	Stagger-bush	G5	S1	PE	PE
Magnolia tripetala	Umbrella Magnolia	G5	S2	PT	PR
Magnolia virginiana	Sweet Bay Magnolia	G5	S2	PT	PT
Orontium aquaticum	Goldenclub	G5	S4	PR	SP
Oxypolis rigidior	Stiff Cowbane	G5	S2	TU	PT
Packera anonyma	Plain Ragwort	G5	S2	PR	PR
Panax quinquefolius	Wild Ginseng	G3G4	S4	PV	PV
Paronychia fastigiata var. nuttallii	Forked-chickweed	G5T3T5	S1S2	TU	PE
Pedicularis lanceolata	Swamp Lousewort	G5	S1S2	N	PE
Phaseolus polystachios	Wild Kidney Bean	G5	S1S2	N	PE
Phemeranthus teretifolius	Round-leaved Fame-flower	G4	S2	PT	PT

Scientific Name	Common Name	Global Rank	State Rank	State Status	Proposed State Status
Plants (continued)					
Physalis virginiana	Virginia Ground-cherry	G5	S1S2	TU	PE
Poa autumnalis	Autumn Bluegrass	G5	S1	PE	PE
Poa paludigena	Bog Bluegrass	G3	S3	PT	PR
Polygala curtissii	Curtis's Milkwort	G5	S1	PE	PE
Prenanthes serpentaria	Lion's-foot	G5	S3	N	PT
Quercus falcata	Southern Red Oak	G5	S1	PE	PE
Ranunculus hederaceus	Long-stalked Crowfoot	G5	S1	PX	PE
Rhynchospora recognita	Small Globe Beaked-rush	G5?	S1	TU	PE
Rotala ramosior	Tooth-cup	G5	S3	PR	PR
Rubus cuneifolius	Sand Blackberry	G5	S1	TU	PE
Rudbeckia fulgida	Eastern Coneflower	G5	S3	N	PT
Scleria pauciflora	Few Flowered Nutrush	G5	S2	PT	PT
Sericocarpus linifolius	Narrow-leaved White-topped Aster	G5	S1	PE	PE
Solidago uliginosa	Bog Goldenrod	G4G5	S2	N	PT
Spiranthes vernalis	Spring Ladies'-tresses	G5	S1	PE	PE
Sporobolus heterolepis	Prairie Dropseed	G5	S1	PE	PE
Strophostyles umbellata	Wild Bean	G5	S2	N	PE
Stylosanthes biflora	Pencilflower	G5	S2	TU	PE
Symphyotrichum depauperatum	Serpentine Aster	G2	S2	PT	PT
Symphyotrichum dumosum	Bushy Aster	G5	S1	TU	PE
Tipularia discolor	Cranefly Orchid	G4G5	S3	PR	PR
Trillium cernuum	Nodding Trillium	G5	S2	N	PT
Vernonia glauca	Tawny Ironweed	G5	S1	PE	PE
Viburnum nudum	Possum-haw	G5	S1	PE	PE
Woodwardia areolata	Netted Chainfern	G5	S2	N	PT
Xyris torta	Twisted Yellow-eyed Grass	G5	S1	N	PT
Zizania aquatica	Indian Wild Rice	G5	S3	PR	PR
Communities					
Bluejoint - reed canary grass marsh	Bluejoint - reed canary grass marsh	GNR	S5	N	N
Circumneutral shrub swamp	Circumneutral Shrub Swamp	GNR	S3	N	N
Red-cedar - pine serpentine shrubland	Red-cedar - pine serpentine shrubland	GNR	S1	N	N
Serpentine grassland	Serpentine grassland	GNR	S1	N	N
Serpentine pitch pine - oak forest	Serpentine pitch pine - oak forest	GNR	S1	N	N
Serpentine virginia pine - oak forest	Serpentine virginia pine - oak forest	GNR	S2	N	N
Skunk cabbage - golden saxifrage forest seep	Skunk cabbage - golden saxifrage forest seep	GNR	S4S5	N	N

Natural Heritage Areas of Chester County

This inventory of rare species has resulted in the designation of 169 Natural Heritage Areas in Chester County (Table 3). Both Core Habitat and Supporting Landscape are shown. Brief site descriptions and their significance ranks are presented in Table 3. Thirteen of the sites are ranked as having Global Significance, nine have Regional Significance, and 144 have State Significance. Criteria for these significance ranks are discussed in more detail in the Methods section of this document.

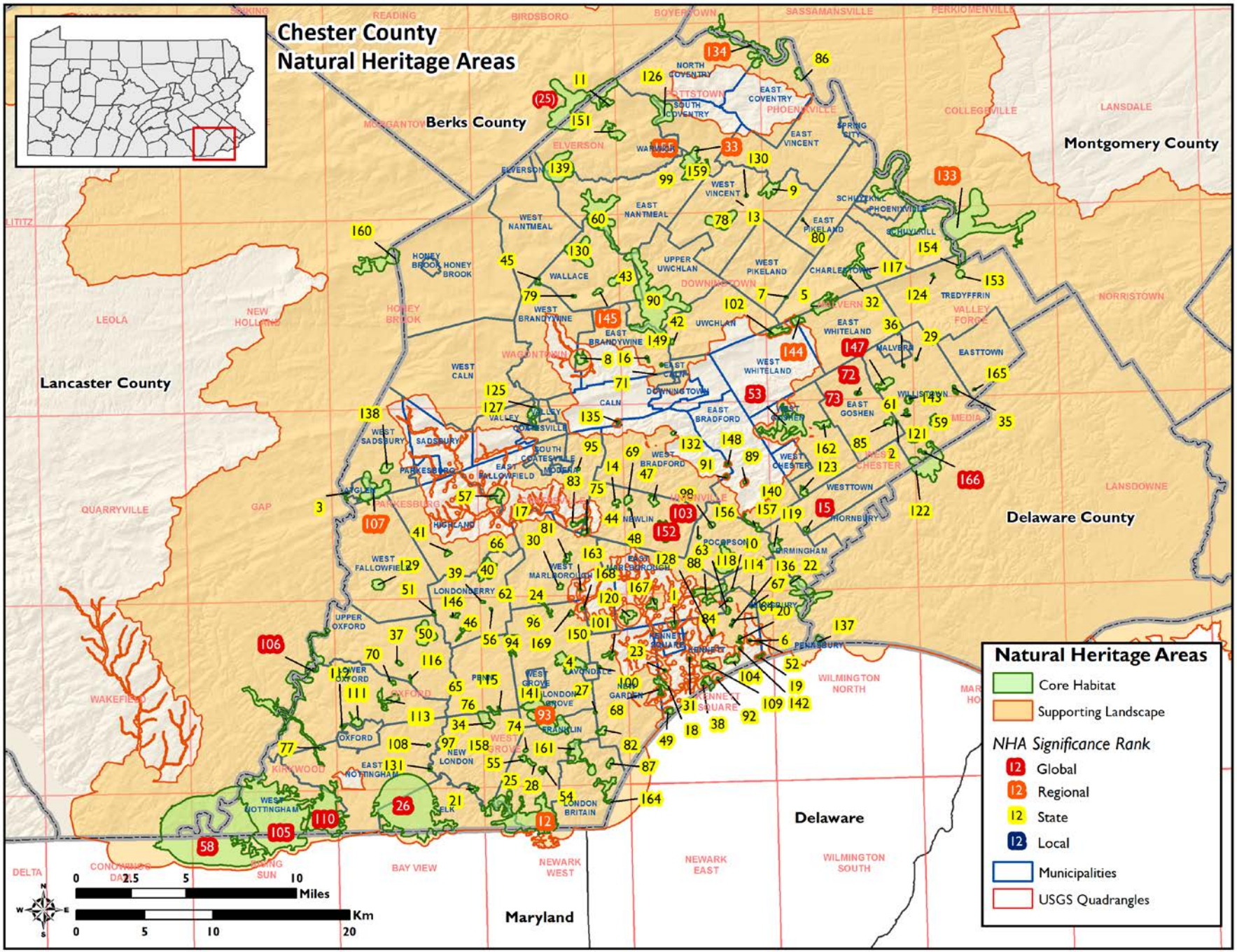

Chester County
Natural Heritage Areas
Berks County
Montgomery County
Lancaster County
Delaware County
Delaware
Maryland
Natural Heritage Areas
Core Habitat
Supporting Landscape
NHA Significance Rank
12 Global
12 Regional
12 State
12 Local
Municipalities
USGS Quadrangles
Miles
Km

Table 3. Natural Heritage Areas in Chester County. Significance ranks are ***Global***, ***Regional***, ***State***, and ***Local***.

NHA #	Site Name	Significance Rank	Description
1	Anson B. Nixon Park	State	Forests at this site provide habitat for Autumn bluegrass and Yadkin River panic grass, both critically imperiled plants in PA, and a population of a sensitive species of concern.
2	Ashbridge Farm	State	A dry meadow provides habitat for Heller's witchgrass, a vulnerable plant species in Pennsylvania.
3	Atglen Meadow	State	An open wet meadow at this site supports a population of *Carex tetanica*, a sedge plant species which is state threatened.
4	Avondale Woods	State	This site supports populations of tawny ironweed and Long's sedge, both of which are plant species of concern. Populations for two sensitive species of concern are also found here.
5	Bacton Mine Ridge	State	Forested wetlands and disturbed uplands support populations of five plant species of concern.
6	Balmoral Drive Woods	State	Moist forest along this tributary to the East Branch of Red Clay Creek supports a population of Autumn bluegrass, a state endangered plant in PA.
7	Bassett Lane at Seven Oaks Road	State	This site supports a population of Elliott's beardgrass.
8	Beaver Creek Lake	State	This site supports a population of a sensitive species of concern.
9	Beaver Hill Road Woods	State	Forest habitat supports a population of spring coralroot, a critically imperiled plant species in Pennsylvania, and a population of a sensitive species of concern.
10	Bennett's Run	State	Moist, mature forest along Bennett's Run provides habitat for a Watch List plant species.
11	Bethesda Road Wet Woods	State	This forested wetland supports populations of 6 plant species of concern.
12	Big Elk Creek	Regional	A diversity of habitats supports 11 species of concern and 3 sensitive species of concern.
13	Birch Run Woods	State	Disturbed upland forest supports a population of wild kidney bean, a plant species of concern.
14	Brandywine Creek - Eastern Laurel Floodplain	State	A partially vegetated gravel bar provides habitat for a population of Ellisia, a threatened plant species in Pennsylvania.

NHA #	Site Name	Significance Rank	Description
15	Brinton's Quarry Serpentine Barren	Global	Abandoned quarries on a serpentine barren host populations of 5 plant species of concern.
16	Buck Road Meadow	State	Open meadow habitat and adjacent forest support populations of two plant species of concern: twisted yellow-eyed grass and Elliott's beardgrass.
17	Buck Run Fields	State	An open disturbed meadow supports a population of the state imperiled plant, pencilflower.
18	Bucktoe Creek Woods	State	This NHA supports populations of three plant species of concern in Pennsylvania: netted chainfern, stiff cowbane, and horrible thistle.
19	Burnt Mill Road North Meadow	State	This site supports populations of two plant species of concern, Elliott's beardgrass and grass-leaved rush.
20	Burrows Run Road South	State	Forested wetlands along Burrows Run support a population of grass-leaved rush, a plant species of concern.
21	Camp Bonsul Road Woods	State	Forested habitat along Big Elk Creek supports a population of puttyroot, a plant species of concern, and two sensitive species of concern.
22	Chadd's Ford Swamp	State	Wetlands and riparian habitats support 6 plant species of concern, including Elliott's beardgrass and Yadkin River panic-grass, as well as an additional sensitive species of concern.
23	Chandler Mill Road Meadow	State	Open upland habitat supports a population of Pennsylvania endangered horrible thistle.
24	Chatham Stream Valley	State	Riparian forest provides habitat for stiff cowbane, a plant species of concern.
25	Chesterville Road Woods	State	This NHA provides upland forest habitat for three species of concern, including puttyroot and two sensitive species of concern.
26	Chrome Serpentine Barrens	Global	This site supports globally rare natural communities of Serpentine Grassland and Serpentine Virginian Pine-Oak Forest. These communities support at least 26 species of concern.
27	Clay Creek Road East Wetland	State	Forested wetlands support a population of fringe-tree, a vulnerable plant species in Pennsylvania.
28	Clay Line Corridor	State	Open meadow within an energy transmission corridor provides habitat for three plant species of concern: *Eupatorium rotundifolium*, field dodder, and Nuttall's tick-trefoil.

NHA #	Site Name	Significance Rank	Description
29	Clearview Road Barrens	State	A tiny serpentine barren supports a population of a sensitive species of concern.
30	Clonmell Upland Road	State	This forested site supports a population of Autumn bluegrass, an endangered plant species in Pennsylvania.
31	Cold Springs Drive	State	Open, disturbed habitat along Cold Springs Drive supports a population of state vulnerable Elliott's beardgrass.
32	Constant Spring Lane Meadow	State	This site provides habitat for Elliott's beardgrass, a vulnerable plant species in Pennsylvania.
33	Coventryville Road Woods	Regional	This site supports a population of a sensitive species of concern as well as two Watch List plant species.
34	Cox Farm	State	Wet meadow habitat supports a population of downy lobelia, an endangered plant species in Pennsylvania.
35	Crum Creek	State	The forested floodplain of Crum Creek supports a population of Autumn bluegrass, a state endangered plant species.
36	Crum Creek Barrens	State	Serpentine barrens support populations of two plant imperiled plant species in Pennsylvania, few flowered nutrush and plain ragwort.
37	Cullen Road Pasture	State	Old pasture habitat at this site supports Pennsylvania critically imperiled bushy aster and a sensitive species of concern.
38	Delaware Line Woods	State	This forested site supports populations of tawny ironweed and puttyroot, both plant species of concern, and a sensitive species of concern.
39	Derry Meeting Road Wetland	State	A wet maple woods supports populations of two plant species of concern, stiff cowbane and screw-stem.
40	Doe Run Fields	State	Open fields, roadsides, and grasslands support a population of a plant species of concern, Elliott's beardgrass, and another sensitive species of concern.
41	Doe Run Headwaters	State	This site supports a population of a sensitive species of concern.
42	Dowlin Forge Road	State	Open, disturbed upland habitat hosts a population of St. Andrew's-cross, an imperiled plant species in Pennsylvania.
43	East Branch Brandywine Creek	State	Riparian forest and forested wetland provide habitat for a population of northern myotis, a bat species critically imperiled in Pennsylvania.

NHA #	Site Name	Significance Rank	Description
44	East Green Valley Road Woods	State	An old meadow opening in this forest patch supports Nuttall's tick-trefoil, an imperiled plant species in Pennsylvania.
45	Edgemoor Lane Meadow	State	A small meadow supports a population of bushy bluestem, a plant species of concern in Pennsylvania.
46	Elm Creek Wet Woods	State	Forest and forested wetland at this site supports two plant species of concern in Pennsylvania: fringe-tree and stiff cowbane.
47	Embreeville Road Wetlands	State	Wetlands with shallow pools support a population of tooth-cup, a plant species of concern in Pennsylvania.
48	Embreeville West	State	Rocky outcrops provide habitat for lobed spleenwort, a plant species of concern in PA.
49	Ewart Road Meadow	State	Open, disturbed fields and edge habitat support a population of Eastern coneflower, a vulnerable plant species in Pennsylvania.
50	Ewing Road Wetland	State	Wetland habitat supports a population of a sensitive species of concern.
51	Faggs Manor Road Wetland	State	Wetland habitat supports a population of stiff cowbane, an imperiled plant species of concern in Pennsylvania.
52	Fairville Road Woods	State	This forested site supports a population of puttyroot, a plant species of concern in PA.
53	Fern Hill Serpentine Barrens	Global	This site includes three state rare natural communities as part of a small serpentine barren. This unique habitat supports 10 plant species of concern and two butterfly species of concern.
54	Franklin School East	State	This site supports a sensitive species of concern.
55	Franklin School North	State	Upland forest is important habitat for a sensitive species of concern.
56	Gap Newport Pike-Street Road	State	This NHA provides habitat for bushy aster, a critically imperiled plant species in Pennsylvania.
57	Glenrose	State	Aquatic and riparian habitats at this site support a population of a sensitive species of concern.
58	Goat Hill Serpentine Barrens	Global	This diverse site contains a globally rare Serpentine Pitch Pine-Oak Forest community and supports populations of more than 65 species of concern - including many moths and butterflies, numerous plants, and some vertebrates.

NHA #	Site Name	Significance Rank	Description
59	Goshen Road Woods	State	Aquatic and forested wetland habitats support a population of a sensitive species of concern.
60	Great Marsh	State	Extensive wetlands at this site support two state rare natural communities and 7 species of concern. Included among these is state imperiled marsh wren, two state rare butterflies - black dash and mulberry wing, and a state imperiled upland plant, Nuttalls' tick-trefoil.
61	Green Lane Woods	State	Forested wetland supports a population of log fern, a critically imperiled plant species in Pennsylvania.
62	Green Lawn Southwest	State	This site provides habitat for a population of Elliott's beardgrass, a vulnerable plant species of concern in Pennsylvania.
63	Greenwood Elementary School	State	Forested habitat on the grounds of Greenwood Elementary School support populations of two plant species of concern: grass-leaved rush and stiff cowbane.
64	Greenwood Road East Woods	State	This forested site supports a population of the state rare plant, puttyroot.
65	Grist Mill Woods	State	Upland forest and forested wetlands along the East Branch of Big Elk Creek support populations of 5 plant species of concern
66	Gum Tree Road	State	This site supports a population of a sensitive species of concern.
67	Hamorton Woods	State	Forested habitat supports a population of Autumn bluegrass, an endangered plant species in PA.
68	Hartsfeld Woods	State	Upland forest at this site provides habitat for a sensitive species of concern.
69	Harvey's Bridge North	State	Upland habitats support two plant species of concern: Elliott's beardgrass and puttyroot.
70	Hayesville Powerline Seep	State	Wetland habitat at this site supports a population of a Pennsylvania imperiled plant, stiff cowbane.
71	Helm Way Pipeline	State	An open, disturbed pipeline corridor supports a population of tawny ironweed, an endangered plant species in Pennsylvania.
72	Hershey Mill Barrens Southeast	Global	Serpentine rock outcrops and small barrens patches provide habitat for two Pennsylvania threatened plants, annual fimbry and serpentine aster, and another sensitive species of concern.

NHA #	Site Name	Significance Rank	Description
73	Hershey Mill Barrens Southwest	Global	Prairie outcrop barrens supports populations of serpentine aster, a globally imperiled plant species, and annual fimbry, a plant species imperiled in Pennsylvania.
74	Hill Crest Drive	State	Moist upland forest slopes support a population of fringe-tree, a vulnerable plant species in Pennsylvania.
75	Hilltop View Woods	State	Upland forest at this site provides habitat for a sensitive species of concern.
76	Hodgson Circle	State	Wet shrubland provides habitat for grass-leaved rush, an imperiled plant species in Pennsylvania.
77	Hopewell Floodplain	State	Open, disturbed habitat at this site supports two critically imperiled plants in Pennsylvania: forked rush and downy lobelia.
(25) Berks CNHI Update 2014	Hopewell Lake	Global	This site contains two state-rare natural communities along with populations of 14 plant species of concern, 2 dragonfly species of concern, Northern myotis, a critically imperiled bat species, and five additional sensitive species of concern.
78	Horsehoe Trail	State	Wetlands at this site support a population of a sensitive species of concern.
79	Indian Run	State	Moist forest along Indian run supports a population of a sensitive species of concern.
80	Kimberton Meadows	State	This site provides habitat for a sensitive species of concern.
81	King Ranch Woods	State	This site supports a population of puttyroot, a vulnerable plant species in Pennsylvania.
82	Laurel Woods Preserve	State	Forested habitat at this site supports a population of fringe-tree, a plant species of concern, and a population of a sensitive species of concern.
83	Laurels Preserve	State	Sand bars in Buck Run support a population of Ellisia, a threatened plant species in Pennsylvania.
84	Lenape Road Meadow	State	A population of state rare Elliott's beardgrass is found at this site.
85	Line Road Woods	State	Riparian and upland forests support populations of tooth-cup and Autumn bluegrass, plant species of concern in Pennsylvania.
86	Linfield Siltation Basin	State	Forested wetlands along the Schuykill River support populations of two plant species of concern: Schweinitz's flatsedge and tooth-cup.

NHA #	Site Name	Significance Rank	Description
87	London Tract Marsh	State	Wetland habitat supports a population of swamp lousewort, a critically imperiled plant in Pennsylvania.
88	Longwood Gardens	State	Wetlands at this site support populations of four plant species of concern: false hop-sedge, grass-leaved rush, Scirpus-like rush, and swamp dog-hobble.
89	Lucky Hill Road	State	Wetlands at this site support populations of four plant species of concern: false hop-sedge, grass-leaved rush, Scirpus-like rush, and swamp dog-hobble.
90	Marsh Creek Lake	State	Aquatic and wetland habitats support two butterfly species of concern, mulbery wing and black dash, a plant species of concern, Nuttall's tick trefoil, and a sensitive species of concern.
91	Marshallton Barrens	State	This small serpentine barren provides habitat for two plant species of concern: plain ragwort and tall gramma, in addition to a sensitive species of concern.
92	Merrybell Lane Woods	State	Upland forest at this site supports a population of Autumn bluegrass, an endangered plant species in Pennsylvania.
93	Middle Branch White Clay Creek	Regional	Riparian and wetland habitats support populations of several species of concern.
94	Middle Branch White Clay Creek Wetlands	State	Forested wetlands at this site support two plant species of concern, false hop sedge and stiff cowbane.
95	Modena Railroad Yard	State	Dry, cinder-filled uplands at this site support a population of forked-chickweed, a critically imperiled plant species in Pennsylvania.
96	Mosquito Lane	State	This site supports a population of a sensitive species of concern.
97	Mt. Hope Road	State	Open, disturbed forest habitat at this site supports a population of Pennsylvania critically imperiled bushy aster.
98	Myrick Conservation Center	State	This forested site supports a population of the state rare plant, puttyroot, and a sensitive species of concern.
99	Nantmeal Powerline	State	Wetland habitat in this powerline corridor supports a population of grass-leaved rush, an imperiled plant species of concern in Pennsylvania.

NHA #	Site Name	Significance Rank	Description
100	New Garden Airfield	State	Open grassy habitats support a population of smooth tick-trefoil, a plant species of concern which is critically imperiled in Pennsylvania.
101	New Garden Airfield - North	State	Disturbed areas of open, upland habitat support populations of 4 plant species of concern.
102	North Valley Hills	State	Two plant species of concern, stagger-bush and Southern red oak, have populations in the upland forest at this site.
103	Northbrook Serpentine Meadow	Global	A serpentine meadow supports populations of 7 plant species of concern and a sensitive species of concern.
104	Norway Road West	State	This diverse site contains globally rare Serpentine Grassland and Serpentine Pitch Pine-Oak Forest communities and supports populations of more than 70 species of concern - including many moths and butterflies, numerous plants, and some vertebrates.
105	Nottingham Serpentine Barrens	Global	This diverse site contains globally rare Serpentine Grassland and Serpentine Pitch Pine-Oak Forest communities and supports populations of more than 70 species of concern - including many moths and butterflies, numerous plants, and some vertebrates.
106	Octoraro Lake	Global	This site supports populations of 6 species of concern. Included among these are 4 state rare plants: fringe-tree, Virginia ground-cherry, Maryland golden-aster, and stiff cowbane.
107	Officers Run	Regional	Wetland and upland habitats support 7 plant species of concern and two sensitive species of concern.
108	Old Creek Road	State	Upland forest provides habitat for a Pennsylvania vulnerable plant, fringe-tree.
109	Old Kennett Road	State	This site supports populations of two plant species of concern: swamp lousewort and horrible thistle.
110	Oxford Airport Barrens	Global	Serpentine barren and upland forest provide habitat for 35 species of concern, comprised of moths, butterflies, and plants.
111	Oxford Commons	State	This site supports a population of a sensitive species of concern.
112	Oxford Meadow	State	This site supports a population of a sensitive species of concern.

NHA #	Site Name	Significance Rank	Description
113	Oxford Woods	State	Forest and wetland habitats support populations for five species of concern. Among these are Pennsylvania imperiled plants such as umbrella magnolia and stiff cowbane.
114	Parkersville Road	State	This site supports a population of a sensitive species of concern.
115	Pennock Bridge Road	State	Riparian forests and associated wetlands support populations of 3 plants species of concern: stiff cowbane, possum-haw, and fringe-tree.
116	Pennsgrove Road Wetland	State	Forested wetland at this site supports a population of a Pennsylvania imperiled plant, stiff cowbane.
117	Pickering Creek Tributary	State	Aquatic and riparian habitat supports a sensitive species of concern.
118	Pocopson Creek	State	This site supports populations of three plant species of concern in Pennsylvania: Elliott's beardgrass, Heller's witchgrass. amd a sensitive species.
119	Radley Run	State	This site supports a sensitive species of concern.
120	Red Clay Creek West Branch	State	Aquatic and forested wetland habitats support a population of a sensitive species of concern.
121	Ridley Creek-Hunters Run	State	Upland and floodplain forest at this site support two plant species of concern: Yadkin River panic-grass and Autumn bluegrass.
122	Ridley Creek Headwaters	State	Wetlands that form the headwaters to Ridley Creek support populations of tooth-cup, a state rare plant, and tiger spiketail, a state rare dragonfly, as well as a sensitive species of concern.
123	Robert B. Gordon Natural Area	State	Mixed hardwood forest at this site supports a population of state endangered Autumn bluegrass and a sensitive species of concern.
124	Rochambeau Drive Swale	State	A wet swale wetland supports a population of grass-leaved rush, an imperiled plant species in Pennsylvania.
125	Rock Run Railroad Woods	State	A rocky outcrop provides habitat for a population of the wild kidney bean, an imperiled plant species in Pennsylvania.
126	Rock Run Thicket	State	Wetlands at this site support a population of sweetbay magnolia, an imperiled tree species in Pennsylvania, and a sensitive species of concern.

NHA #	Site Name	Significance Rank	Description
127	Rock Valley Woods	State	Upland forest supports populations of two plant species of concern: stagger-bush and Eupatorium.
128	Rosedale-Bayard Roads	State	Meadows along these two roads support a population of grass-leaved rush, an imperiled plant species in PA.
129	Ross Fording-Homeville	State	This site provides habitat for a sensitive species of concern.
130	Route 282 Wetlands	State	This site supports two sensitive species of concern.
131	Saginaw Road Woods	State	Upland forest at this site supports three plant species of concern: wild bean, sand blackberry, and fringe-tree.
132	Saw Mill Road Pond	State	This human-made pond supports a population of netted chainfern, a plant species that is imperiled in Pennsylvania.
133	Schuykill River-Port Providence	Regional	Diverse habitats at this site support 7 species of concern, including 3 sensitive species.
134	Schuykill River-Kenilworth	Regional	Aquatic habitat at this site supports a sensitive species of concern and wells on the Pottstown side of the river were historically known to support the northern most population of Pizzini's cave amphipod.
135	Silbury Hill	State	This forested site supports a population of a sensitive species of concern.
136	Sills Mill Road Meadow	State	This meadow provides habitat for Elliott's beardgrass, a vulnerable plant species in PA.
137	Smith's Bridge Floodplain	State	Populations of two plant species of concern, tooth-cup and puttyroot, are found at this site.
138	South Blackhorse Forest	State	Forested habitat at this site supports a population of a sensitive species of concern.
139	South Branch French Creek	State	This site supports a state rare natural community, a Skunk Cabbage-Golden Saxifrage Forest Seep, and a sensitive species of concern.
140	South Connelltown Road	State	This site supports a population of Elliott's beardgrass, a plant species of concern in Pennsylvania.
141	South Guernsey Roadbank	State	Open, disturbed roadside habitat supports a population of Heller's witchgrass, a plant species of concern.
142	Spring Mill Road Meadow	State	A moist meadow supports a population of the state endangered plant, horrible thistle.

NHA #	Site Name	Significance Rank	Description
143	Spring Road Wet Meadow	State	Wetland habitat supports a population of grass-leaved rush, an imperiled plant species in Pennsylvania.
144	Spring Valley Road Woods	Regional	Upland forest at this site supports a population of a sensitive species of concern.
145	Springton Brandywine Bend	Regional	Forested habitats at this site support a population of bog bluegrass and a sensitive species of concern.
146	Street Road Woods	State	Forested wetland supports a population of screw-stem, a plant species of concern in Pennsylvania.
147	Sugartown Serpentine Barrens	Global	Serpentine barrens include state rare serpentine grassland and serpentine Virginia pine-oak forest communities and support 10 plant species of concern.
148	Telegraph Road Woods	State	This site provides habitat for a sensitive species of concern.
149	Township Road Woods	State	This site supports populations of two plant species of concern: Elliott's beardgrass and St. Andrew's-cross.
150	Triangle Woods	State	A small patch of forest supports a population of cattail sedge, an endangered plant species in Pennsylvania.
151	Trythall Woods	State	Seepage forested wetlands support a population of swamp lousewort, a plant species of concern.
152	Unionville Serpentine Barren	Global	This site contains a serpentine grassland natural community, critically imperiled in PA and supports many plant and lepidopteran species of concern.
153	Valley Forge	State	The floodplain corridor of Valley Creek provides foraging habitat for Northern Myotis, a critically imperiled bat species in Pennsylvania.
154	Valley Forge-Yellow Springs Field	State	This open field supports a population of St. Andrew's-cross, an imperiled plant species in Pennsylvania.
155	Warwick County Park	Regional	Forest and seeps support populations of netted chainfern, imperiled in PA, and bog bluegrass, a globally vulnerable plant species.
156	Wawaset-Brandywine Floodplain	State	Riparian forest and wetland along West Branch of Brandywine Creek supports a population of cattail sedge, an endangered plant species in Pennsylvania.

NHA #	Site Name	Significance Rank	Description
157	Wawaset Marsh	State	Cat-tail marsh along West Branch Brandywine Creek supports populations of Indian wild rice and Ellisia, both plant species of concern in Pennsylvania.
158	Ways Run Wetland	State	Wetland habitat at this site supports a population of stiff cowbane, an imperiled plant species in Pennsylvania.
159	Welkinweir Reserve	State	Upland forest provides habitat for a population of a sensitive species of concern.
160	West Branch Brandywine Creek	State	This site supports 3 plant species of concern and a sensitive species of concern.
161	West Branch White Clay Creek	State	Upland and riparian forest as well as aquatic habitat along the West Branch of White Clay Creek support two sensitive species of concern, in addition to several other species of concern. Among these are silver-haired bat, Autumn bluegrass, and triangle floater (mussel).
162	West Chester Reservoir	State	Aquatic and riparian habitats at this site support a population of a sensitive species of concern.
163	West Upland Woods	State	This forested site supports a population of Autumn bluegrass, an endangered plant species in Pennsylvania.
164	White Clay Creek	State	Forested habitats along White Clay Creek support populations of 4 plant species of concern and an historic occurrence of Vannote's cheumatopsyche caddisfly.
165	Whitehorse Road Farm	State	This site supports a population of Autumn bluegrass, an endangered plant species in Pennsylvania.
166	Willistown Serpentine Barrens	Global	Serpentine barrens support five plant species of concern and one sensitive species of concern.
167	Wollaston Road Woods	State	Forested wetlands at this site support two plant species of concern: cattail sedge and false hop sedge.
168	Woodville Southeast	State	This site supports a population of a sensitive species of concern.
169	Woodville Woods	State	This forested site supports a population of the state rare plant, puttyroot.

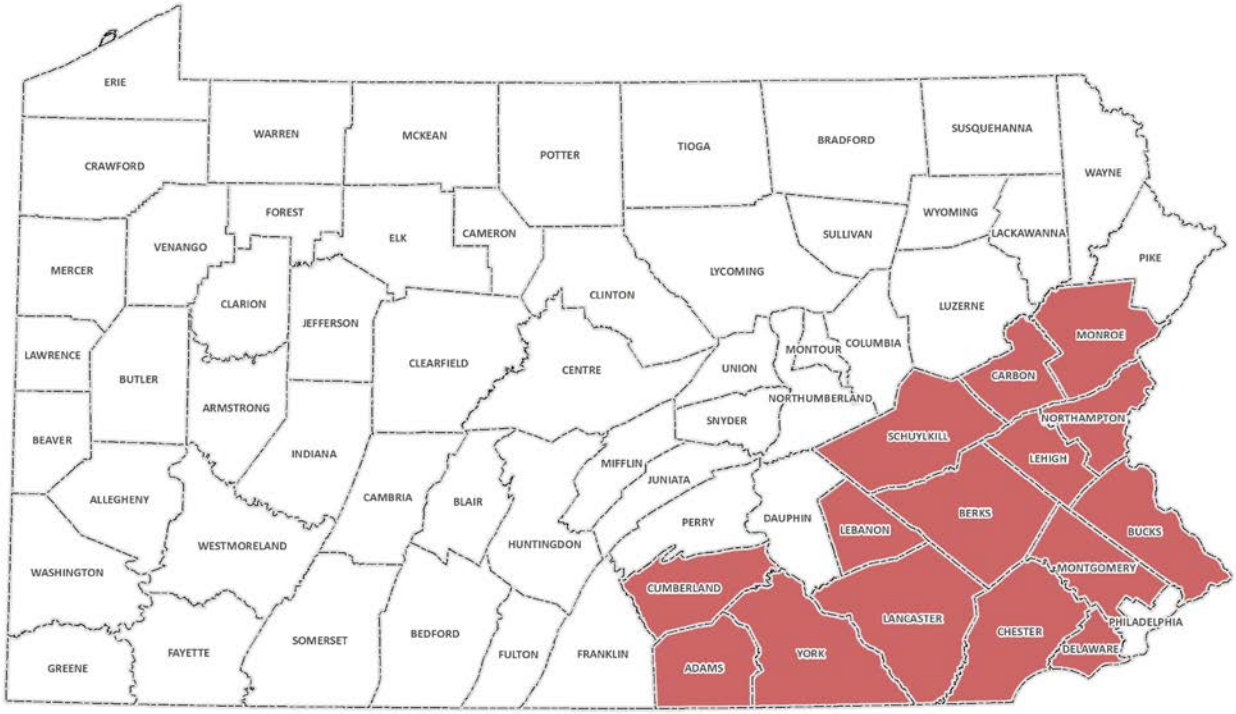
Conservation Planning for Bog Turtles

Bog turtles (*Glyptemys muhlenbergii*) are small semi-aquatic turtles endemic to the eastern United States ranging from Massachusetts and New York discontinuously to northern Georgia. In Pennsylvania, the bog turtle still occurs in the southeastern corner of the state. Bog turtles inhabit slow, shallow, muck-bottomed rivulets of sphagnum bogs, calcareous fens, marshy/sedge-tussock meadows, spring seeps, wet cow pastures, and shrub swamps; the habitat usually contains an abundance of sedges or mossy cover. The turtles depend on a mosaic of microhabitats for foraging, nesting, basking, hibernation, and shelter (USFWS 2000).

Charlie Eichelberger, PNHP

Bog turtle (*Glyptemys muhlenbergii*)

The species is listed as "Threatened" under the US Endangered Species Act (USFWS 2000) and is considered "State Endangered" in Pennsylvania. Due to the threat of illegal collection, detailed location information for individual populations cannot be provided. Therefore, the following information is provided to guide conservation and development projects within the species known range within Pennsylvania. Counties that harbor at least one population of bog turtles are presented below. Development projects that are undertaken within portions of this area of southeastern Pennsylvania are likely to produce a 'bog turtle conflict' through the Pennsylvania Natural Diversity Inventory (PNDI) environmental review system.



Pennsylvania counties (shaded) that are known to harbor bog turtle populations.

Threats and Stresses

The greatest threat faced by the bog turtle is loss and fragmentation of its habitat. Specific threats include:

- The bog turtle's fragile wetland habitat has suffered from direct loss degradation and modification through damming, ditching, draining and filling. Fragmentation of habitat, and the corridors between patches of habitat, threaten the long-term viability of bog turtle populations
- Patches of bog turtle habitat are often fragmented by roads, making the turtles susceptible to road mortality as they move between habitat patches
- Invasive plants such as reed canary grass (*Phalaris arundinacea*), common reed (*Phragmites australis*), purple loosestrife (*Lythrum salicaria*), and cattail (*Typha* sp.) form dense stands that can eliminate basking/nesting areas and make movement though the wetland more difficult.
- Succession of open-canopied emergent wetlands to shrub or forested habitats will impact the open nature of high-quality bog turtle habitat.
- Bog turtles are frequently illegally collected and traded in the black market wildlife trade.
- Human-subsidized populations of raccoon, opossum, red fox, and striped skunk, all known predators of bog turtles or their nests, have swelled throughout the turtles range.
- Typically, sizes of individual populations are small and potentially subject to greater rates of local extinction from the above factors.

Conservation Recommendations

The USFWS (2001) developed recovery criteria and management. This species benefits the most from acquisition or easement and appropriate management of suitable wetland complexes. Specific recommendations for bog turtle conservation are as follows:

- Appropriate management techniques for maintaining open-canopy wetland habitats for bog turtles include selective cutting, tree girdling, approved herbicide application, prescribed burning (if possible), periodic mowing, sustainable grazing management that supports native plant communities (e.g., Morrow et al. 2001)
- Existing wet meadows should not be modified (i.e. dammed, planted in trees or farmed). The wetlands in this area could be improved by active management to setback succession by cutting trees and shrubs to maintain wetland openings. Once the open habitat within the historic floodplain has been restored, light grazing or infrequent mowing can be effective tools to maintain these soggy meadows in their preferred condition.
- Take into account the presence of legacy sediments at historic milldam locations (Walter and Merritts 2008) and appropriately restore the historic floodplain as feasible. Priorities for restoration of historic floodplain topography should be where the end result would be a functioning wetland habitat.
- Suppress the establishment and spread of invasive species of plants. Programs to reduce the prevalence of invasive species in wetlands will be necessary to prevent their complete dominance of critical habitats. Pioneer populations of invasive plants should be targeted for immediate and continued removal. It is much easier and more effective to keep a place invasive-free than to try and repair a heavily infested habitat. Mechanical (hand pulling, cutting and mowing) and chemical (spot herbicide treatment) management techniques may be necessary to protect the habitat from colonization by aggressive species. Broadcast application of herbicides is not suitable for delicate habitats. Control of invasive species will require extensive and continual effort.
- Determine how best to control invasive alien plants that may degrade habitat.
- Because this species relies upon open-canopied habitats, programs (e.g. CREP) or local riparian buffer ordinances that aim to restore forest should be avoided in areas of suitable habitat.
- Education of land owners and law enforcement officials may help deter illegal collecting.

To these ends, a Natural Resource Conservation Service (NRCS) program exists that provide incentives for development or restoration of habitat on private lands. Through "Working Lands for Wildlife", NRCS can provide financial assistance through the Wildlife Habitat Incentive Program (WHIP) to assist private landowners combat habitat fragmentation and degradation to restore bog turtle populations, and increase landowner confidence that the conservation practices they volunteer to implement will not harm the species or its habitat. Restoration activities will complement the existing NRCS Wetland Reserve Program effort to protect bog turtle habitat. Funding for habitat restoration or improvement is available through the Wildlife Habitat Incentive Program.

Details about the NRCS Working Lands for Wildlife Program can be found at: http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/pa/plantsanimals/?cid=nrcs142p2_018211

Additional inquires about the bog turtle, 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

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 sees this report as 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. Through early integration, costly conflicts with rare, threatened, and endangered species can be avoided and these resources can be protected 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 also 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 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, as well as a release 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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Chester County
Natural Heritage Areas

Update 2015

Anson B. Nixon Park NHA

PNHP Significance Rank: *State*

Site Description

The 106 acres of Anson B. Nixon Park span portions of Kennett Square Borough and Kennett Township south of Route 1. This small park surrounds the Kennett Square Reservoir, which consists of two ponds that were used for water treatment. East Branch Red Clay Creek flows through the park. Numerous recreational areas are located throughout the park, as well as trails that run along the ponds and through the wooded areas. The wooded habitat on the northern end of the park is dominated by beech and has skunk cabbage dominated seeps along the small tributary to East Branch Red Clay Creek. Invasive species are abundant through many sections of the park. The NHA for this site consists of the section of the park containing the ponds and forested areas surrounding East Branch Red Clay Creek and the small tributary. The wooded riparian habitat supports a population of **autumn bluegrass**, a plant species of concern. This NHA also provides habitat for a **sensitive species of concern**, not named 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]
Autumn Bluegrass (*Poa autumnalis*)		G5	S1	PE (PE)	6/15/2002	C
Sensitive species of concern A[3]	S	---	---	---	7/12/2002	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.

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

In Pennsylvania, autumn bluegrass has been documented in several southwestern counties and is typically found along stream banks and in moist woods. It is more common in the southern portions of its range, which spans from New Jersey west into Michigan and south to Florida and Texas. Autumn bluegrass is classified as endangered in Pennsylvania due to the small number of known populations in a small geographical area.

Threats and Stresses

Invasive species are common in many areas of Anson B. Nixon Park and may threaten habitat critical to the species of concern at this site. Disturbances, such as logging and changes in hydrology, may also impact the integrity of the habitat in this location.

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

- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Runoff and other sources of water pollution from the surrounding area threaten to degrade the water quality of streams and seeps.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Further development of recreational areas may impact sensitive habitats and further fragment the small patches of existing forest.

Conservation Recommendations

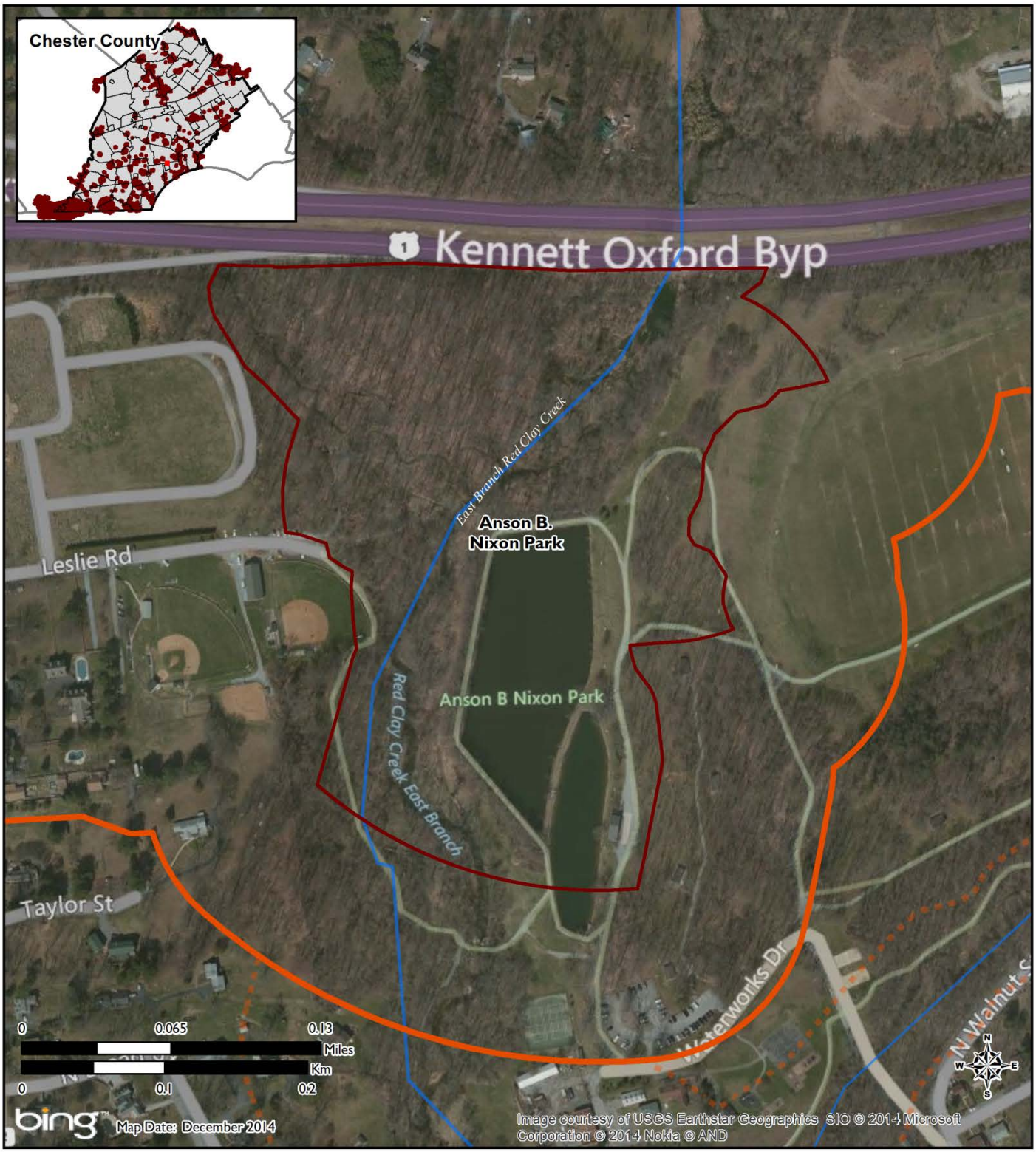
This site is part of an existing local park. This will allow the property to be protected from large scale development but may still be susceptible to modifications of the natural habitat. Avoid fragmentation of the remaining habitat and target areas for continued invasive species removal.

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

- Protect the existing wooded areas from logging and extension of the existing trails. Maintaining as many intact habitats as possible, given the location within a populated area, will help to preserve habitat for as many species as possible.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Avoid altering the existing hydrologic regime in order to maintain existing conditions of the streams and surrounding wetlands.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Kennett Township, East Marlborough Township*
USGS quads: *Kennett Square*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Anson B. Nixon Park
Natural Heritage Area

Forests at this site provide habitat for Autumn bluegrass a critically imperiled plant in PA and 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 Supporting Landscape***

Ashbridge Farm NHA

PNHP Significance Rank: *State*

Site Description

Ashbridge Farm NHA is located in Dutton Mill in a mostly residential area mixed with some agricultural land. The surrounding area is agricultural fields and wooded habitat with residential development. Part of the property within this NHA is regularly mowed to keep the grassy habitat open and prevent succession. This managed field provides habitat for **Heller's witchgrass**, a plant 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]
Heller's Witchgrass (*Dichanthelium oligosanthes*)	G5	S3	N (PT)	5/27/2002	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.

Heller's witchgrass is found across North America. In Pennsylvania, it has been documented mostly in the southeastern counties. This species requires open habitat and may require maintenance to prevent succession.

Threats and Stresses

Succession is the main threat to this site and regular maintenance is necessary to preserve the habitat. Invasive species may also degrade the quality of the habitat.

Denise Watts, PNHP

Heller's witchgrass (*Dichanthelium oligosanthes*)

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

- Succession that is not controlled by mowing or other methods of disturbance will likely cause the habitat to become unsuitable for Heller's witchgrass to be able to persist at this site.
- Invasive species are present and further spread may cause competition with species of concern and other native species.
- Herbicide and fertilizer use in fields, lawns, and along roads may wash into the NHA and degrade the habitat conditions and cause direct mortality.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

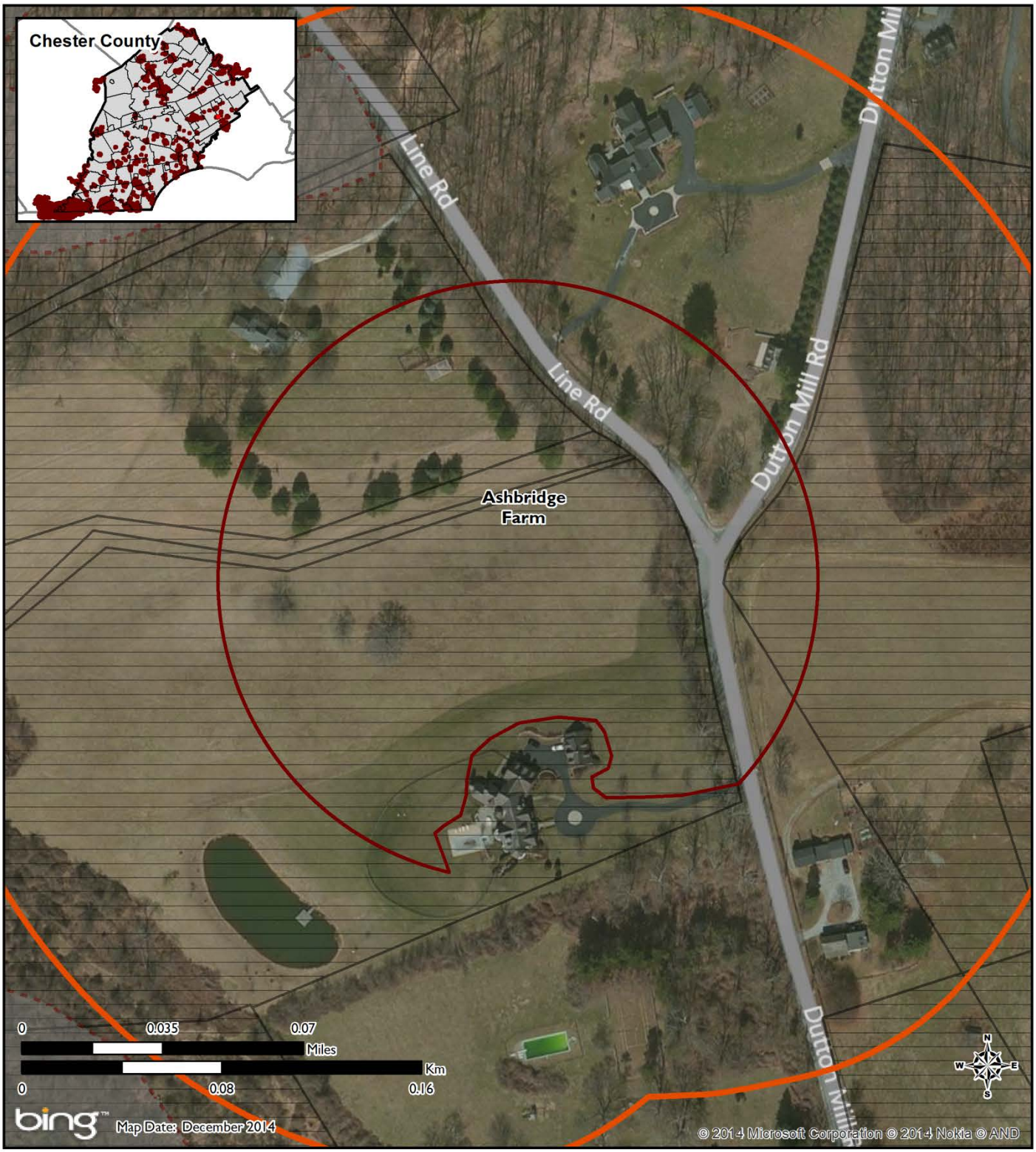
This property is privately owned, but the area surrounding the house is under a conservation easement. This should limit large scale disturbances that could alter the existing habitat conditions. Regular maintenance is needed to prevent succession of woody species.

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

- Heller's witchgrass requires open habitat that needs to be maintained. The needs of this species should be considered when planning the timing and frequency of maintenance.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Willistown Township, East Goshen Township*
USGS quads: *West Chester*
Previous CNHI reference: *Dutton Mill Woods*
Associated NHAs: *None*
Overlapping Protected Lands: *Willistown Conservation Trust Easement, Brandywine Conservancy Easement*



Ashbridge Farm
Natural Heritage Area

A dry meadow provides habitat for Heller's witchgrass, a vulnerable 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***
- ***Conservation Lands***

Atglen Meadow NHA

PNHP Significance Rank: *State*

Site Description

This site is located along the border with Lancaster County on the western end of Atglen Borough and into West Sadsbury Township. East Branch Octoraro Creek runs along the western edge of Atglen Meadow NHA. This site is comprised of wooded riparian habitat and wet early successional habitat. The surrounding area is mostly agricultural fields and wooded habitat. A wet meadow occurs at this location that supports a population of **a sedge** (*Carex tetanica*), a state threatened plant species of concern.

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

	PNHP Rank[1]		PA Legal	Last	
Species or Natural Community Name	Global	State	Status[1]	Seen	Quality[2]
A Sedge (*Carex tetanica*)	G4G5	S2	PT (PT)	6/3/1993	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.

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

A sedge (*Carex tetanica*) is most often found in open, wet habitats and has been documented throughout the state. In the United State, this species if found from Maine west to North Dakota and south to North Carolina and Nebraska. It is found in portions of southern Canada as well.

Threats and Stresses

Succession is the main threat to this habitat. Proper maintenance is necessary to preserve the habitat. Changes in the hydrology will alter the habitat found within the wet meadow and nearby areas.

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

- Succession that is not controlled by mowing or other methods of disturbance will likely cause the habitat to become unsuitable for the species of concern to be able to persist at this site.
- Modifications to the hydrology, including draining and damming, will likely cause unfavorable changes to the habitat and negatively impact the species of concern.
- Herbicide and fertilizer use in fields and along roads may wash into the surrounding habitat and degrade the habitat conditions and cause direct mortality.
- Invasive species can take over portions of the meadow currently used by the species of concern and other native species.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

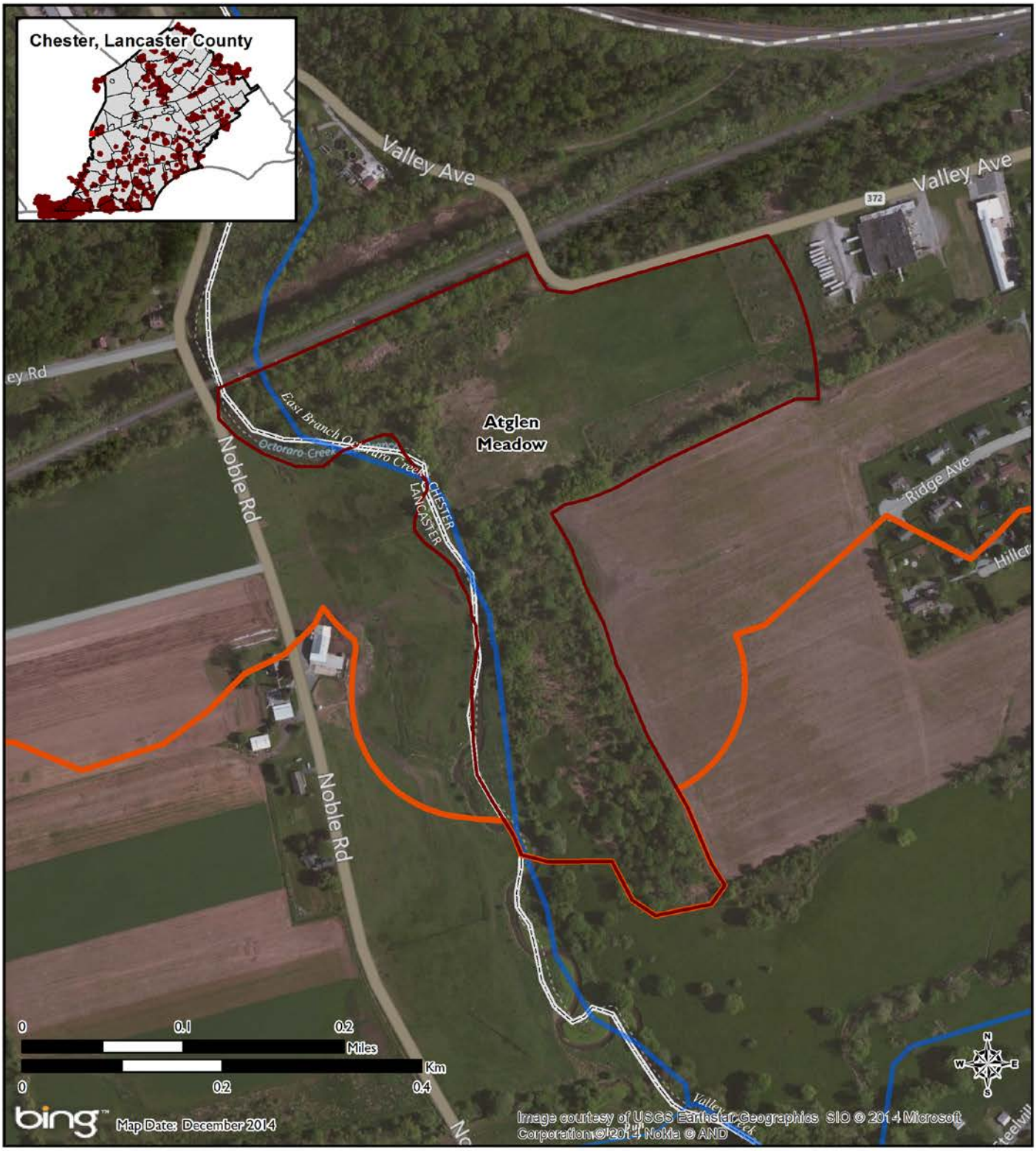
The northern portion of this site is owned by Atglen Borough, which should provide some protection from major disturbances. The southern end of the site is privately owned. Maintain the existing hydrology and improve the riparian buffer around East Branch Octoraro Creek and adjacent wetlands in order to protect the water quality in these habitats.

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

- Perform periodic mowing or other disturbance to prevent succession of the meadow area. The species of concern requires open habitat that needs to be maintained. The needs of this species should be considered when planning the timing and frequency of maintenance.
- Widen the native vegetated buffer along East Branch Octoraro Creek. A width of 100 meters is ideal, but any increase will benefit the stream and adjacent wetlands.
- Maintain the existing hydrology. Any activities that occur along the roads and other areas surrounding the NHA should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.
- Control the introduction and spread of invasive species. Target lesser established populations that will be more susceptible to treatment.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *West Sadsbury Township, Atglen Borough, Sadsbury Township*
USGS quads: *Parkesburg*
Previous CNHI reference: *Atglen Meadow*
Associated NHAs: *None*
Overlapping Protected Lands: *Atglen Meadow*



Atglen Meadow
Natural Heritage Area

An open wet meadow at this site supports a population of Carex tetanica, a sedge plant species which is state threatened.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

Avondale Woods NHA

PNHP Significance Rank: *State*

Site Description

Avondale Woods NHA is located south of the intersection of Route 1 and Route 41. The patch of wooded habitat is dominated by Norway maple and tulip poplar and occurs along East Branch White Clay Creek. The NHA also includes residential development and some agricultural fields. Several industrial sites occur adjacent to the NHA, as well as other residential developments. A railroad track is located along East Branch White Clay Creek, altering drainage that has created some wetland openings. These wetlands support populations of **Long's sedge** and **tawny ironweed**, two plant species of concern. This NHA also provides habitat for **two sensitive species of concern**, not named at the request of the jurisdictional agencies overseeing their 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]
Long's Sedge (*Carex longii*)		G5	S2S3	TU (PT)	6/21/2006	BC
Tawny Ironweed (*Vernonia glauca*)		G5	S1	PE (PE)	9/12/1992	CD
Sensitive species of concern A[3]	**S**	---	---	---	4/28/2009	E
Sensitive species of concern B[3]	**S**	---	---	---	4/30/2006	BC
Sensitive species of concern C[3]	**S**	---	---	---	4/15/2009	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.

Long's sedge is found from Maine west to Wisconsin and south to Florida and Texas. It is also found along the West Coast, but is not native to that portion of the country. In Pennsylvania, Long's sedge has been documented in several counties in the eastern half of the state. This species is found in a number of man made and natural wetland openings.

Tawny ironweed is a perennial herb that flowers in the late summer and fall. It often grows in open habitats and upland forests. This species is endangered in Pennsylvania due to the small number of populations in a limited area of the state. Tawny ironweed is found from Pennsylvania and New Jersey south to Florida and Mississippi. In Pennsylvania, it is at the northern edge of its range and found in a few southern counties. Habitat loss and succession are the major threats to this species.

Threats and Stresses

Further fragmentation of the wooded area would diminish habitat used by native species and create opening for the establishment and spread of invasive species. Changes in the existing hydrology would alter the conditions of the wetland habitats. Runoff from surrounding industrial areas and other disturbances may degrade the quality of the wetlands.

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

- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.

- Logging will further fragment the existing forest and alter the conditions of the habitat needed by the species of concern.
- Degradation of water quality or quantity can have a negative impact on the habitat supporting the species of concern found at this location. Runoff from industrial and residential development, agricultural fields, and roads have significantly higher levels of sediment, nutrients, pesticides, herbicides and other pollutants than runoff filtered through a natural habitat.
- Draining or flooding of wet meadow and forested wetland habitats can eliminate suitable habitat for the species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

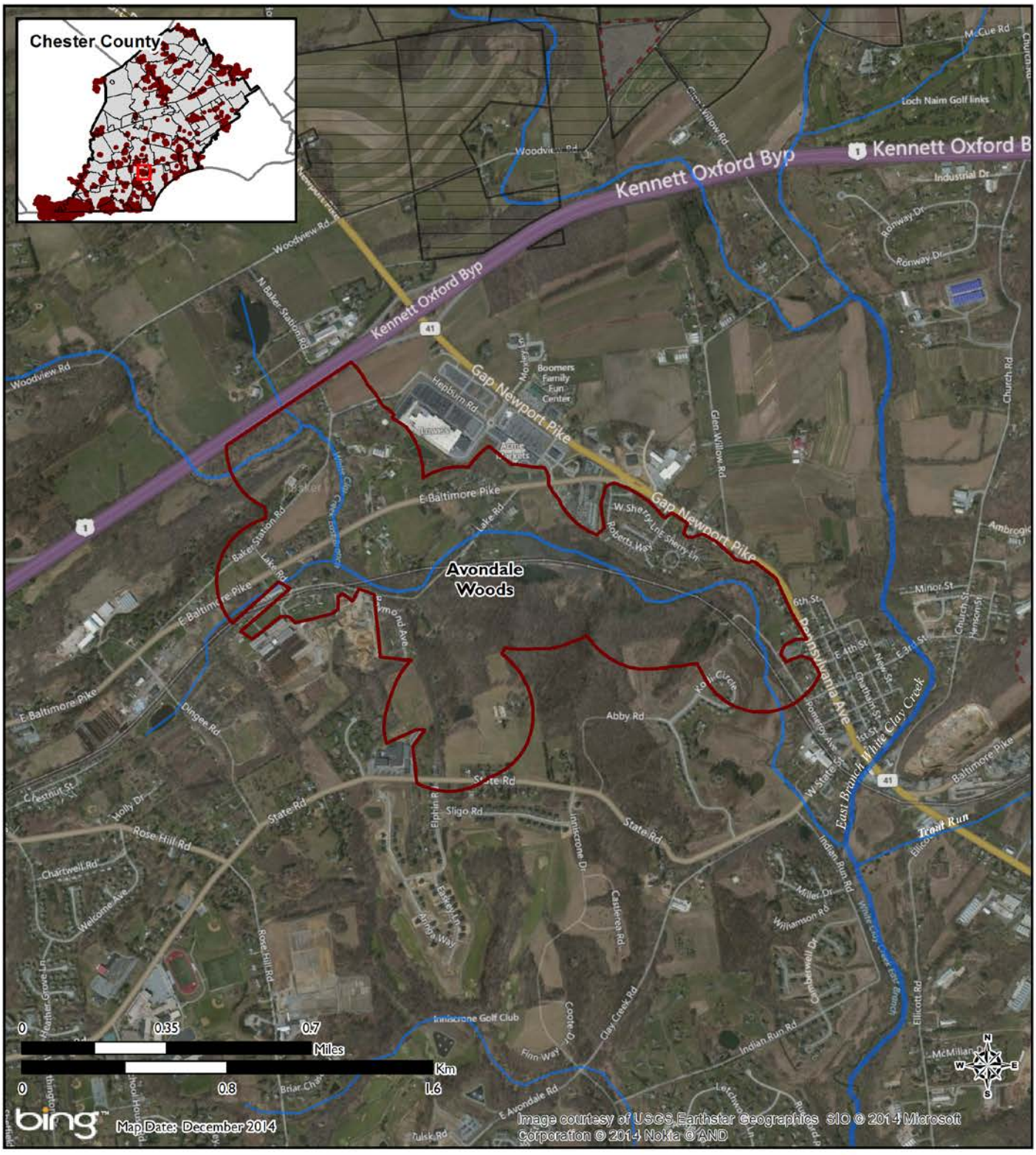
Avoid further alterations to this habitat and maintain the current hydrologic conditions. Increase buffers of native vegetation along streams and wetlands. A width of 100 meters is ideal, but any expansion will help to improve the water quality.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Protect remaining portions of the wooded riparian zone and repair others that have been degraded, by encouraging the growth of native vegetation. Careful determination is needed to avoid planting trees in floodplains that should remain as open canopied herbaceous wetland habitats. These habitats should be maintained in their current open condition, with tree plantings to occur uphill of areas containing hydric soils.
- Stormwater management measures such as the creation of detention basins or vegetated swales should be implemented to decrease the unfiltered flow down the slopes into the creek floodplain.
- Avoid disrupting the hydrology of the site by draining or filling the wetlands, or disturbing the surface or groundwater hydrology.
- 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 population of species of concern, the natural landscape also helps to protect water quality of the streams that drain through this NHA.
- Tawny ironweed and Long's sedge require open habitats that need to be maintained with mowing or other methods of disturbance. The needs of these species should be considered when planning the timing and frequency of maintenance.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *London Grove Township, Avondale Borough*
USGS quads: *West Grove*
Previous CNHI reference: *Avondale Woods*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Avondale Woods
Natural Heritage Area

This site supports populations of tawny ironweed and Long's sedge, both of which are plant species of concern. Populations for two sensitive species of concern are also found here.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Bacton Mine Ridge NHA

PNHP Significance Rank: *State*

Site Description

Bacton Mine Ridge NHA is a forested slope located south of the Pennsylvania Turnpike. Most portions of this NHA not adjacent to the Pennsylvania Turnpike border housing developments. A series of seeps run through the forested area and provide habitat for several plant species of concern – **netted chainfern**, **possum-haw**, **serviceberry**, and **shining panic-grass**. The forested area is more than 300 acres, although a pipeline cuts through the NHA. The roadside habitat at this site also provides habitat for **Elliot's beardgrass**, a plant 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]
Serviceberry (*Amelanchier canadensis*)		G5	S1	N (PE)	9/5/1997	CD
Elliott's Beardgrass (*Andropogon gyrans)*		G5	S3	N (PR)	2/4/2001	C
Shining Panic-grass (*Dichanthelium lucidum*)		GNR	S1	TU (PE)	8/17/1993	CD
Possum-haw (*Viburnum nudum*)		G5	S1	PE (PE)	7/2/1993	BC
Netted Chainfern (*Woodwardia areolata*)		G5	S2	N (PT)	5/22/1993	CD

[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.

Serviceberry ranges from Eastern Canada south along the Atlantic Coast and parts of the Gulf Coast. Most documented populations in Pennsylvania are located in several southeastern counties. This is a shrub species found in swamps and wet thickets.

Elliot's beardgrass is at the northern edge of its range in Pennsylvania and has only been documented in a few southeastern counties. It spans from New Jersey to Illinois, south from Texas to Florida. This species needs open, early successional habitat in order to persist.

Shining panic-grass is found along the coastal plain in open or shaded sphagnum wetlands. In Pennsylvania, this species has been documented in the southeastern and south central portions of the state.

In Pennsylvania, possum-haw is found in a few southeastern counties. This species lives in swamps, wet thickets, and other types of wetlands. Possum-haw is found in few locations in the state and has been classified as endangered in Pennsylvania.

Netted chainfern is a wetland species that is found scattered throughout Pennsylvania. Its entire range spans from Nova Scotia south to Florida and west to Texas. It is more common in the southern portion of its range.

Threats and Stresses

The area surrounding this NHA has been heavily disturbed by roads and housing developments. A pipeline right-of-way fragments the forested habitat at this site. Management along the right-of-way, such as herbicide spraying, may impact the native species in adjacent areas.

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

- Changes in the currently hydrology could significantly the habitat for the plant species of concern by making conditions either too wet or too dry to be able to persist at this site.
- Herbicides sprayed on the pipeline right-of-way and along roads may cause direct mortality to the species of concern and other native species. Fertilizers from surrounding lawns may also wash into the NHA and degrade habitat conditions.
- Logging will further fragment the existing forest and alter the conditions of the habitat needed by the species of concern.
- Invasive species are present in this site and may displace native vegetation, including species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

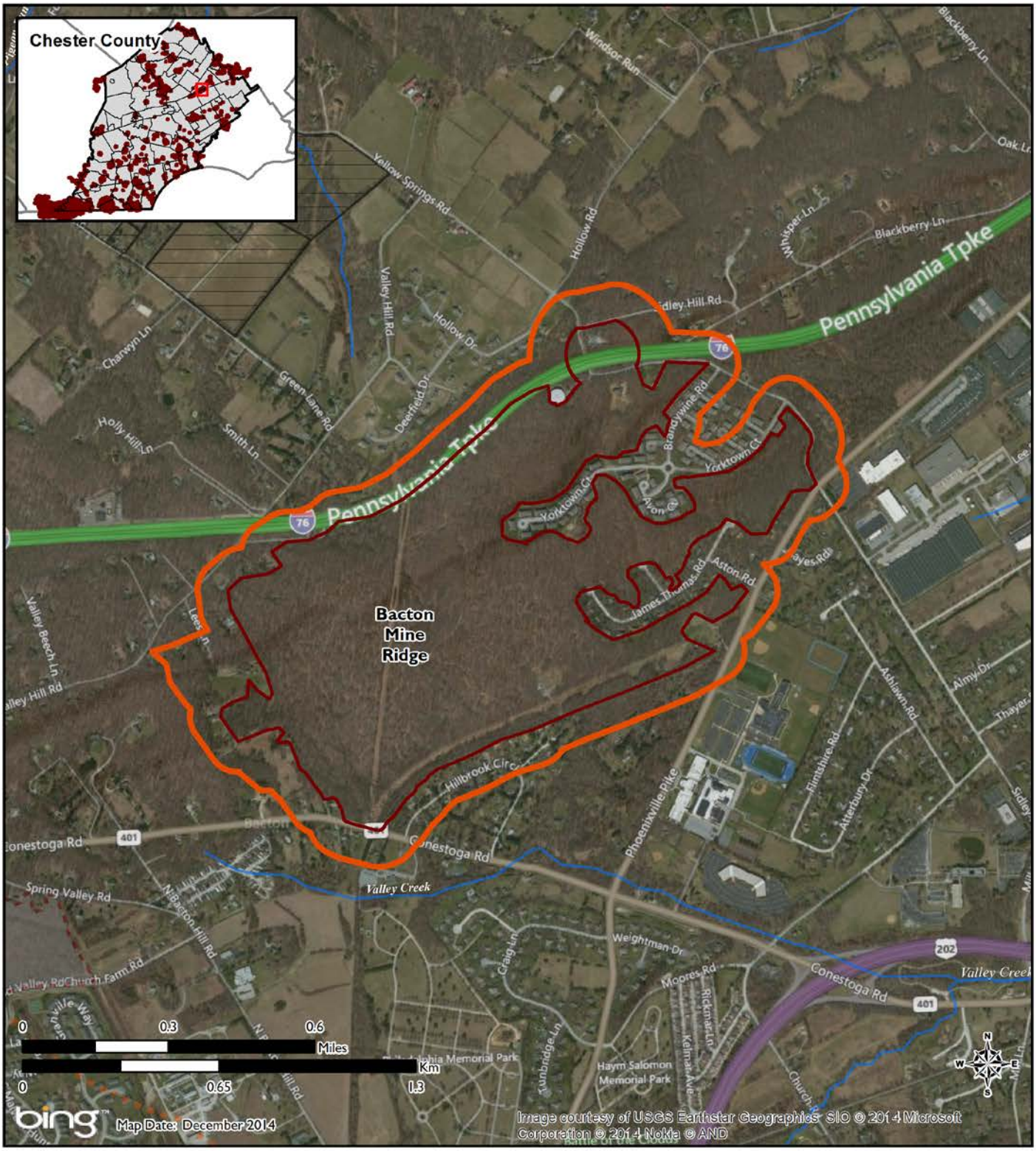
Maintain the existing conditions and limit activities within and adjacent to the NHA that may disturb the habitat. Minimize herbicide spraying and other disturbances that may negatively impact the quality of the wetland habitat.

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

- Maintain the existing hydrology. Any activities that occur in surrounding areas should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.
- Protect the existing forested areas from logging and disturbance along the forest edge. Maintaining as many intact habitats as possible, given the location within a residential area, will help to preserve habitat for as many species as possible.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations. Further disturbance within this habitat will create additional opening for the establishment and spread of invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *East Whiteland Township, Charlestown Township*
USGS quads: *Malvern*
Previous CNHI reference: *Bacton Mine Ridge, Charlestown Oaks Seeps*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Bacton Mine Ridge Natural Heritage Area

Forested wetlands and disturbed uplands support populations of five plant 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***

Balmoral Drive Woods NHA

PNHP Significance Rank: *State*

Site Description

Balmoral Drive Woods NHA is located in the remnant forest interspersed with the houses of a residential development. Burrows Run flows through the site. This stream is a tributary to East Branch Red Clay Creek. The forested area among the houses provides habitat for **autumn bluegrass**, a plant species of concern. This species grows in the moist woods along the stream.

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]
Autumn Bluegrass (*Poa autumnalis*)	G5	S1	PE (PE)	6/7/1999	CD

[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.

In Pennsylvania, autumn bluegrass has been documented in several southwestern counties and is typically found along stream banks and in moist woods. It is more common in the southern portions of its range, which spans from New Jersey west into Michigan and south to Florida and Texas. Autumn bluegrass is endangered in Pennsylvania due to the small number of known populations in a small geographical area.

Threats and Stresses

Invasive species are found throughout this site, especially along the edge habitat and are the biggest threat to the site and the native species found within it.

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

- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Further fragmentation of the small patch of existing forest may alter the structure of the habitat and allow an increase in invasive species.
- Herbicides and fertilizers from surrounding lawns and roads may wash into the NHA and cause direct mortality and degrade habitat conditions.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

Minimize disturbance to the remaining forest. Maintain the forested buffer along the stream and improve it wherever possible. Control invasive species in order to preserve the native species found in this NHA.

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

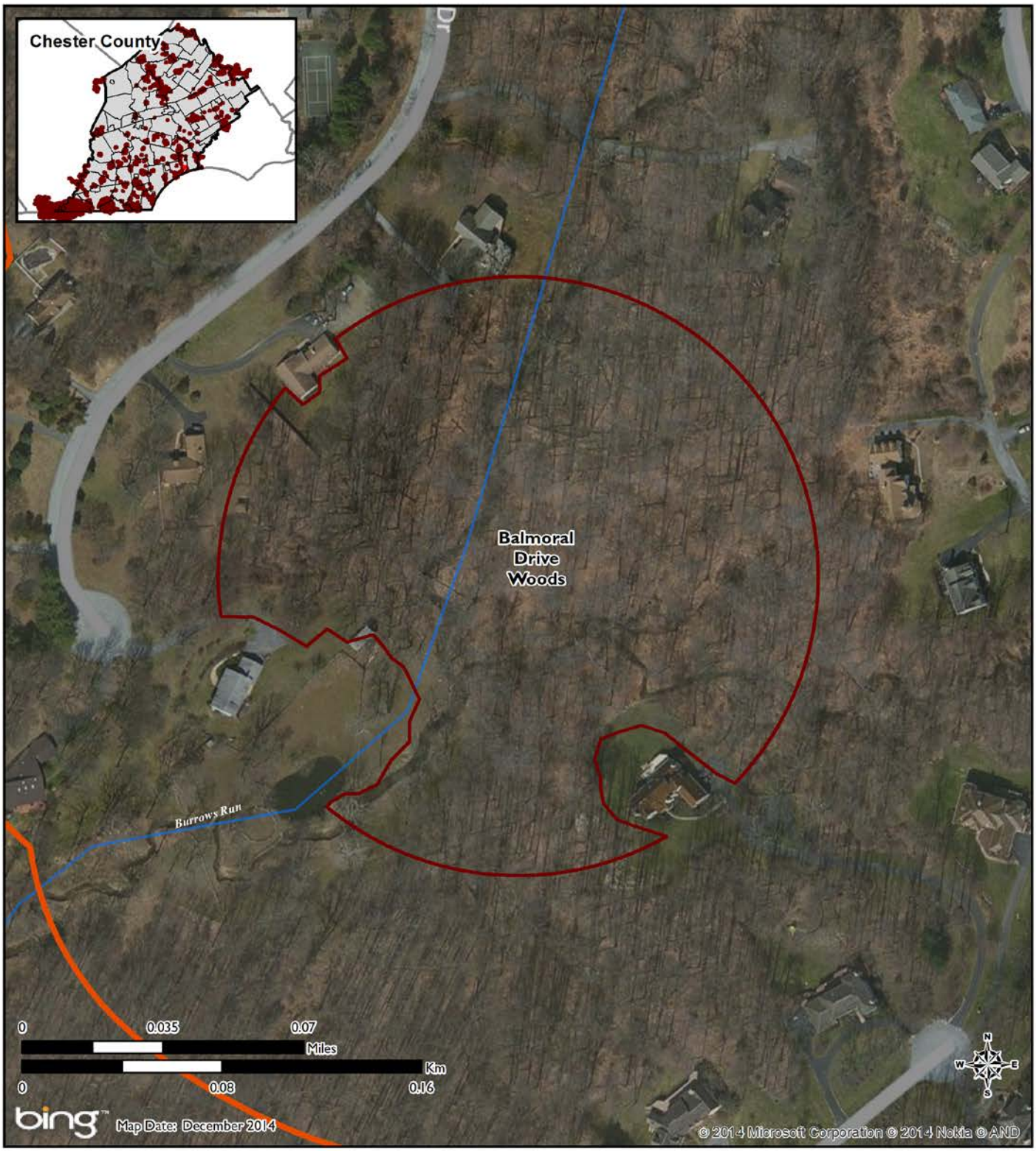
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and

more effective than targeting established populations. Further disturbance within this habitat will create additional opening for the establishment and spread of invasive species.

- Protect the existing forested areas from logging and disturbance along the forest edge. Maintaining as many intact habitats as possible, given the location within a residential area, will help to preserve habitat for as many species as possible.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Kennett Township*
USGS quads: *Kennett Square*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Balmoral Drive Woods Natural Heritage Area

Moist forest along this tributary to the East Branch of Red Clay Creek supports a population of Autumn bluegrass, a state endangered plant in PA.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

Bassett Lane at Seven Oaks Road NHA

PNHP Significance Rank: *State*

Site Description

Bassett Lane at Seven Oaks Road NHA is a roadside site that supports a population of **Elliot's beardgrass**, a plant species of concern. This NHA sits within a housing development just to the north of the Pennsylvania Turnpike.

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]
Elliott's Beardgrass (*Andropogon gyrans*)	G5	S3	N (PR)	2/4/2001	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.

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

Elliot's beardgrass is at the northern edge of its range in Pennsylvania and has only been documented in a few southeastern counties. It spans from New Jersey to Illinois, south from Texas to Florida. This species needs open, early successional habitat in order to persist.

Threats and Stresses

The continued existence of the conditions at this site requires regular maintenance to prevent succession from altering the structure of the habitat. The use of herbicides or mowing during the growing season may have a negative impact on the native species composition.

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

- Succession that is not controlled by mowing or other methods of disturbance will likely cause the habitat to become unsuitable for the species of concern to be able to persist at this site.
- Further development of the habitat currently occupied by Elliot's beardgrass will likely eliminate it from this area.
- Herbicide use along the road may cause direct mortality to the species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Invasive species can take over portions of the habitat currently used by the species of concern and other native species.

Conservation Recommendations

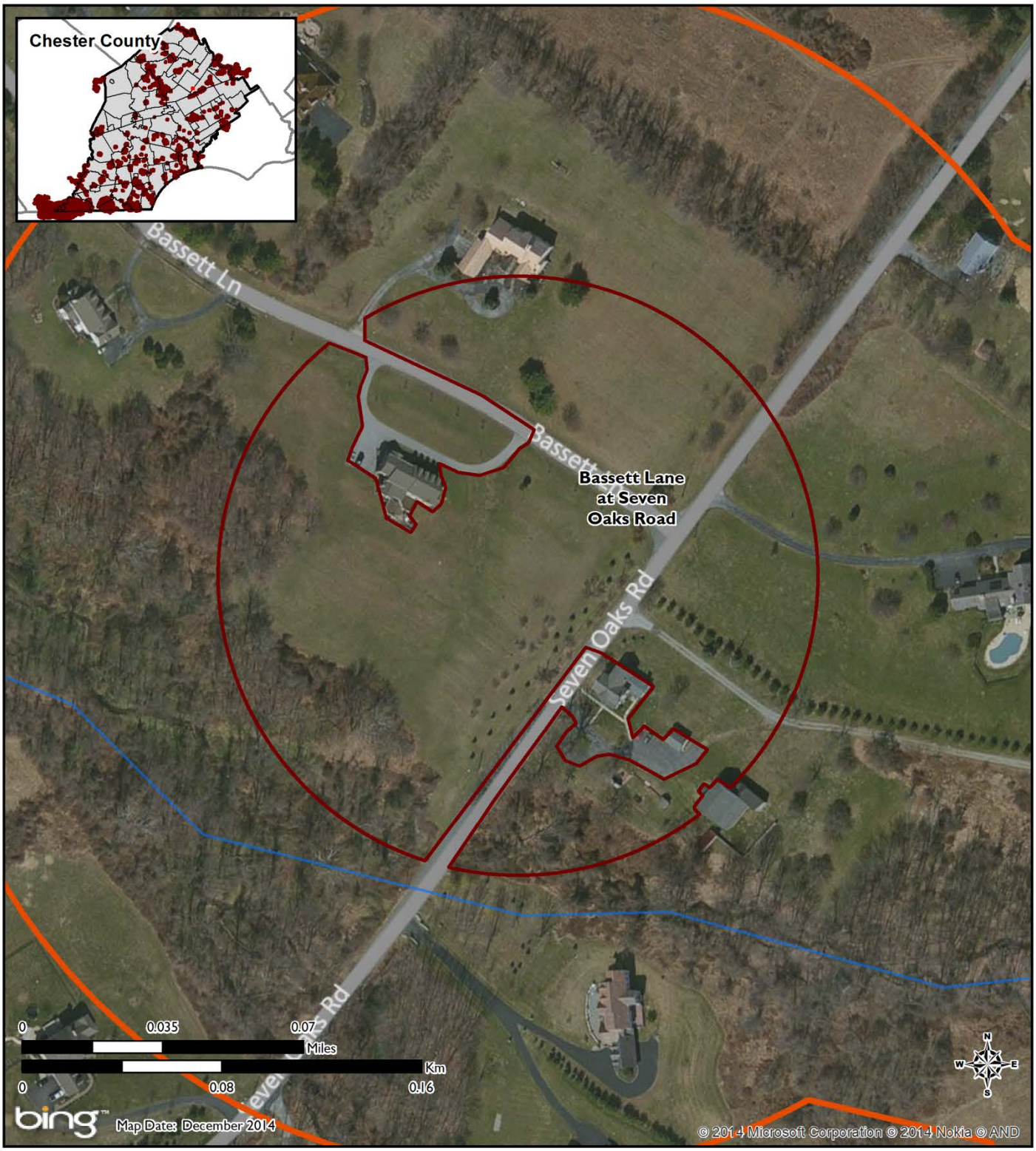
Active maintenance is necessary to maintain the habitat in the existing condition. Periodic mowing or other disturbance needs to be done to prevent establishment of woody species, although too much disturbance may affect the life cycle of the species of concern.

The following steps are recommended to ensure the persistence of Elliott's Beardgrass at this site:

- Elliot's beardgrass requires open habitat that needs to be maintained. The needs of this species should be considered when planning the timing and frequency of maintenance.
- Avoid building additional houses or infrastructure in the area where Elliot's beardgrass is known to occur.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.

Location

Municipalities: *West Pikeland Township, Charlestown Township*
USGS quads: *Malvern*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Bassett Lane at Seven Oaks Road Natural Heritage Area

This site supports a population of Elliott's beardgrass.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

Beaver Creek Lake NHA

PNHP Significance Rank: *State*

Site Description

Located in central Chester County, this NHA includes Beaver Creek Lake and surrounding riparian forest and wetlands just north of the intersection of East Reeceville Road and Norland Drive. Wetland, forest and aquatic habitats support a **sensitive species of concern**. This species cannot be named 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**	---	---	---	4/18/2013	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 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 sensitive species of concern at this site relies on good water quality, and is vulnerable to siltation and chemical pollution.

Conservation Recommendations

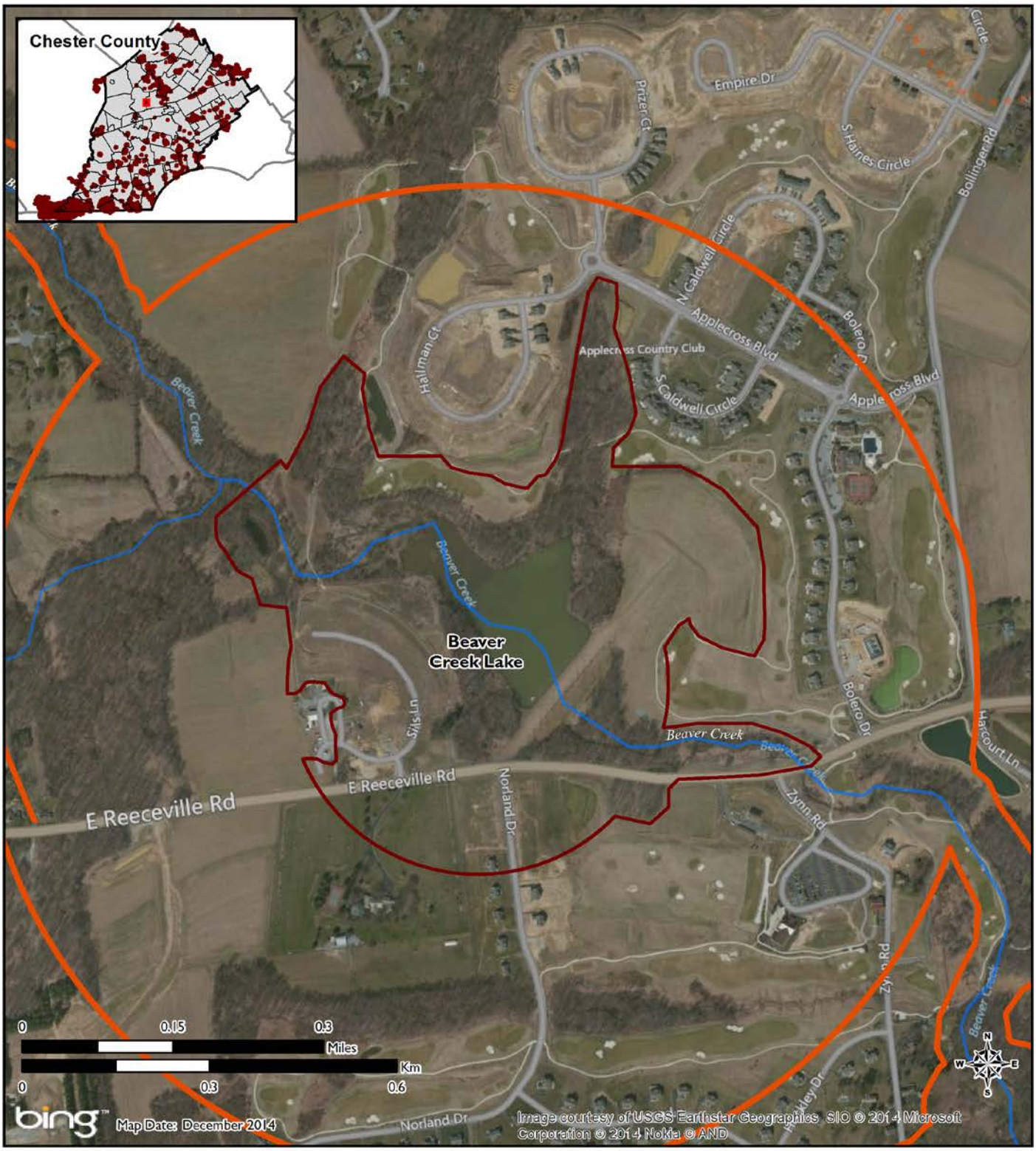
The entire site is privately owned and landowners in the Core Habitat should be aware that the species is sensitive to disturbance.

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

- Avoid disturbance from human activities within the Core Habitat during the breeding season (December – July).
- Additional development within the Core Habitat should be avoided to protect the sensitive species of concern.
- 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.
- 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.
- 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 are. Maintaining high quality aquatic habitat is important to this species.

Location

Municipalities: *East Brandywine Township, West Brandywine Township*
USGS quads: *Wagontown*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Beaver Creek Lake
Natural Heritage Area

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 Supporting Landscape***

Beaver Hill Road Woods NHA

PNHP Significance Rank: *State*

Site Description

Beaver Hill Road Woods NHA is a wooded area dominated by tulip poplar and silver maple near Wilsons Corner. This NHA is more than 200 acres in size, including a few residences. The surrounding area has been fragmented by agriculture and residential development. The steep bank south of French Creek and two tributaries are included in this NHA, which provides habitat for **spring coral root**, a plant species of concern. Beaver Hill Road Woods NHA also supports a **sensitive species of concern**, not named 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]
Spring Coral-root (*Corallorhiza wisteriana*)		G5	S1	TU (PE)	5/22/1999	BC
Sensitive species of concern A[3]	S	---	---	---	5/6/2009	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.

Spring coral-root has been documented from Pennsylvania west to Oregon and south to Arizona and Florida. It is found through much of the United States, but is at the northern edge of its range in Pennsylvania and has been found in several southern counties. This orchid is saprophytic, meaning that it gets its nutrients from organic material instead of photosynthesis. Spring coral root may not flower every year, and flowers only last a short time, making surveys for this species difficult.

Threats and Stresses

Disturbances to the forest, such as logging and development, may eliminate the existing habitat. Invasive species would also likely colonize any newly disturbed areas.

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

- Logging may disturb the small amount of remaining habitat, as well as cause changes in hydrology and allow for the introduction of additional invasive species.
- Invasive species are present in this site and may displace native vegetation and alter the habitat required by the species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

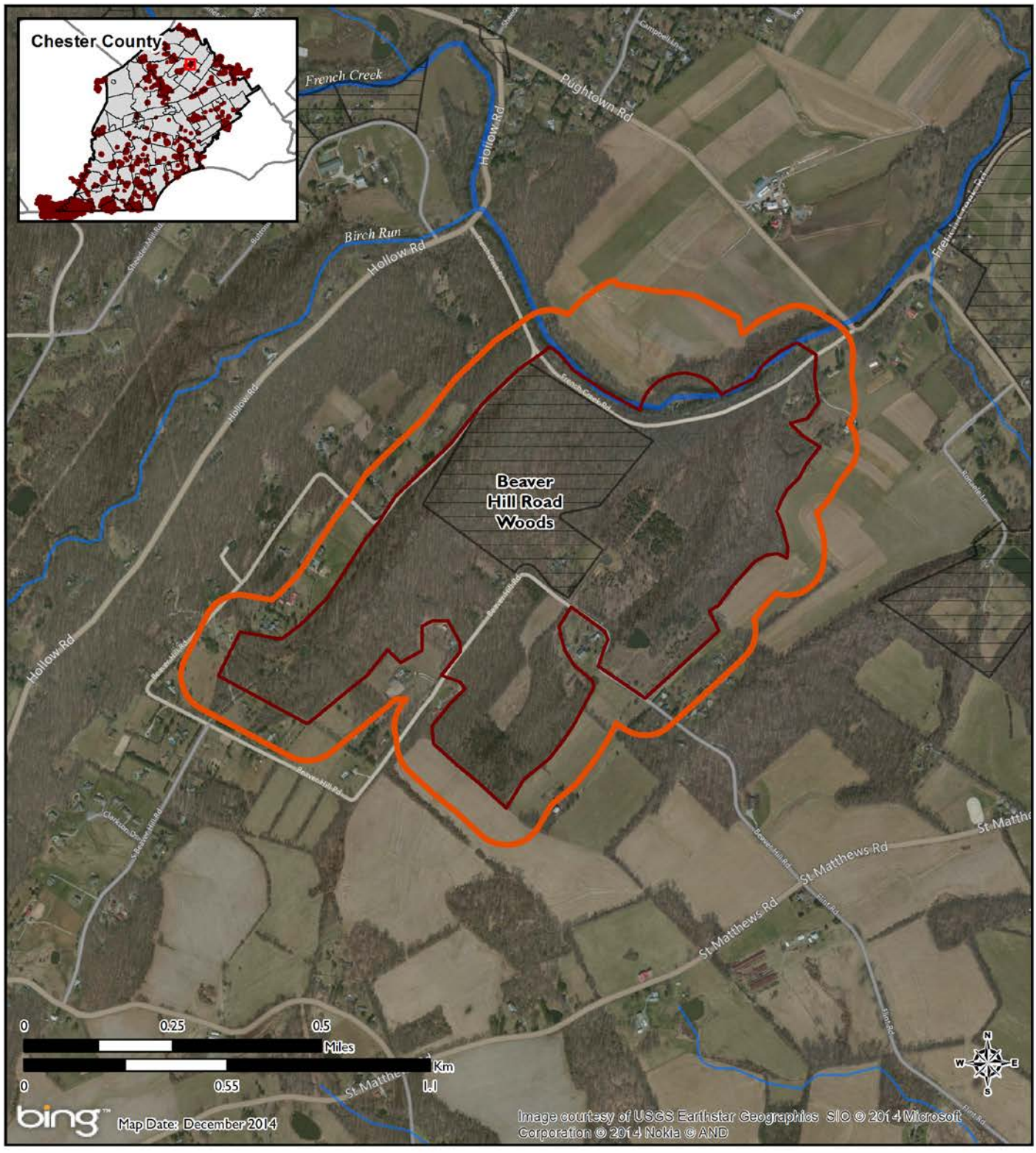
All of Beaver Hill Road Woods NHA is privately owned, with a portion protected by a conservation easement. The steep hillsides along the streams should limit development opportunities. Avoid logging any additional areas and maintain a forested buffer along the streams to protect the water quality and minimize erosion.

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

- Protect the existing forested areas from logging and disturbance along the forest edge. Maintaining as many intact habitats as possible, given the location within a residential area, will help to preserve habitat for as many species as possible.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations. Further disturbance within this habitat will create additional opening for the establishment and spread of invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *West Vincent Township, East Vincent Township*
USGS quads: *Phoenixville, Pottstown*
Previous CNHI reference: *French Creek-East-Chester Co*
Associated NHAs: *None*
Overlapping Protected Lands: *French and Pickering Creeks Conservation Trust Conservation Easement*



Beaver Hill Road Woods Natural Heritage Area

Forest habitat supports a population of spring coralroot, a critically imperiled plant species in Pennsylvania, and 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 Supporting Landscape***
- ***Conservation Lands***

Bennett's Run NHA

PNHP Significance Rank: *State*

Site Description

Bennett's Run NHA is a patch of wooded habitat near Longwood. The remnant wooded area is situated between several housing developments and agricultural fields. A man made pond has been created along Bennett's Run within this NHA. The canopy is dominated by tulip poplar with spicebush and witch hazel dominating the understory. This area provides habitat for a **sensitive species of concern**, not named 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**	---	---	---	9/24/1991	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

Loss of habitat through logging and development is a major threat to the NHA and surrounding natural areas. Invasive species could also have a significant impact on species composition and habitat structure.

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

- Development of areas within the NHA will likely eliminate habitat used by species of concern.
- Changes in hydrology may alter the habitat conditions and make the area unsuitable to the species found here.
- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Excessive recreational use many disturb the species of concern. Trail widening and erosion may alter the habitat that currently occurs in this area.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Herbicide use, especially along the roads, may have a major impact on the species of concern found at this site.

Conservation Recommendations

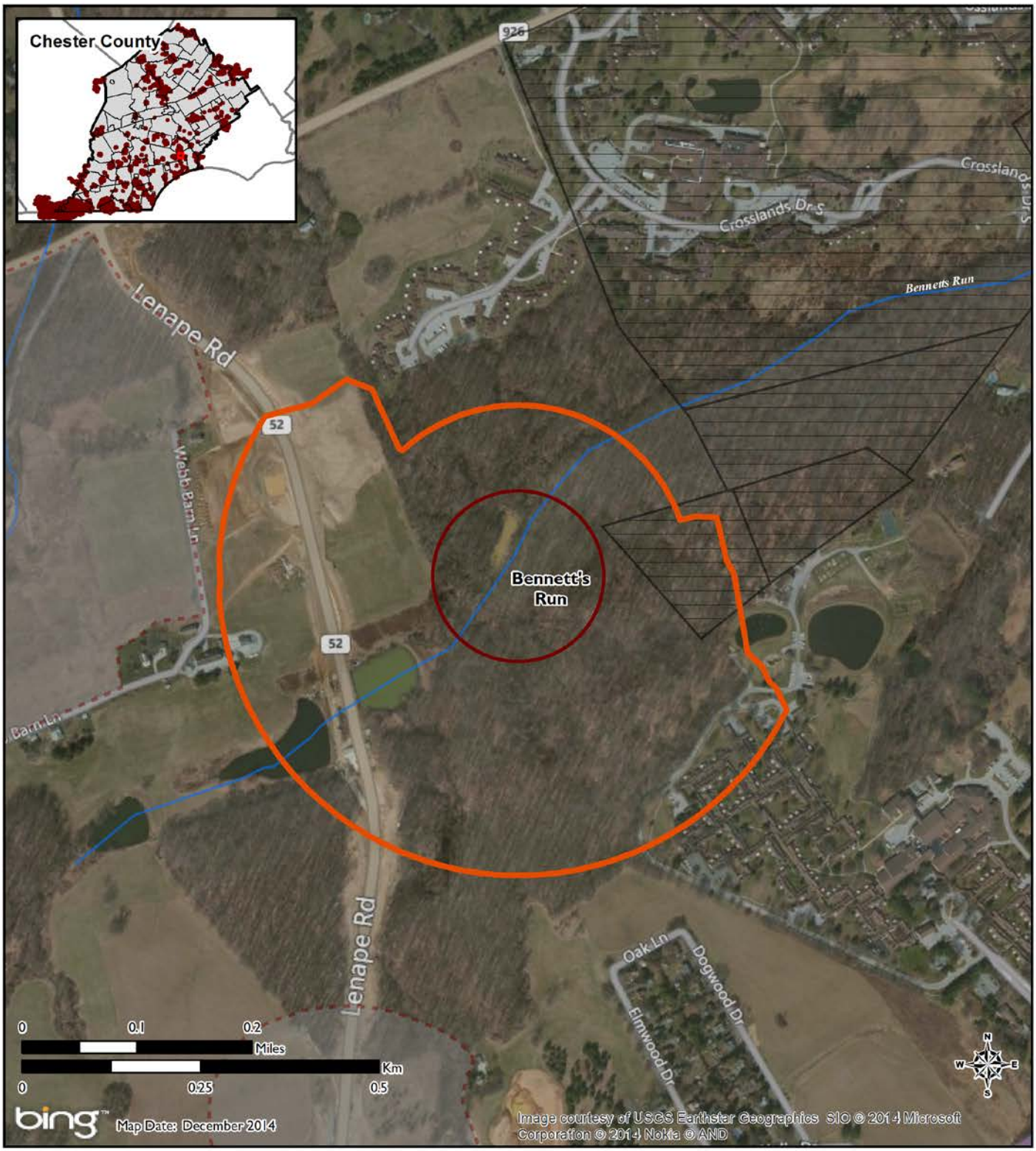
Forested habitats should be protected to prevent further degradation that may impact species of concern and other native species. Avoid fragmenting the remaining forested areas with logging or creation of new housing developments or other infrastructure.

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

- Protect the existing forested areas from development, logging and disturbance along the forest edge. Maintaining intact habitats will help to preserve habitat for as many native species as possible.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Create a sufficient vegetated buffer along the stream in order to filter sediment and chemicals from runoff. A buffer of 100 meter is ideal, but any increase will help to protect the water quality.
- Maintain the existing hydrology. Any activities that occur in the surrounding areas should be conducted with a consideration for the impact to the flow of water into the nearby wetlands. Removal of the small pond should not have a significant impact to the wooded habitats and would return the flow of Bennett's Run to its previous conditions.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations. Further disturbance within this habitat will create additional opening for the establishment and spread of invasive species.
- Carefully consider alteration of the existing trail as widening or new trail creation may disturb the remaining habitat and create opening for invasive species to become established.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Kennett Township, Pennsbury Township*
USGS quads: *Unionville*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Bennett's Run
Natural Heritage Area

Moist, mature forest along Bennett's Run provides habitat for a sensitive Watch List 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***

Bethesda Road Wet Woods NHA

PNHP Significance Rank: *State*

Site Description

Most of Bethesda Road Wet Woods NHA is part of the Crow's Nest Preserve, which is owned by the Natural Lands Trust. This forested area is part of Hopewell Big Woods, which spans Chester and Berks Counties. A number of open fields and other early successional habitats are also found throughout the site. Several species of concern have been documented in the open habitats here.

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]
Bushy Bluestem (*Andropogon glomeratus*)		G5	S3	TU (PR)	9/5/2008	AB
White Milkweed (*Asclepias variegata*)		G5	S1	TU (PE)	6/29/1991	D
Dodder (*Cuscuta compacta*)		G5	S2	N (PT)	9/5/2008	C
Nuttalls' Tick-trefoil (*Desmodium nuttallii*)		G5	S2	TU (PT)	9/30/1990	C
Grass-leaved Rush (*Juncus biflorus*)		G5	S2	TU (PT)	9/5/2008	AB
Bushy Aster (*Symphyotrichum dumosum*)		G5	S1	TU (PE)	10/5/1992	CD

[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.

Bushy aster is located throughout the eastern United States from Maine west to Wisconsin and south to Florida and Texas. It occurs through some parts of Canada as well. Most occurrences in Pennsylvania have been documented in the southeastern counties. Bushy aster is most often found in open habitat and along shrubby edge habitat.

Bushy bluestem is found along the entire southern United States and much of the Atlantic Coast as far north as Massachusetts. In Pennsylvania, it has been documented in the southeastern and southwestern corners of the state. This grass species is found in open habitats with moist soil.

Dodder is a parasitic plant found from New Hampshire west to Wisconsin and south to Florida and Texas. It is considered a nuisance species throughout much of the southern portion of its range. In Pennsylvania it has mostly been documented in the south central and southeastern counties. Dodder is most often found in open fields and shrubby disturbed or man-made habitats.

Susan Elliott, iNaturalist

White milkweed (*Asclepias variegata*)

Grass-leaved rush has been documented from Massachusetts west to Michigan and south to Florida and Arizona. This species is found in open wet habitats throughout the state, but most populations occur in the southeastern counties.

Nuttall's tick-trefoil is at the northern edge of its range in Pennsylvania. It is found from New Jersey west to Illinois and south to Florida and Texas. It has been documented mostly in the southeastern corner of the state. This species is found on dry, open hillsides, utility right-of-ways and other open habitats.

In the United States, white milkweed is found in Massachusetts and New York south to Florida and Texas. It is more common in the southern portions of its range. In Pennsylvania, it is found in several counties in the eastern part of the state. White milkweed prefers dry, open habitat.

Threats and Stresses

Succession is the main threat to the patchy open habitats that are found at this site. Deer density is high in this area and heavily browsed vegetation is evident. Invasive species are found in many parts of this NHA.

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

- Succession that is not controlled by mowing or other methods of disturbance will likely cause the habitat to become unsuitable for the species of concern to be able to persist at this site.
- Herbicide use along the road and right-of-ways may cause direct mortality to the species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Invasive species can take over portions of the habitat currently used by the species of concern and other native species.

Conservation Recommendations

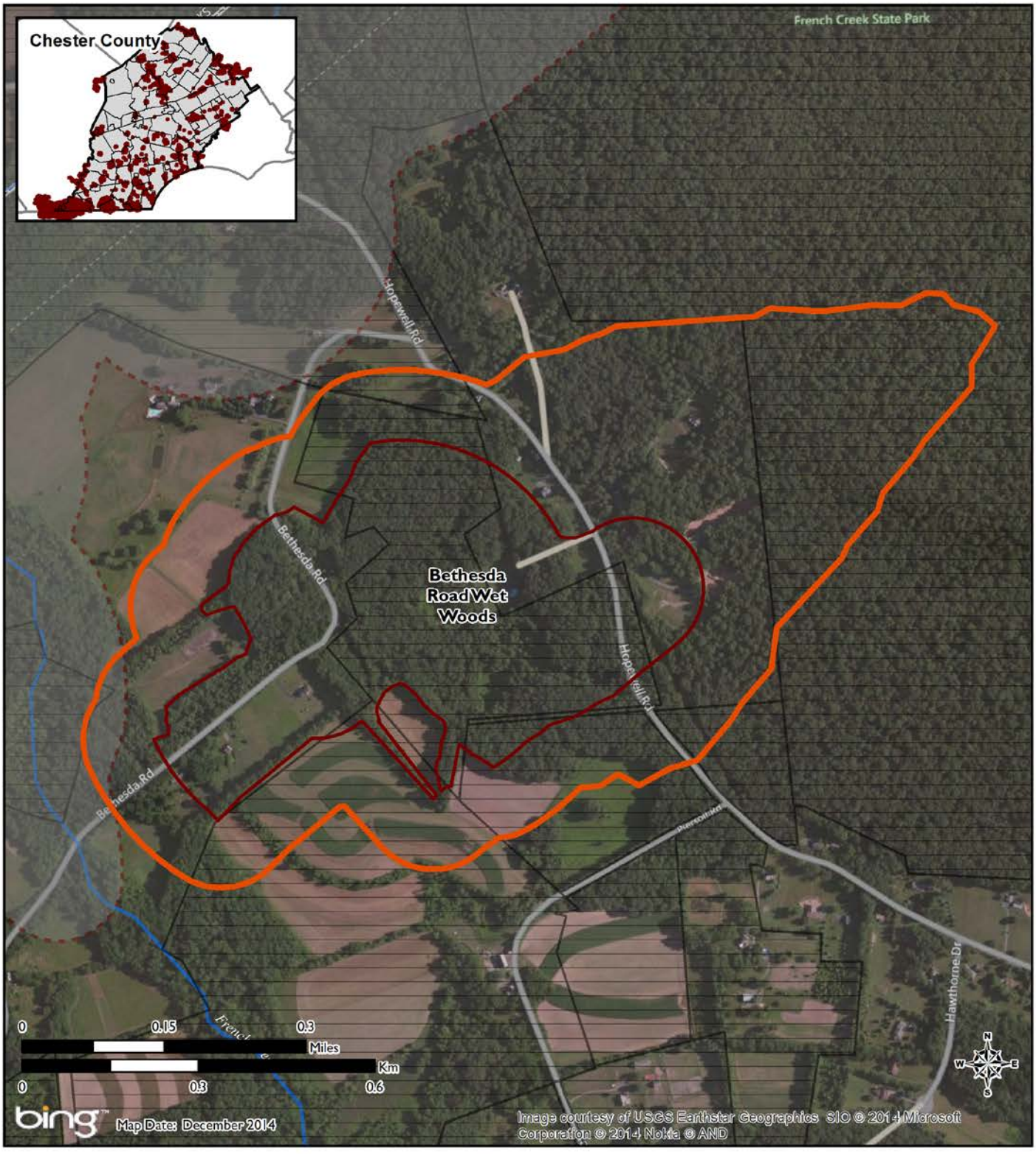
Maintain the existing forested habitat that is part of the large forested area in this region. Any disturbances done to prevent succession in the open habitats should be done in a way to support native species and limit the spread of invasive species. Reduce the white-tailed deer density throughout this NHA to attempt to reverse the damage currently being done by over browsing.

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

- The species of concern at this site require open habitat that needs to be maintained. The needs of these species should be considered when planning the timing and frequency of maintenance.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Reduce the current deer density and continue to monitor and maintain the population at a level that is able to be supported by the landscape.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.

Location

Municipalities: *Warwick Township*
USGS quads: *Elverson*
Previous CNHI reference: *Sportsman Club Site, Dorrance Estate*
Associated NHAs: *None*
Overlapping Protected Lands: *Natural Lands Trust Property, Brandywine Conservancy Easement*



Bethesda Road Wet Woods Natural Heritage Area

This forested wetland supports populations of 6 plant 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 Elk Creek NHA

PNHP Significance Rank: *Regional*

Site Description

Big Elk Creek NHA is a large site nearly 2000 acres in size that is made up of White Clay Creek Preserve and surrounding habitat located on the Maryland border. Much of the area within the NHA and surrounding habitat is managed as pasture and agricultural fields. Mowed meadows are found on many of the slopes and upland areas with a narrow band of wooded riparian habitat found along Big Elk Creek and other small tributaries. The wooded habitat is dominated by tulip poplar and red oak. The early successional habitat in the fields and along roadsides supports a number of species of concern. Several species of concern have been documented in the wooded riparian habitat. **Three sensitive species of concern** are found at this site which are not named at the request of the jurisdictional agencies overseeing their 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]
Elliott's Beardgrass (*Andropogon gyrans*)		G5	S3	N (PR)	10/11/2012	B
Puttyroot (*Aplectrum hyemale*)		G5	S3	PR (PR)	11/12/2012	B
Fringe-tree (*Chionanthus virginicus*)		G5	S3	N (PT)	8/15/1999	BC
Maryland Golden-aster (*Chrysopsis mariana*)		G5	S1	PT (PE)	9/18/2012	C
Horrible Thistle (*Cirsium horridulum*)		G5	S1	PE (PE)	6/2/2002	D
Vase-vine Leather-flower (*Clematis viorna*)		G5	S1	PE (PE)	6/23/2002	BC
Heller's Witchgrass (*Dichanthelium oligosanthes*)		G5	S3	N (PT)	6/9/2007	BC
Panic-grass (*Dichanthelium polyanthes*)		G5	S4	N (SP)	7/27/2002	BC
Velvety Panic-grass (*Dichanthelium scoparium*)		G5	S1	PE (PE)	9/18/2012	AB
Downy Lobelia (*Lobelia puberula*)		G5	S1	PE (PE)	9/11/2012	C
Lion's-foot (*Prenanthes serpentaria*)		G5	S3	N (PT)	2002-04	BC
Long-stalked Crowfoot (*Ranunculus hederaceus*)		G5	S1	PX (PE)	5/27/2007	C
Sensitive species of concern A[3]	S	---	---	---	11/12/2012	D
Sensitive species of concern B[3]	S	---	---	---	2007	BC
Sensitive species of concern C	S	---	---	---	8/12/1992	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.

Downy lobelia, Elliot's beardgrass, Heller's witchgrass, horrible thistle, Maryland golden aster, vase-vine leather-flower, and v**elvety panic-grass** are all species of concern found in early successional habitats in fields and roadsides. Most of the species are found in southern Pennsylvania, and the majority of those are only found in the southeastern portion of the state. A number of these are classified as endangered in the state. They rely on management to maintain open habitat conditions necessary for their persistence. Succession and development of the habitat threatens the populations of these species.

The wooded habitat and bordering shrubby edges support populations of **fringe-tree, lion's foot**, and **puttyroot**. These three plant species of concern are also found in the southern portion of Pennsylvania. Invasive species, habitat loss and deer browse are major threats to these species.

Denise Watts, PNHP

Maryland golden aster (*Chrysopsis mariana*)

Threats and Stresses

The majority of this NHA is made up of early successional habitats that require maintenance to persist. Establishment of woody species can shade early successional habitat, but excessive mowing may also have a negative impact on native species. Further development of the area will destroy existing habitats. The browsing pressure from the high deer population in this area will impact the native species composition.

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

- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Herbicide and fertilizer use in lawns, fields, and along roads within the NHA and in surrounding areas may wash into the site and degrade the habitat conditions.
- Succession of the open grassy areas may cause the field habitat to become overgrown and shaded by woody species.
- Further development of the habitat within the NHA will likely eliminate some populations of species of concern from this area.

Conservation Recommendations

A large portion of this NHA is part of White Clay Creek Preserve, which will allow the habitat conditions that are currently present to persist. Current management within the preserve and surrounding habitats appears to be done in a way that supports species of concern and other native species and should be continued outside of the growing season. A significant reduction in the deer population should help to reduce over browsing that is found throughout much of the site. Avoid additional development of natural habitats and protect the riparian habitat from logging and other fragmentation.

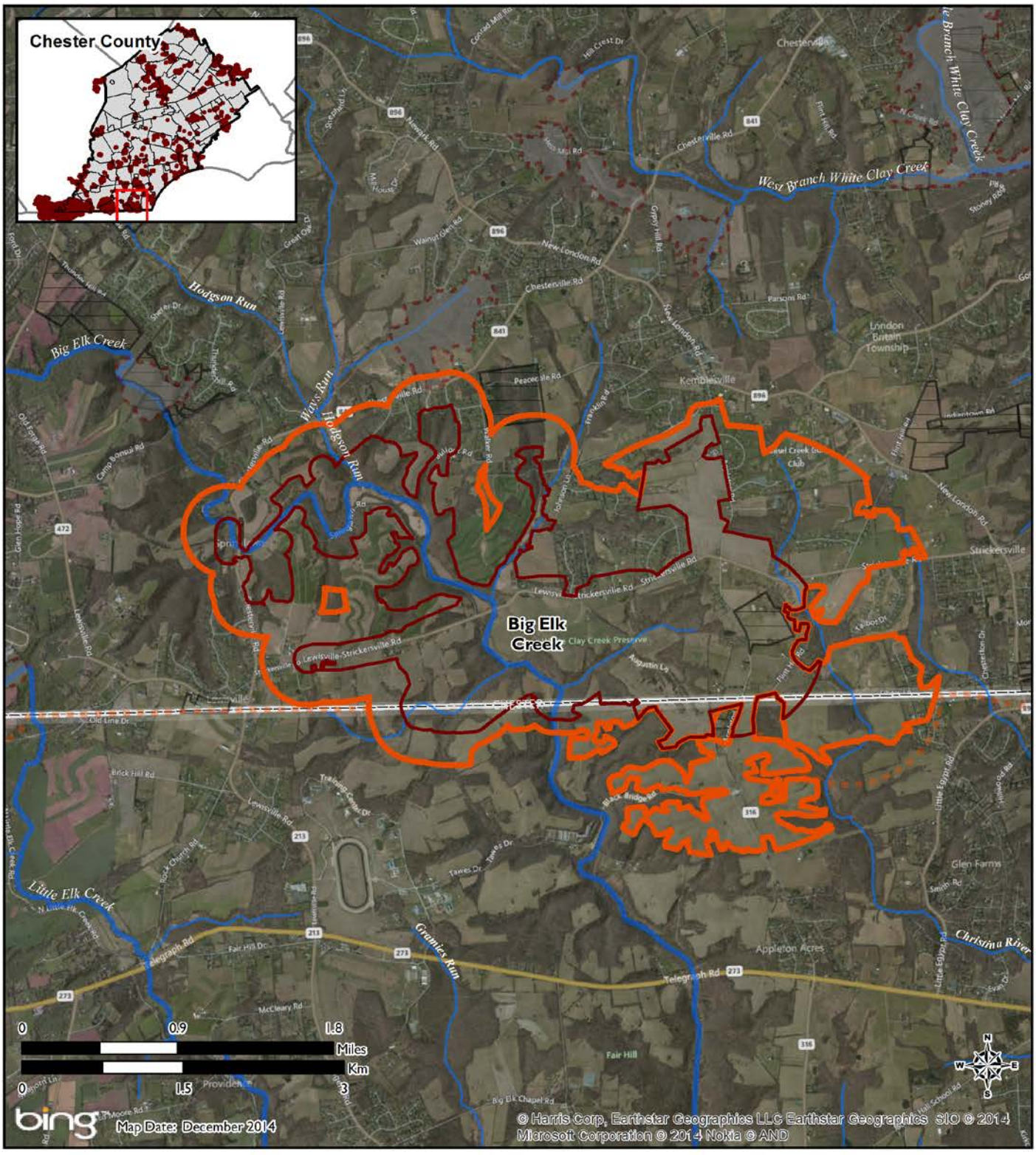
The following steps are recommended to ensure the persistence of these species at this site:

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Several species require open habitat that needs to be maintained. The needs of these species should be considered when planning the timing and frequency of maintenance.
- Protect the existing forested areas from logging and other large scale disturbance. Keep the forest as intact as possible to protect the habitat and species within it.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.

- Reduce deer density, then monitor and maintain it at a level that is able to be supported by the landscape.
- Avoid building additional houses or infrastructure within the NHA in order to prevent fragmentation of the habitat and loss of species of concern.

Location

Municipalities*: Franklin Township, Elk Township, London Britain Township, New London Township*
USGS quads: *Newark West, Bay View*
Previous CNHI reference: *Thistle Hill, Lewisville Roadbank Site, Lewisville North*
Associated NHAs: *None*
Overlapping Protected Lands: *Natural Lands Trust Property, Brandywine Conservancy Easement, White Clay Creek Preserve*



Big Elk Creek
Natural Heritage Area

A diversity of habitats supports 11 species of concern and 3 sensitive species of concern.

Significance Rank:
REGIONAL

Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Birch Run Woods NHA

PNHP Significance Rank: *State*

Site Description

This NHA is located along a forested hillside above Birch Run. A power line right-of-way cuts through the NHA along the edge of the forested habitat. Agricultural fields make up the northern end of the NHA and surrounding habitat. The disturbed forest along the right-of-way is dominated by a number of invasive shrub species, including multiflora rose, Oriental bittersweet, and Japanese honeysuckle. This habitat also supports a small population of **wild kidney bean**, a plant 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]
Wild Kidney Bean (*Phaseolus polystachios*)		G5	S1S2	N (PE)	10/7/2001	C
Sensitive species of concern A[3]	**S**	---	---	---	6/2/2000	E
Sensitive species of concern B[3]	**S**	---	---	---	6/2/2000	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.

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

Wild kidney bean is distributed across most of the eastern United States. Its range stretches from New York west to Michigan and south to Florida and Texas. In Pennsylvania it has a scattered distribution, with the majority of occurrences in the southeastern counties. Wild kidney bean can be found in a variety of habitats, including open woods, thickets, banks, and slopes.

Threats and Stresses

A large number of invasive species occupy this habitat and may continue to spread and change the overall species composition. Maintenance along the right-of-way may disturb natural habitats with mowing or herbicide spraying. Excessive deer browse may hamper the growth of native species.

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

- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Herbicide and fertilizer used along right-of-ways, roads, and fields may wash into the forested area and degrade the habitat or cause direct mortality.
- Succession of the shrubby habitat may shade the area too much for the wild kidney bean to persist.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

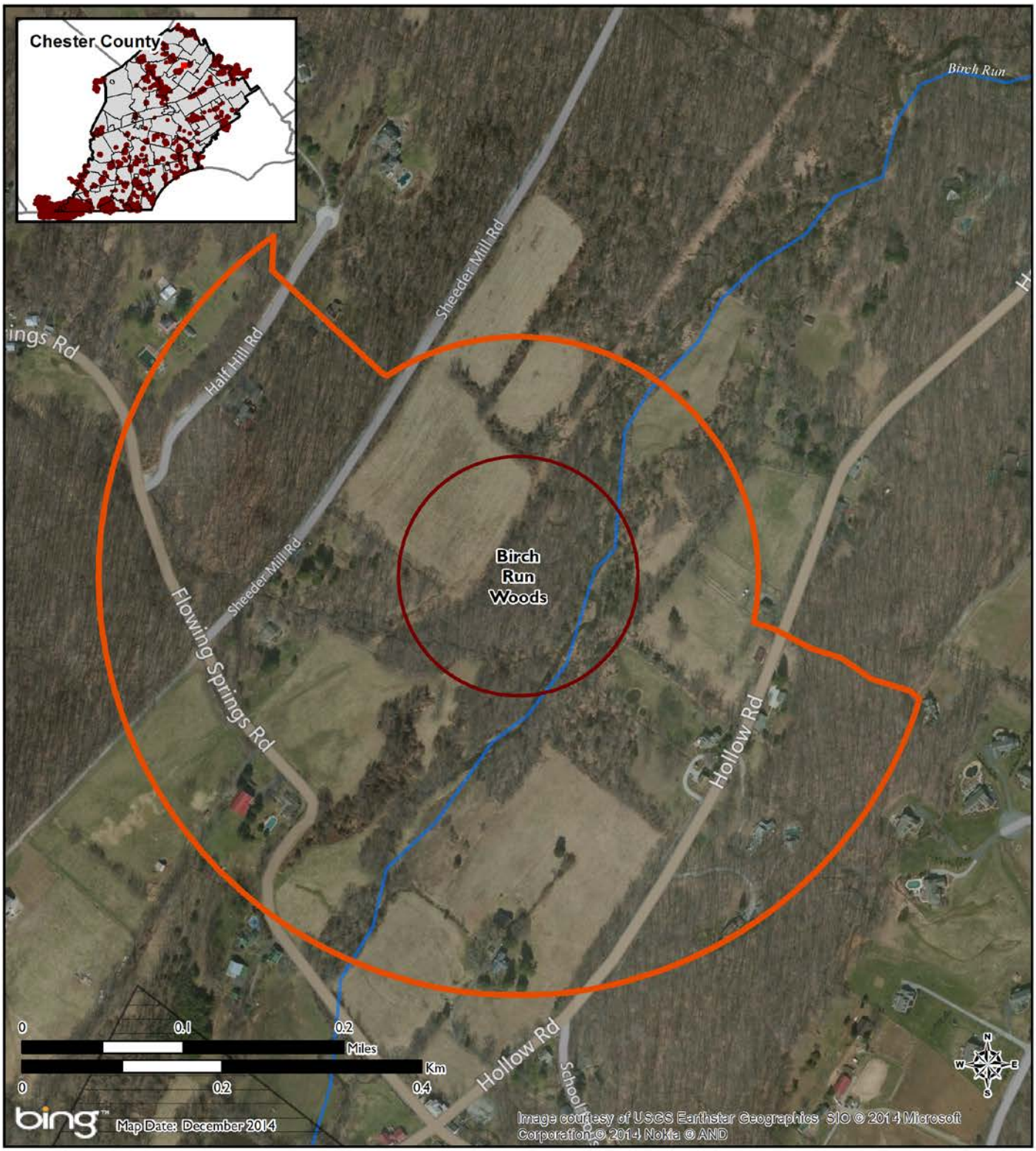
Attempt to remove invasive species, while taking care to not open large gaps that may cause an increase in other invasive species. Minimize disturbance along the right-of-way and other portions of the NHA that will fragment the existing habitat.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Limit the application of chemicals within the NHA and surrounding areas in order to protect the quality of the habitat.
- Periodically cut woody vegetation to maintain the current habitat conditions. Time maintenance with consideration to limit disturbance of wild kidney bean.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *West Vincent Township*
USGS quads: *Pottstown*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Birch Run Woods
Natural Heritage Area

Disturbed upland forest supports a population of wild kidney bean, a plant species of concern.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Brandywine Creek - Eastern Laurel Floodplain NHA

PNHP Significance Rank: *State*

Site Description

The wide, flat floodplain of West Branch Brandywine Creek between Laurel and Embreeville is dominated by reed canary grass, with stands of silver maple and box elder. A narrow channel is located in the floodplain, which has been left behind as West Branch Brandywine Creek has changed its course. A gas pipeline crosses through the floodplain. This NHA also includes part of a small tributary that flows through an agricultural field. The shoreline along this section of West Branch Brandywine Creek has a vegetated gravel bar that provides habitat for **ellisia**, a plant 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]
Ellisia (*Ellisia nyctelea*)	G5	S2	PT (PT)	5/25/2002	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.

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

Ellisia is a state-threatened spring flowering herb found along shady stream banks. It is found throughout much of the United States, but has not been documented in New England, the southeast or the West Coast. It is at the northern end of its range in Pennsylvania and is found along major waterways in the southeast, as far west as the Susquehanna River. Habitat loss and invasive species are the major threats to ellisia.

Threats and Stresses

Logging and other fragmentation are major threats to the habitat found at this site. Openings in the wooded habitat would allow invasive species to become established and spread throughout the area. Alteration of the natural hydrology would affect species composition and habitat conditions.

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

- Changes in hydrology may make the habitat unsuitable to the species of concern found here. Ellisia is found on stream bank habitat that is sensitive to changes in flooding regime.
- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Logging, development, or other major activities will further fragment the existing forest and alter the conditions of the habitat needed by the species of concern. Disturbances will also open areas that can be easily colonized by invasive species.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Herbicide and fertilizer use in lawns, fields, and along roads may wash into the forested area and degrade the habitat conditions.

Conservation Recommendations

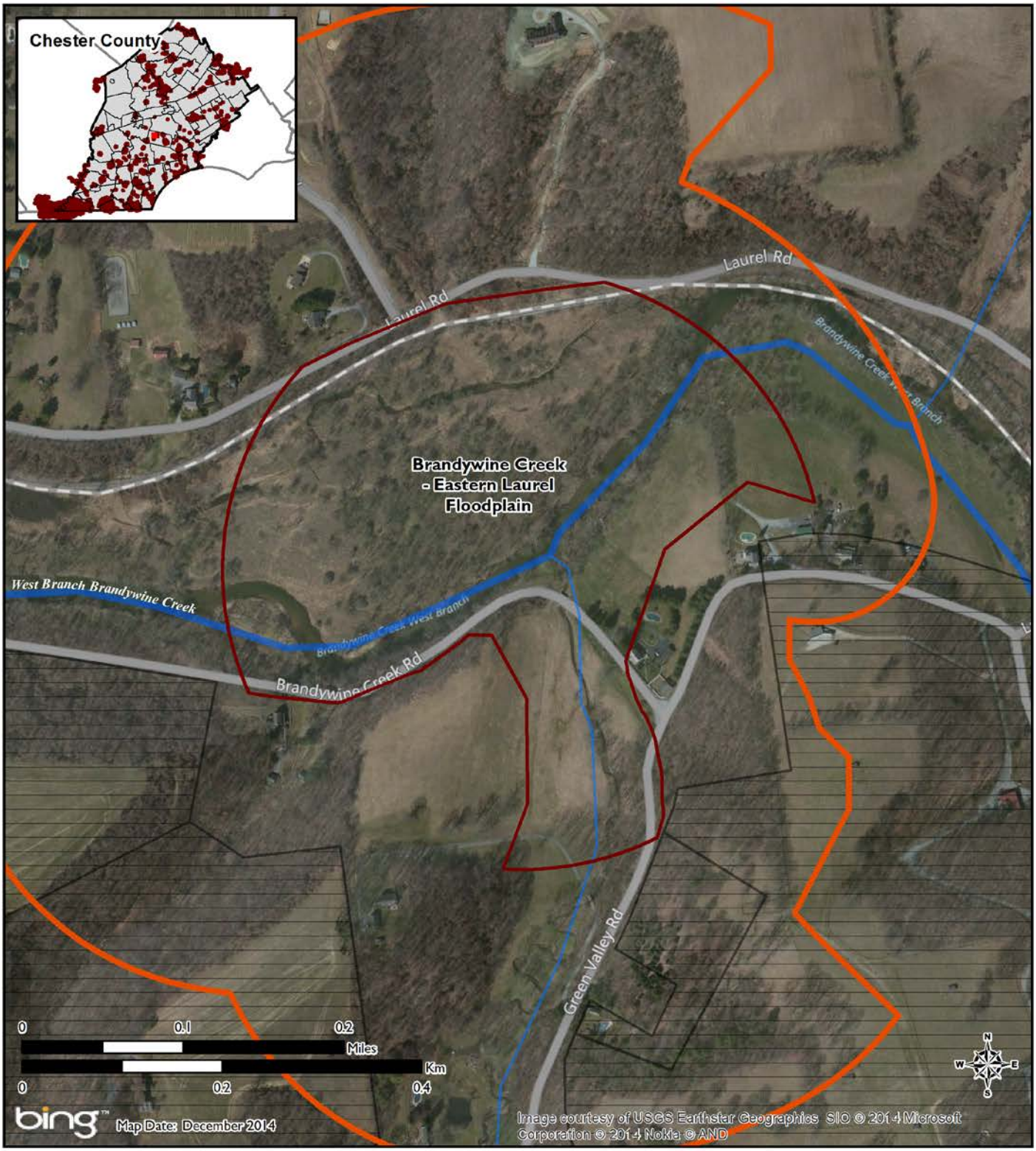
Avoid logging this floodplain in order to protect the habitat conditions and maintain a forested buffer along the steams. Increase this buffer wherever possible to improve the water quality of the streams and wetlands.

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

- Maintain the existing hydrology. Any activities that occur along the roads and other nearby areas should be conducted with a consideration for the impact to the flow of water into the nearby stream and wetlands.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Protect the existing forested areas from logging and other large scale disturbance. Keep the forest as intact as possible to protect the habitat and species within it.
- Widen the native vegetated buffer along the streams, especially the tributary that flows through the agricultural field. A width of 100 meters is ideal, but any increase will benefit the stream and adjacent wetlands.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Newlin Township*
USGS quads: *Coatesville*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Brandywine Creek - Eastern Laurel Floodplain Natural Heritage Area

A partially vegetated gravel bar provides habitat for a population of Ellisia, a threatened plant species in Pennsylvania.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Brinton's Quarry Serpentine Barren NHA

PNHP Significance Rank: *State*

Site Description

This Natural Heritage Area has roughly two acres of serpentine bedrock influenced grassland above the former quarry. The serpentine habitats are often referred to as grasslands, and these herbaceous openings can have a strong representation of warm season grasses and grass-like plants, but they often also contain a good diversity of other plant species, many uncommon at the state and global levels.

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

John Kunsman (PNHP)

Arrow-feathered Three Awned
(*Aristida purpurascens*)

Species or Natural Community Name		PNHP Rank[1] Global	PNHP Rank[1] State	PA Legal Status[1]	Last Seen	Quality[2]
Arrow-feathered Three-awn (Aristida purpurascens)		G5	S2	PT (PT)	8/30/2011	E
Tall Gramma (*Bouteloua curtipendula*)		G5	S2	PT (PT)	8/30/2011	B
Bicknell's Sedge (*Carex bicknellii*)		G5	S1	PE (PE)	6/11/2012	A
Long-haired Panic-grass (*Dichanthelium villosissimum var. villosissimum)*		G5T5	SH	TU (PE)	6/11/2012	A
Plain Ragwort (*Packera anonyma*)		G5	S2	PR (PR)	6/11/2012	CD
Serpentine Aster (*Symphyotrichum depauperatum*)		G2	S2	PT (PT)	8/30/2011	CD

[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.

The plant species of concern found within this Natural Heritage Area are found within the strongly serpentine influenced herbaceous opening or within the adjacent thin woodlands. In the past, natural disturbance, such as wildfires, would have helped to keep this area in an open condition. Without active management, the open grassy area will gradually close due to natural succession. An active restoration effort to maintain the serpentine openings will be necessary to ensure the continued existence of this habitat and the species it contains.

Serpentine aster is a species of plant that deserves special mention based on its potential for global extinction due to its extremely limited global population. This species is predominantly known to occur in the eastern serpentine barrens of Pennsylvania and Maryland, with a few far flung outliers in Virginia and North Carolina (Gustafson 2005; Kartesz 2013). This extremely limited distribution has given this species the status of G2 – globally imperiled. Serpentine aster is found in the more open areas of serpentine barrens, suggesting that fire or other active management may be needed to remove woody overgrowth and maintain this preferred habitat.

Threats and Stresses


Rocky Gleason (PNHP)

Serpentine Aster (*Symphyotrichum depauperatum*)

Historically, wildfires likely helped to maintain the open aspect of these habitats. Early accounts record the intentional setting of fire by Native Americans to help open areas for greater potential hunting success. Because of the past prevalence of intentional or accidental wildfires, this habitat was historically less dominated by woody trees and shrubs, but recent fire suppression has favored the expansion of wooded habitats at the expense of herbaceous openings. Invasion of serpentine herbaceous openings by woody trees and shrubs can influence the surrounding habitat. As woody vegetation encroaches on the openings, they tend to trap more organic debris and allow deeper soils to accumulate. As deeper soils occur on the site, they succeed to more common woodland and forest types. Fire disturbances had maintained these herbaceous openings in the past. In the absence of fire, active woody vegetation removal will be necessary to maintain these openings.

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

- The lack of natural fire disturbance poses one of the greatest threats to this habitat. In the absence of natural fire events, most of the open serpentine barrens habitats will gradually succeed to more common woody vegetation such as junipers, pines and oaks.
- Residential development occurs along one edge of the serpentine habitat while active agricultural fields surround the remainder of the site.
- Invasive species of plants can displace native species of plants.
- Over browsing by white-tailed deer is a serious threat to the overall plant diversity.

Conservation Recommendations

These serpentine habitats occur in isolated patches as the bedrock material, serpentinite, is exposed at the surface of the ground in a scattered fashion much like an archipelago chain of islands. Each habitat has a slightly different species composition, largely due to the slightly different environmental conditions found at each distinct location. A long range goal for these isolated habitats is to recognize them as a single system and plan for their ecological needs. The area between and around these habitats should be maintained to provide the necessary buffer to allow prescribed burns to maintain the mosaic of open habitat once a network of the woody species have been removed.

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

- There appears to be no specific formal management plan for this Natural Heritage Area, and the site would benefit from a thorough review of the site-specific goals and procedures for management here. In the interim, general goals and actions could be gleaned from other serpentine management plans such as the Goat Hill Management Plan (Furedi 2008); Unionville Serpentine Barrens Restoration and Management Plan (Latham 2012); Pink Hill Serpentine Barrens Restoration and Management Plan (Latham 2008).
- The plants that characterize these habitats are adapted to the dry, nutrient poor soils and periodic fire events. A priority for the security of these globally rare habitats should be to establish protection for the core habitats as well as to provide for the landscape context in which natural process can be maintained.

- Active stewardship of these habitats is necessary. In the absence of natural fire disturbance, or active vegetation removal, these habitats will succeed into woodlands and forests, replacing the globally rare habitat with a more common type.
- Habitat restoration activities should strive to establish a mosaic of habitat types to accommodate the variety of organisms and their diverse habitat preferences. While some of these plants will only thrive in the open on thin soils, or even bare bedrock conditions, others need the limited shelter of scattered trees or even the deep shade provided by a mature forest. Some of the insect species require conifers during part of their life cycle while others need deciduous trees or specific shrubs or wildflower host plants. There is no "one-size-fits-all" management recommendation for this habitat other than to provide for a mosaic of habitat diversity. "It's essential in restoring and maintaining disturbance-dependent ecosystems to vary the intensity and frequency of the disturbance in patchwork fashion, so that there is always a mosaic of patches of differing disturbance history. …the patchy landscape produced by random variation in disturbance history from one patch to another is essential to sustain the diversity of habitats and organisms that make up the total ecosystem." (Roger Latham, personal communication November 7th, 2014)
- Management activities should be coordinated with long-term habitat monitoring. "Analysis of desired conditions, inventory of existing conditions, and long-term monitoring of an array of key indicators is essential to know whether restoration and management efforts are accomplishing all of the goals or if some of the threatened or endangered species whose recovery is first and foremost among those goals might be inadvertently falling by the wayside." (Roger Latham, personal communication November 7th, 2014)
- Expand herbaceous openings as needed on convex landscapes by removing trees and other woody plants. Focus woody plant removal on areas of pines and junipers, which tend to indicate drier, thinner soils. The establishment of hardwoods should be taken as an indicator of deeper, moister soils. Where deeper soils occur, soil organic matter reduction may be necessary to establish thin soils over serpentine bedrock. "Soil organic matter (SOM) reduction has proven effective in restoring serpentine grassland vegetation where it has been fully displaced by forest succession, as long as intact grassland adjoins the treated area to serve as a seed source. SOM reduction consists of skimming the surface organic horizons from the soil profile using a backhoe or front-end loader and transporting the material offsite by dump truck. It is particularly effective in restoring serpentine grassland where it has been invaded by a dense thicket of common greenbrier (*Smilax rotundifolia*)." (Roger Latham, personal communication November 18th, 2014)
- These systems may be best maintained in an agricultural or rural setting. Residential development near or between these barrens should be strongly discouraged. Adjacent residential development can conflict with or greatly reduce the options for management using prescribed fire.
- Educate the adjacent landowners on the significance of the globally rare habitat and the need for ongoing management activities.
- Suppress the spread of invasive species of plants to prevent native species from being crowded out of the habitat. Removal of invasive plants in the immediately vicinity of the species of concern can help these populations compete for space against much more aggressive species. Invasive species management should be coordinated by individuals familiar with the rare species as well as the invasive species present. Continual invasive species monitoring and control will be necessary.
- Reduce deer herd density to suitable levels to prevent overbrowsing of sensitive species.

Location

Municipalities: *Westtown Township*
USGS quads: *West Chester*
Previous CNHI reference: *Brintons Quarry*
Associated NHAs: *None*
Overlapping Protected Lands: *None*

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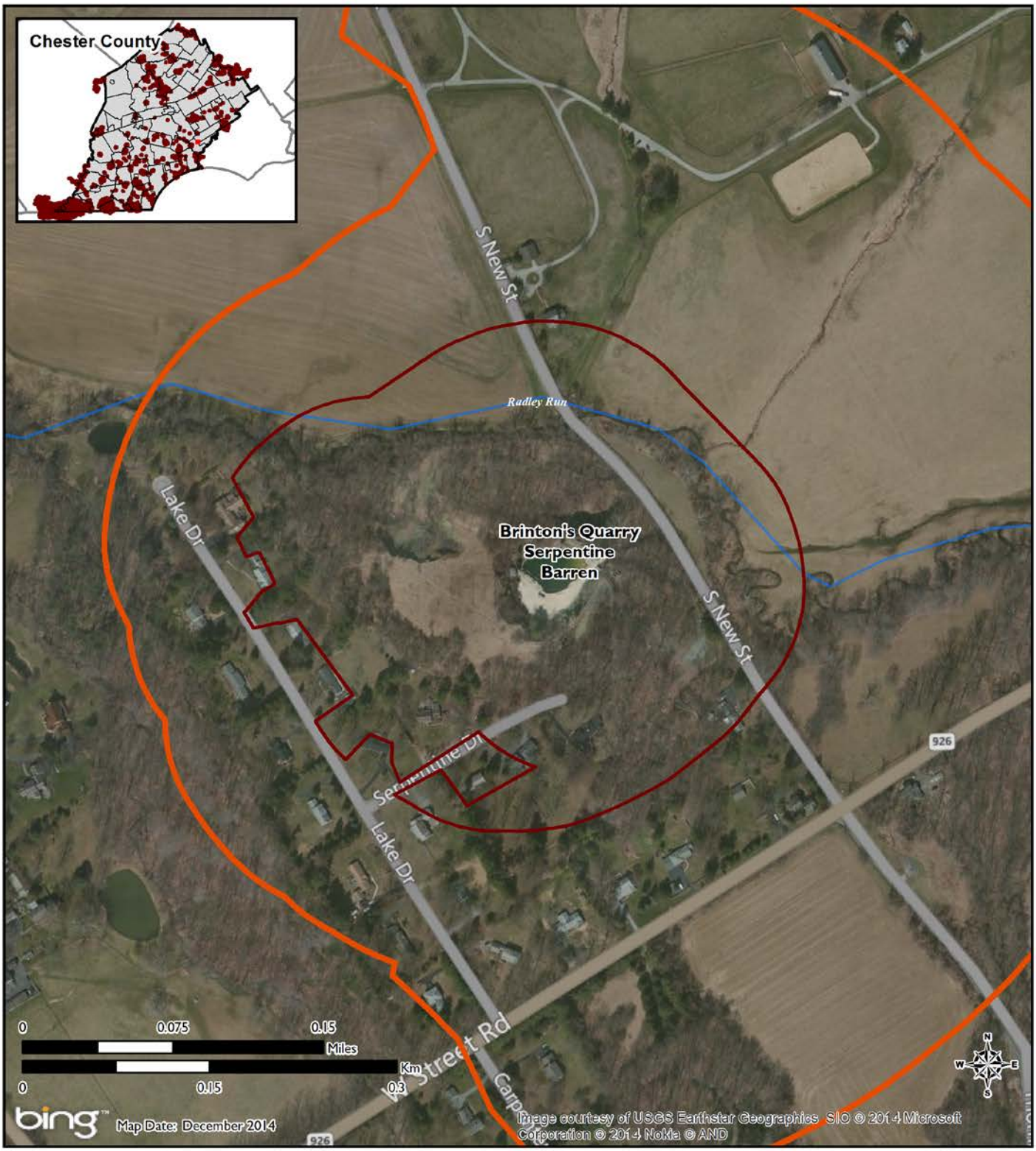


Brinton's Quarry Serpentine Barren Natural Heritage Area

Abandoned quarries on a serpentine barren host populations of 5 plant species of concern.

Significance Rank:
GLOBAL

PNHP
Pennsylvania Natural Heritage Program

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

Buck Road Meadow NHA

PNHP Significance Rank: *State*

Site Description

The headwaters to a tributary of East Branch Brandywine Creek occur at the southern end of this site near Buck Road. The lower end of this wetland is dominated by cattails, while the upper end of this site contains more grasses and sedges. Agricultural fields and wooded areas fragmented with residential development surrounds this NHA. The open wetland habitat supports a population of **twisted yellow-eyed grass**, a plant species of concern. An additional plant species of concern, **Elliot's beardgrass**, is found drier, early successional habitat.

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]
Elliott's Beardgrass (*Andropogon gyrans*)		G5	S3	N (PR)	3/11/2001	BC
Twisted Yellow-eyed Grass (*Xyris torta*)		G5	S1	N (PT)	9/5/1994	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.

Elliot's beardgrass is at the northern edge of its range in Pennsylvania and has only been documented in a few southeastern counties. It spans from New Jersey to Illinois, south from Texas to Florida. This species needs open, early successional habitat in order to persist.

Twisted yellow-eyed grass is found scattered throughout much of the eastern half of the United States. In Pennsylvania, it is most frequently found in the southeast, but has been documented in other areas of the state as well. This species is found in various types of wetland habitats.

Threats and Stresses

Succession and invasive species pose significant threats to the habitat present at this site. Changes in hydrology would also alter the wetland habitat.

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

- Succession by woody species will likely alter the hydrology of the site and shade the existing early successional habitat. Expansion of the cattails in this wetland may also produce a similar effect of lowering water levels and shading the lower growing species.
- Changes in hydrology may make the habitat unsuitable to the species of concern found here.
- Invasive species are present and further spread may cause competition with species of concern and other native species.
- Runoff of sediment and pollutants from the adjacent road may degrade the quality of the wetland needed to support the species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

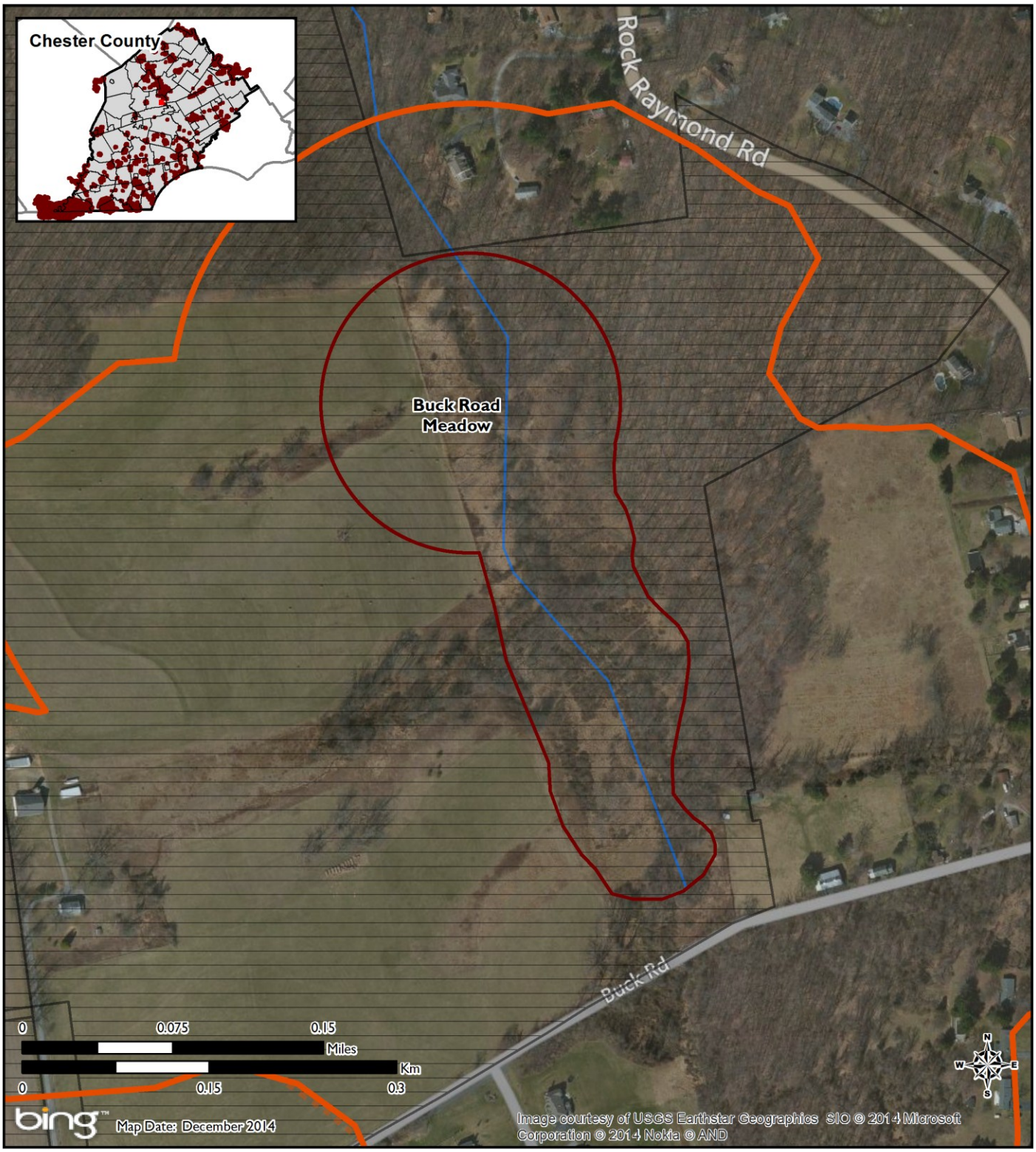
This entire site is located on property owned by the Brandywine Conservancy. Continued stewardship of the various habitats is needed to ensure their persistence at this site. Periodic maintenance is needed in the early successional habitats to prevent succession. Remove invasive species to preserve habitat conditions for as many native species as possible.

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

- Control succession by removing woody species and monitoring the spread of cattails.
- Avoid altering the current hydrology of the wetland or areas downstream.
- Monitor this site for the presence of invasive species. Control the introduction and spread of invasives and target small populations first. These will be easier to eradicate than more established populations.
- Maintain a vegetated buffer along the road to filter sediment and other pollutants before they enter into the wetland.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *East Brandywine Township*
USGS quads: *Downingtown*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Property*



Buck Road Meadow
Natural Heritage Area

Open meadow habitat and adjacent forest support populations of two plant species of concern: twisted yellow-eyed grass and Elliott's beardgrass.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Buck Run Fields NHA

PNHP Significance Rank: *State*

Site Description

Most of Buck Run Fields NHA is mowed early successional habitat on a steep hillside above a tributary to Buck Run. Mowing occurs to the edge of the tributary. Agricultural fields and housing developments surround this site. This NHA is part of a larger field that is approximately 100 acres. This open habitat supports a population of **pencilflower**, a plant 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]
Pencilflower (*Stylosanthes biflora*)	G5	S2	TU (PE)	10/11/1992	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.

Pencilflower is more common in the southern United States. Its entire range stretches from New Jersey west to Wisconsin and south the Florida and Texas. In Pennsylvania, it has been documented in several southern counties. This member of the pea family is found in open habitats that often require management to prevent succession.

Threats and Stresses

Succession is one of the biggest threats to the current habitat conditions within this NHA. Invasive species may continue to spread throughout this site and alter the habitat.

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

- Succession that is not controlled by mowing or other methods of disturbance will likely cause the habitat to become unsuitable for pencilflower to be able to persist at this site.
- Invasive species are present and further spread may cause competition with species of concern and other native species.
- Runoff of sediment and pollutants from the adjacent fields and lawns may degrade the quality of the wetland needed to support the species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

Most of this NHA is protected by a conservation easement, which should protect it from major disturbances, such as development. Occasional disturbance will likely be necessary to prevent succession of woody species.

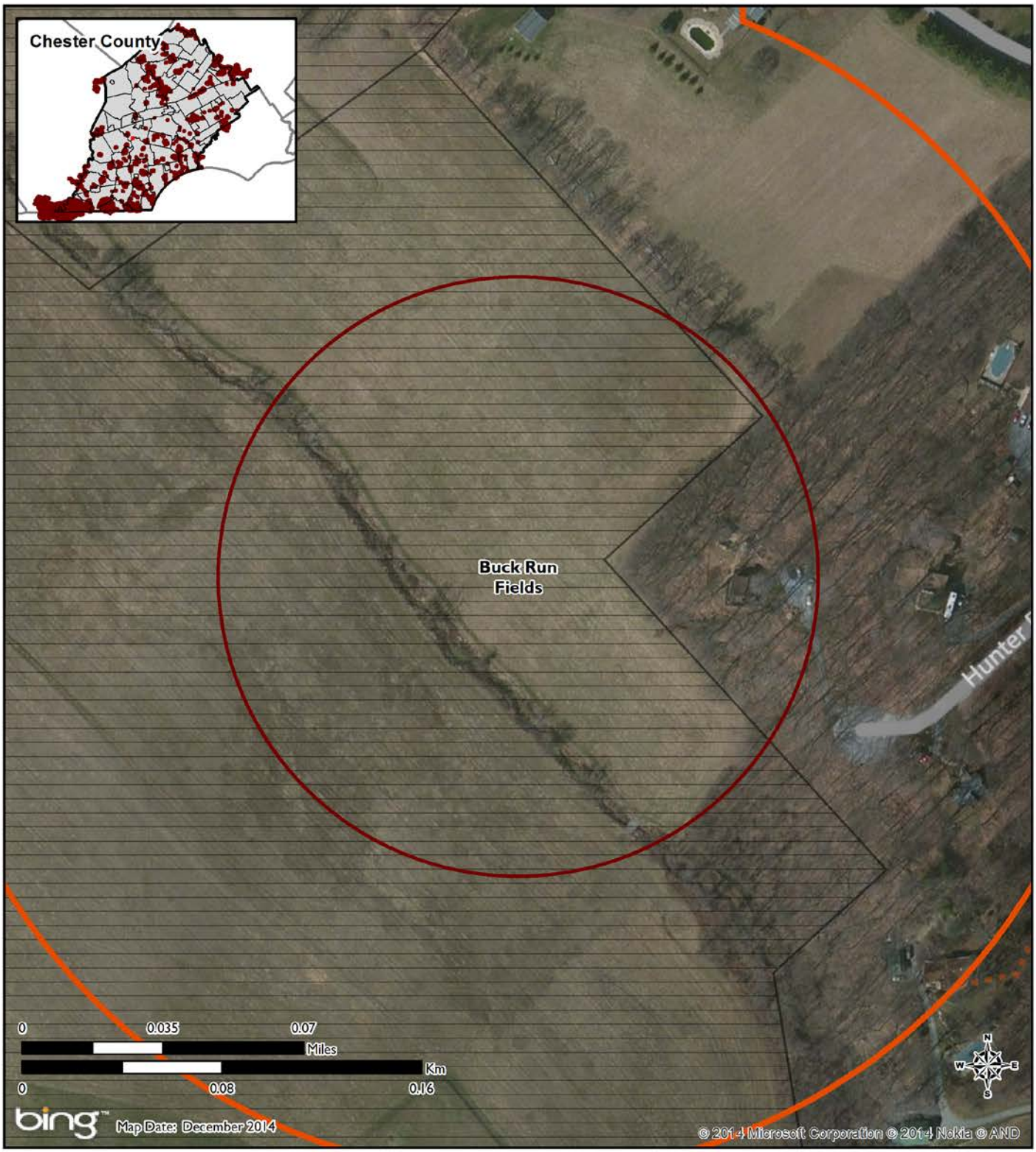
The following steps are recommended to ensure the persistence of these species at this site:

- Pencilflower requires open habitat that needs to be maintained. The needs of this species should be considered when planning the timing and frequency of maintenance.

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *East Fallowfield Township*
USGS quads: *Coatesville*
Previous CNHI reference: *Buck Run Tributary*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Easement*



Buck Run Fields
Natural Heritage Area

An open disturbed meadow supports a population of the state imperiled plant, pencilflower.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Bucktoe Creek Woods NHA

PNHP Significance Rank: *State*

Site Description

Bucktoe Creek Woods NHA is a predominately wooded area south of Kennett Square where Bucktoe Creek enters into West Branch Red Clay Creek. The surrounding area is a mix of agricultural fields, residential developments, and patchy woodlots. The habitat within the NHA is dominated by red maple and black birch with a number of skunk cabbage seeps. The wooded seeps provide habitat for **netted chainfern**, a plant species of concern. The edge of this wet forested habitat supports a population of **stiff cowbane**, another plant species of concern. A mowed meadow that is approximately 5 acres in size is located in the southeastern end of the NHA. This early successional habitat supports a population of **horrible thistle**, a plant 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]
Horrible Thistle (*Cirsium horridulum*)		G5	S1	PE (PE)	5/25/2002	BC
Stiff Cowbane (*Oxypolis rigidior*)		G5	S2	TU (PT)	6/4/1994	D
Netted Chainfern (*Woodwardia areolata*)		G5	S2	N (PT)	6/4/1994	CD

[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.

Horrible thistle is a state endangered plant species that is found throughout the southeastern United States as far west as Texas and Oklahoma and up the Atlantic Coast into New England. In Pennsylvania, horrible thistle has been documented in several southeastern counties. This species is found in a variety of open habitats and disturbed areas.

Netted chainfern is a wetland species that is found scattered throughout Pennsylvania. Its entire range spans from Nova Scotia south to Florida and west to Texas. It is more common in the southern portion of its range.

Stiff cowbane is a plant species in the carrot family. Its range spans from New Jersey west to Minnesota and south to Texas and Florida. It is at the northern edge of its range in Pennsylvania and has mostly been documented in southern counties. Stiff cowbane is found in open, wet habitats.

Threats and Stresses

Alteration of the natural hydrology of Bucktoe Creek and other wetlands would significantly alter the habitats found within this NHA. Fragmentation of the wooded area would impact the habitat conditions and allow opening for the establishment and spread of invasive species. Succession is a threat to the meadow habitat, but excessive mowing may also have negative impacts.

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

- Changes in the currently hydrology could significantly alter the habitat for the plant species of concern by making conditions either too wet or too dry to be able to persist at this site.

- Invasive species are present in this site and may displace native vegetation, including species of concern.
- Logging will further fragment the existing forest and alter the conditions of the habitat needed by netted chainfern and stiff cowbane.
- Succession within the meadow habitat that is not controlled by mowing or other methods of disturbance will likely cause the area to become unsuitable for horrible thistle to be able to persist at this site. Excessive mowing can also affect the life cycle of native species.
- Herbicides sprayed on the agricultural fields and along roads may cause direct mortality to species of concern and other native species. Fertilizers and chemicals used on lawns may also wash into the NHA and degrade the habitat.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

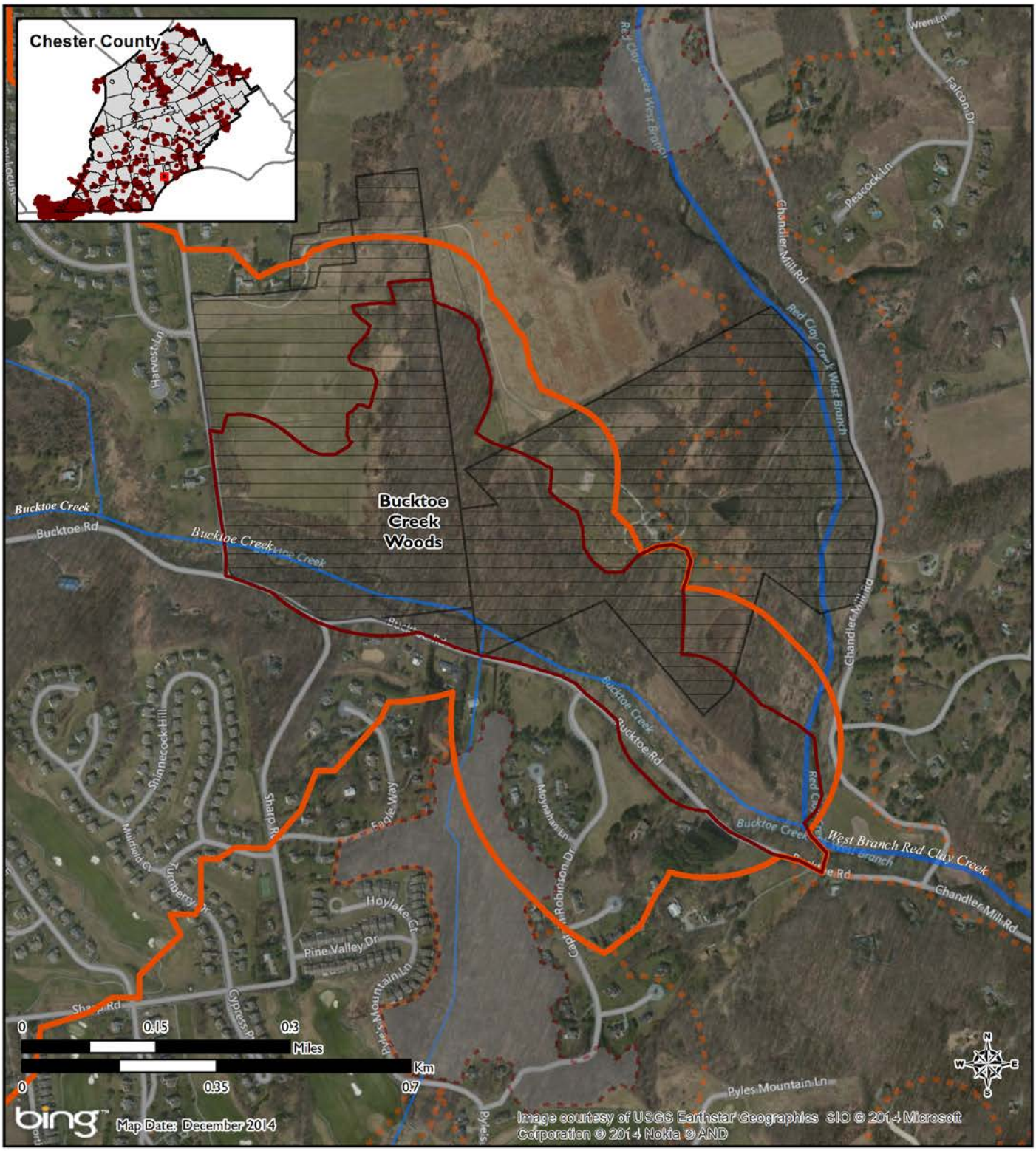
A large portion of this NHA is covered under a conservation easement, especially on the western end. This will help to preserve the existing habitat conditions and limit disturbances. Avoid disturbing the wooded habitat with activities that will fragment the area or introduce invasive species. Periodically mow the early successional habitat outside of the growing season in order to prevent succession.

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

- Maintain the existing hydrology. Any activities that occur near the NHA should be conducted with a consideration for the impact to the flow of water into the wetlands below.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Protect the existing forested areas from logging and disturbance along the forest edge. Maintaining as many intact habitats as possible will help to preserve habitat for as many species as possible.
- Horrible thistle requires open habitat that needs to be maintained with mowing or other methods of disturbance. The needs of this species should be considered when planning the timing and frequency of maintenance.
- Limit herbicide use to situations where it is necessary, such as to control invasive species. Avoid the use of fertilizers and chemicals on lawns or along roads, so they do not wash into other areas and degrade the habitat.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Kennett Township, New Garden Township*
USGS quads: *Kennett Square*
Previous CNHI reference: *Bucktoe Creek Woods*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Easement*



Bucktoe Creek Woods Natural Heritage Area

This NHA supports populations of three plant species of concern in Pennsylvania: netted chainfern, stiff cowbane, and horrible thistle.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Burnt Mill Road North Meadow NHA

PNHP Significance Rank: *State*

Site Description

Burnt Mill Road North Meadow NHA is located in a small patch of habitat surrounded by housing developments. This site is located close to the Delaware State border near Burnt Mills. A small pond is located on the eastern end of the site that creates the headwaters for a small tributary that flows through the NHA. Openings within the forested habitat and along the edge provide habitat for **Elliot's beardgrass** and **grass-leaved rush**, two plant 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]
Elliott's Beardgrass (*Andropogon gyrans*)	G5	S3	N (PR)	1/13/2001	C
Grass-leaved Rush (*Juncus biflorus*)	G5	S2	TU (PT)	9/3/1999	CD

[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.

Elliot's beardgrass is at the northern edge of its range in Pennsylvania and has only been documented in a few southeastern counties. It spans from New Jersey to Illinois, south from Texas to Florida. This species needs open, early successional habitat in order to persist.

Grass-leaved rush has been documented from Massachusetts west to Michigan and south to Florida and Arizona. This species is found in open wet habitats throughout the state, but most populations occur in the southeastern counties.

Threats and Stresses

Further development threatens to destroy and fragment the existing habitat. Invasive species are found at this site and may expand, especially in openings and along habitat edges.

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

- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Logging will further fragment the existing forest and alter the conditions of the habitat needed by grass-leaved rush.
- Succession of the open grassy fields may cause the habitat used by the species of concern to become overgrown and shaded by woody species.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Changes in the currently hydrology could significantly alter the habitat for the plant species of concern by making conditions either too wet or too dry to be able to persist at this site.
- Herbicide use along the road and fields may cause direct mortality to the species of concern.

Conservation Recommendations

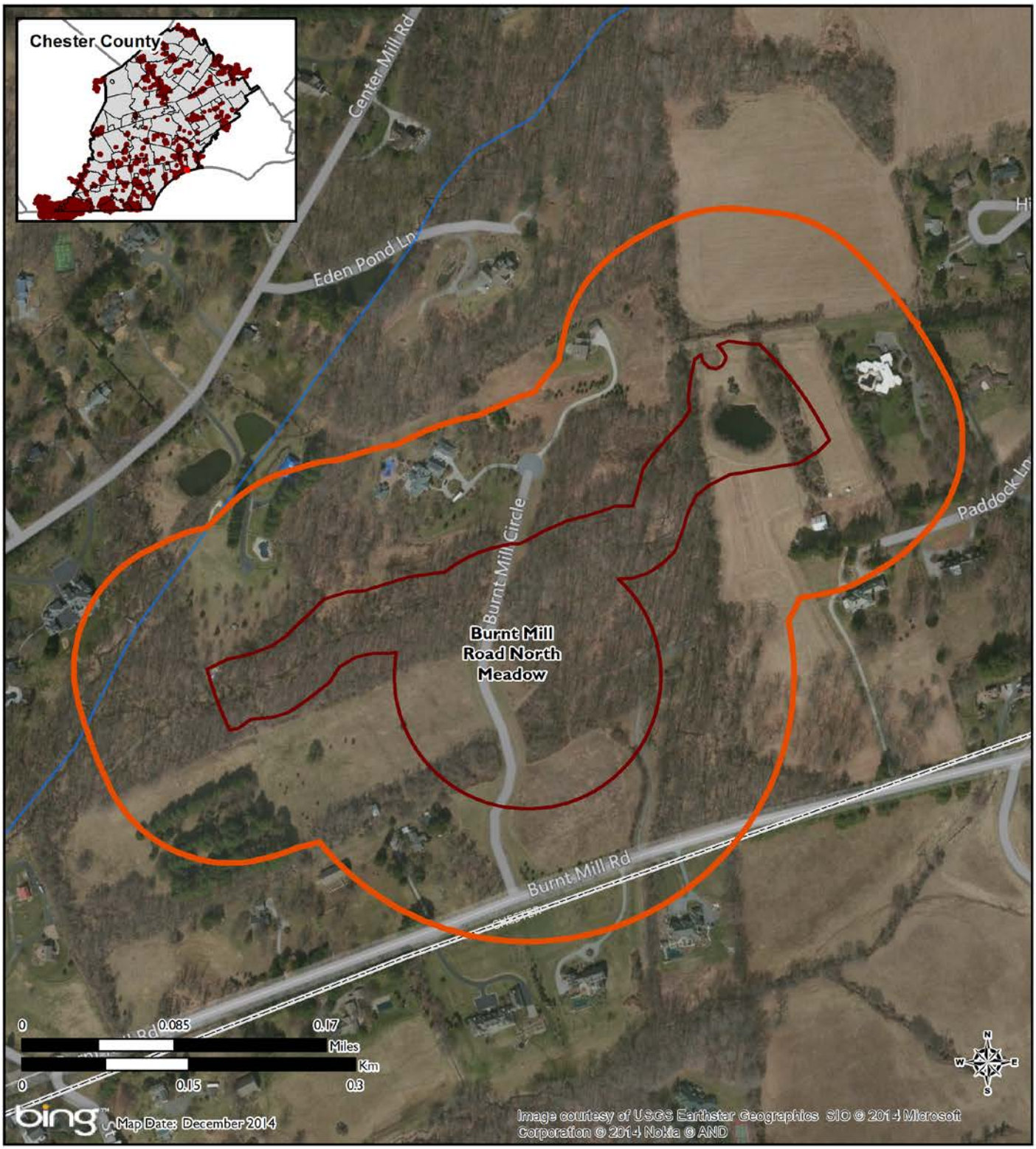
Burnt Mill Road North Meadow NHA is located on private property in an area with a large number of housing developments. Do not expand developments or conduct other disturbances that will fragment the wooded habitat. Use mowing or other management techniques in the winter to maintain the early successional habitat conditions.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Protect the existing forested areas from logging. Do not further fragment the habitat with roads, houses, or other disturbances in order to preserve habitat for as many species as possible.
- Maintain the grassy habitat openings for Elliot's beardgrass and other early successional species. Perform periodic maintenance, such as mowing, to prevent woody species from becoming established.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Maintain the existing hydrology. Any activities that occur along the roads should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.

Location

Municipalities: *Kennett Township, Pennsbury Township*
USGS quads: *Kennett Square*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Burnt Mill Road North Meadow Natural Heritage Area

This site supports populations of two plant species of concern, Elliott's beardgrass and grass-leaved rush.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

Burrows Run Road South NHA

PNHP Significance Rank: *State*

Site Description

Burrows Run Road South NHA is located along the forested habitat of two different tributaries near Rosedale. Several openings in the forest support wet meadow habitat that supports a population of **grass-leaved rush**, a plant species of concern. Housing developments have fragmented the wooded habitat in this area, including some within the core habitat for this NHA.

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)	7/2/2005	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.

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

Grass-leaved rush has been documented from Massachusetts west to Michigan and south to Florida and Arizona. This species is found in open wet habitats throughout the state, but most populations occur in the southeastern counties.

Threats and Stresses

The adjacent homes may cause disturbances to the habitat, including introduction of invasive species and runoff that may include fertilizers, herbicides, and other chemicals. Invasive species are known to occur in this area. Further development near this NHA will not only fragment the remaining habitat, but likely increase the spread of invasive species as well. Changes in hydrology will likely alter the current habitat conditions.

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

- Changes in the currently hydrology could significantly alter the habitat for the plant species of concern by making conditions either too wet or too dry to be able to persist at this site.
- Runoff from surrounding agricultural and residential areas will likely contain sediment, nutrients, herbicides and other pollutants that will degrade the quality of the streams and surrounding wetlands.
- Invasive species are present in this site and may displace native vegetation, including species of concern.
- Logging, development, or other activities that further fragment the patch of existing forest may alter the structure of the habitat and allow an increase in invasive species.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

Maintain the existing habitat conditions. Remove woody species periodically if they become abundant in the wet meadows. Monitor invasive species and attempt to remove them if they begin to crowd out

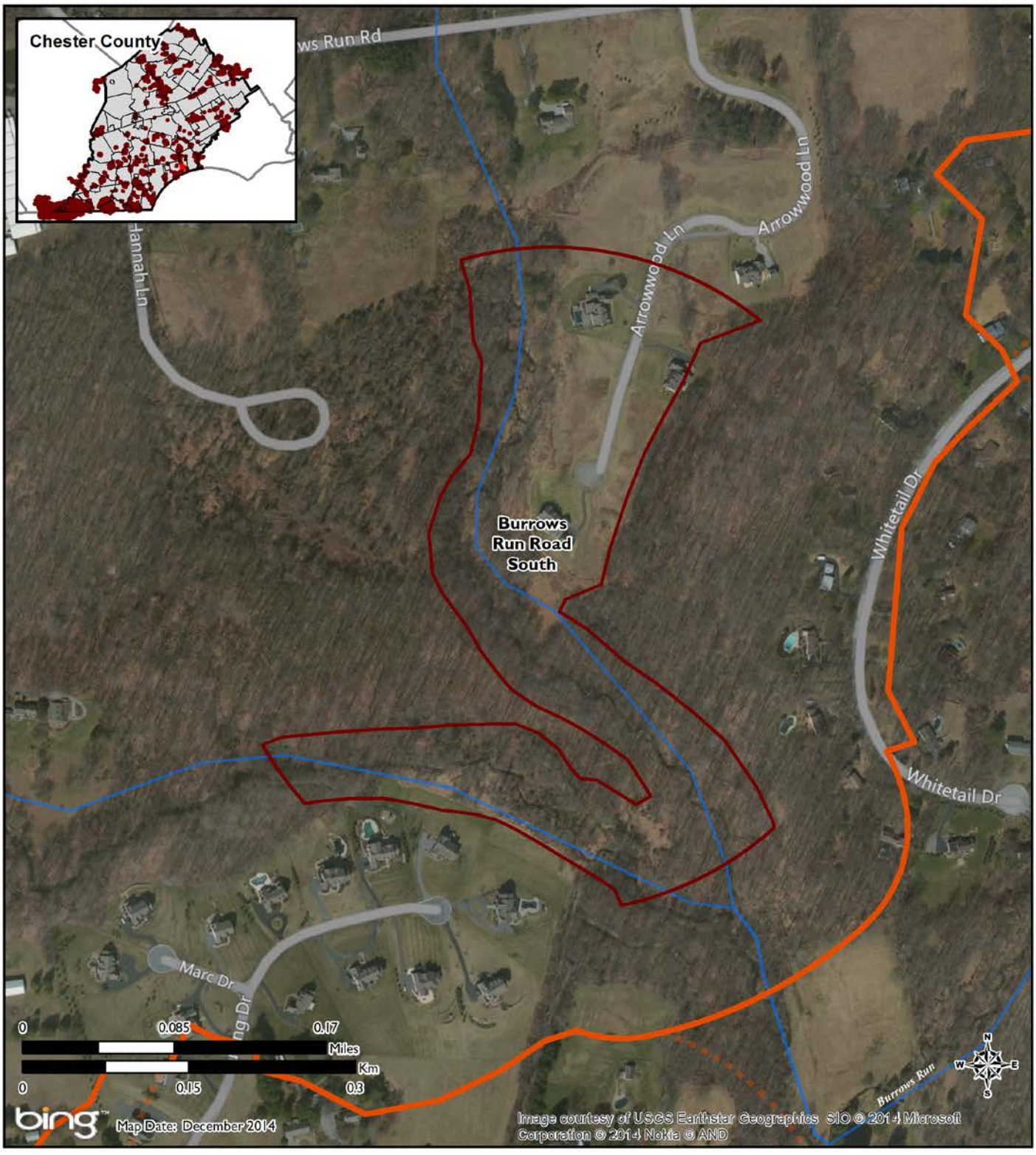
native species. Limit the use of chemicals on lawns in the residential areas bordering the NHA to prevent runoff into the streams and wetlands.

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

- Avoid altering the current hydrology of the wetland, or areas downstream.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations. Further disturbance within this habitat will create additional opening for the establishment and spread of invasive species.
- Protect the existing forested areas from logging and disturbance along the forest edge. Maintaining as many intact habitats as possible will help to preserve habitat for as many species as possible.
- Maintain a vegetated buffer along the streams and wetlands to filter sediment and other pollutants before they enter into the wetland. A buffer of 100 meters in width is ideal, but any amount would be beneficial for the water quality. The forested buffer along the residential areas is especially important in order to protect the quality of the wetland habitats.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Kennett Township*
USGS quads: *Kennett Square*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Burrows Run Road South Natural Heritage Area

Forested wetlands along Burrows Run support a population of grass-leaved rush, a plant species of concern.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

Camp Bonsul Road Woods NHA

PNHP Significance Rank: *State*

Site Description

Camp Bonsul Road Woods is a steep, forested riparian slope that is surrounded by agriculture and residential areas. Big Elk Creek flows through the center of this site at the southern end of Chester County. The forested habitat supports a population of **puttyroot**, a plant species of concern. This NHA also supports **two sensitive species of concern**, not named at the request of the jurisdictional agency overseeing their 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]
Puttyroot (*Aplectrum hyemale*)		G5	S3	PR (PR)	11/4/1967	H
Sensitive species of concern A[3]	**S**	---	---	---	4/18/1999	D
Sensitive species of concern B[3]	**S**	---	---	---	5/30/1999	CD

[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.

The remnant forest provides habitat for puttyroot and two other species of concern. Puttyroot has not been documented at this location since 1967. Further surveys would be useful to determine if this species still exists here. In Pennsylvania, puttyroot is most commonly found in the southeastern counties and grows in moist woodlands and on forested slopes and stream banks. Puttyroot produces leaves that are visible through the fall and winter. The leaves wither in late spring, and the plant flowers in May and June.

Threats and Stresses

Further disturbance, including logging and development, will degrade the quality of the forest and may make it unsuitable for some existing species.

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

- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Logging will further fragment the existing forest and alter the conditions of the habitat needed by the species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

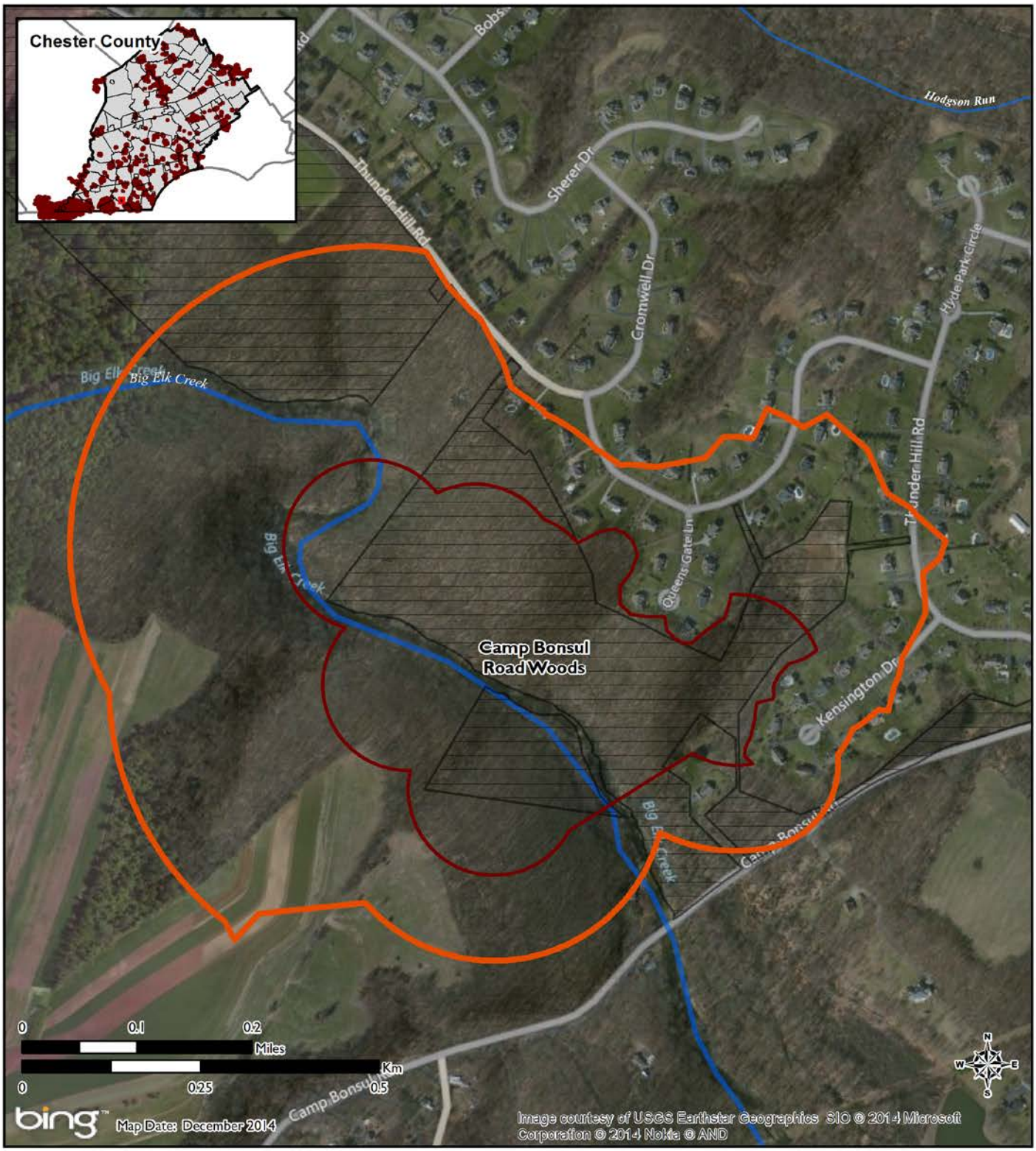
Most of this site is under a conservation easement by the Brandywine Conservancy. This should limit disturbance to the habitat and the species within it. Avoid further fragmentation of the existing forest in order to protect the habitat structure and species composition.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Protect the existing forested areas from logging. Avoid further fragmentation of the habitat with roads, houses, or other disturbances in order to preserve habitat for as many species as possible.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Elk Township, New London Township*
USGS quads: *Oxford, Bay View*
Previous CNHI reference: *Big Elk Creek Woods*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Easement*



Camp Bonsul Road Woods Natural Heritage Area

Forested habitat along Big Elk Creek supports a population of puttyroot, a plant species of concern, and two sensitive species of concern.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Chadd's Ford Swamp NHA

PNHP Significance Rank: *State*

Site Description

The wetlands that are created where Brandywine Creek crosses Route 1 form the habitat that makes up Chadd's Ford Swamp NHA. Brandywine Creek forms the border with Delaware County near the state line. The surrounding area is a mix of residential development, agricultural fields, and small woodlots. A number of habitats occur within the NHA. The exposed shoreline provides habitat for **ellisia** and **tooth-cup**, two plant species of concern that are found in areas that have fluctuating water level. The riparian area along Brandywine Creek supports populations of several plant species of concern. **Cattail sedge** and **Indian wild rice** are found in wetter areas, while **Yadkin River panic-grass** is located in drier upland habitat. Early successional habitat along roadsides within the NHA provide habitat for **Elliot's beardgrass**, a plant species of concern found in a variety of open areas. An additional **sensitive species of concern**, not named at the request of the jurisdictional agency overseeing its protection, was documented at this site as well. More recent surveys were not able to relocate the 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]
Elliott's Beardgrass (*Andropogon gyrans*)		G5	S3	N (PR)	10/31/2008	B
Cattail Sedge (*Carex typhina*)		G5	S2	PE (PT)	6/10/2009	D
Yadkin River Panic-grass (*Dichanthelium yadkinense*)		G4Q	S1	TU (PE)	6/16/2002	C
Ellisia (*Ellisia nyctelea*)		G5	S2	PT (PT)	6/10/2001	C
Tooth-cup (*Rotala ramosior*)		G5	S3	PR (PR)	8/17/2002	BC
Indian Wild Rice (*Zizania aquatica*)		G5	S3	PR (PR)	2010-12	CD
Sensitive species of concern A[3]	S	---	---	---	1987	F

[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.

Cattail sedge is found throughout most of the eastern United States and is scattered throughout Pennsylvania. Cattail sedge grows in areas associated with wetlands. It is often found along the edge of vernal pools but can also be found in swamps and along streams.

Elliot's beardgrass is at the northern edge of its range in Pennsylvania and has only been documented in a few southeastern counties. It spans from New Jersey west to Illinois and south from Texas to Florida. This species needs open, early successional habitat in order to persist.

Ellisia is a state threatened spring flowering herb found along shady stream banks. It is found throughout much of the United States, but has not been documented in New England, the southeast or the West Coast. It is at the northern end of its range in Pennsylvania and is found along major waterways in the southeast, as far west as the Susquehanna River. Habitat loss and invasive species are the major threats to ellisia.

Indian wild rice is a large grass species that can grow up to nine feet tall. It is found throughout much of the United States, but some portions may be due to introduction of the species. Most occurrences in Pennsylvania are found in intertidal marshes along the Delaware River. It can be found in other shallow water habitat, particularly in the southeast. It has been documented in Erie and Huntingdon County as well. Habitat loss and degradation are major threats to Indian wild rice, as well as invasive species.

Tooth-cup grows in exposed, wet habitats. This species has a wide range covering most of the United States and into Canada. In Pennsylvania, it is most commonly seen along the Susquehanna River, and has been documented in southeastern counties as well.

Yadkin River panic-grass is found from Pennsylvania west to Illinois and south to Georgia and Louisiana. In Pennsylvania, this species is found in the southeastern corner of the state. Yadkin River panic-grass is most often found growing in wet, sandy soil along shaded streams. It has been classified as critically imperiled due to the small number of populations documented in Pennsylvania.

Threats and Stresses

Invasive species are abundant throughout this site, especially along the stream edge and are the biggest threat to the site and the native species found within it. Fragmentation of the remaining woods and further alteration of the hydrology may impact habitat conditions found at this site. White-tailed deer density in this area is high, which negatively impacts the native species found within this NHA.

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

- Changes in the currently hydrology could significantly alter the habitat for the plant species of concern by making conditions either too wet or too dry to be able to persist at this site.
- Further fragmentation of the small patch of existing woods may alter the structure of the habitat and allow an increase in invasive species.
- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Herbicides, fertilizers, and sediment from lawns, fields, and roads may wash into the NHA and degrade the habitat conditions.
- Succession of the grassy openings may cause the habitat used by Elliot's beardgrass to become overgrown and shaded by woody species.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

Much of this NHA is covered under a conservation easement held by the Brandywine Conservancy. This should help to prevent large scale disturbances. Maintain the forested buffer along the stream and improve it wherever possible. Control invasive species in order to preserve the native species found in this NHA. Maintain the existing hydrology of the streams and wetlands to preserve the habitat conditions.

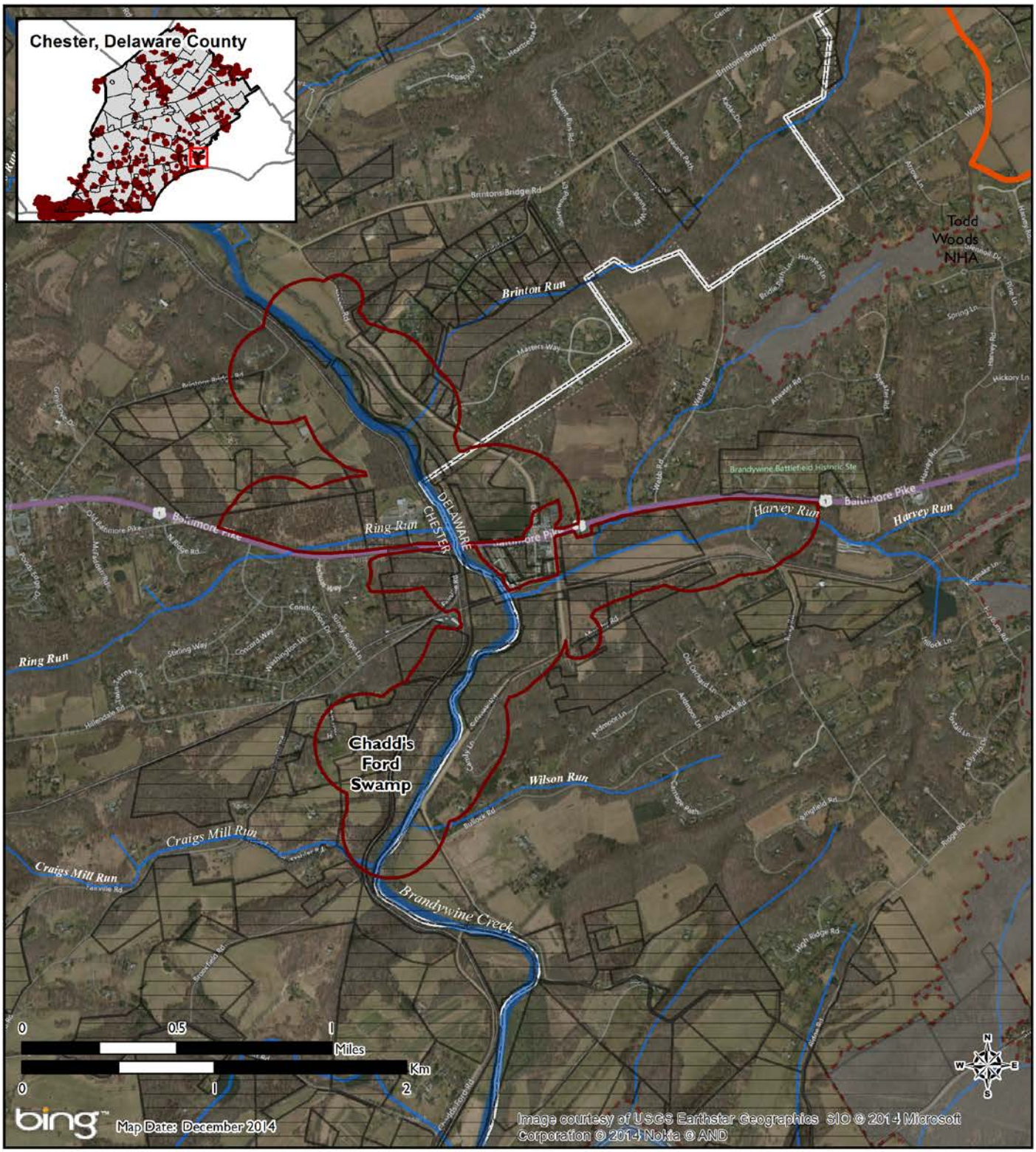
The following steps are recommended to ensure the persistence of these species at this site:

- Maintain the existing hydrology. Any activities that occur near the NHA should be conducted with a consideration for the impact to the flow of water into the wetlands below.
- Protect the existing forested areas from logging and other large scale disturbance. Keep the forest as intact as possible to protect the habitat and species within it. Avoid developing additional areas within the NHA.

- Reduce deer density then continue to monitor and maintain it at a level that is able to be supported by the landscape.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Limit herbicide use to situations where it is necessary, such as to control invasive species. Avoid the use of fertilizers or chemicals on lawns or along roads to prevent them from washing into the NHA and degrading the habitat.
- Create a sufficient vegetated buffer along the stream in order to filter sediment and chemicals from runoff. A buffer of 100 meter is ideal, but any increase will help to protect the water quality.
- Remove woody species and maintain the grassy habitat openings for Elliot's beardgrass and other early successional species. Perform periodic maintenance, such as mowing, to prevent woody species from taking over the area.

Location

Municipalities: *Chadds Ford Township, Birmingham Township, Pennsbury Township*
USGS quads: *West Chester, Wilmington North*
Previous CNHI reference: *Brinton Run Woods, Chadds Ford Swamp*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Property, Brandywine Conservancy Easement*



Chadd's Ford Swamp Natural Heritage Area

Wetlands and riparian habitats support 6 plant species of concern, including Elliott's beardgrass and Yadkin River panic-grass, as well as an additional 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*
- *Conservation Lands*

Chandler Mill Road Meadow NHA

PNHP Significance Rank: *State*

Site Description

Chandler Mill Road Meadow NHA occurs in the forested riparian area along West Branch Red Clay Creek near Kennett Square. The habitats found at this site include forest, wet meadows, and mowed fields. Residential developments and agricultural fields surround the riparian area. The wet meadow habitat found within this NHA support a population of **horrible thistle**, a plant 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]
Horrible Thistle (*Cirsium horridulum*)	G5	S1	PE (PE)	8/22/1999	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.

Horrible thistle is a state endangered plant species that is found throughout the southeastern United States as far west as Texas and Oklahoma and up the Atlantic Coast into New England. In Pennsylvania, horrible thistle has been documented in several southeastern counties. This species is found in a variety of open habitats and disturbed areas.

Threats and Stresses

Succession will affect the structure of the open habitats and species composition by shading and crowding many of the species currently found here. Frequent mowing in the fields and wet meadow will also have a negative affect on the species living in these habitats. Invasive species may also impact the current habitat conditions.

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

- Succession that is not controlled by properly timed mowing or other methods of disturbance will likely cause the habitat to become unsuitable for the species of concern to be able to persist at this site.
- Herbicide use along the road and fields may cause direct mortality to the species of concern.
- Runoff and other sources of water pollution from the surrounding area threaten to degrade the water quality of streams and surrounding wetlands.
- Changes in the currently hydrology could significantly alter the habitat for the plant species of concern by making conditions either too wet or too dry to be able to persist at this site.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Invasive species can take over portions of the habitat currently used by the species of concern and other native species.

Conservation Recommendations

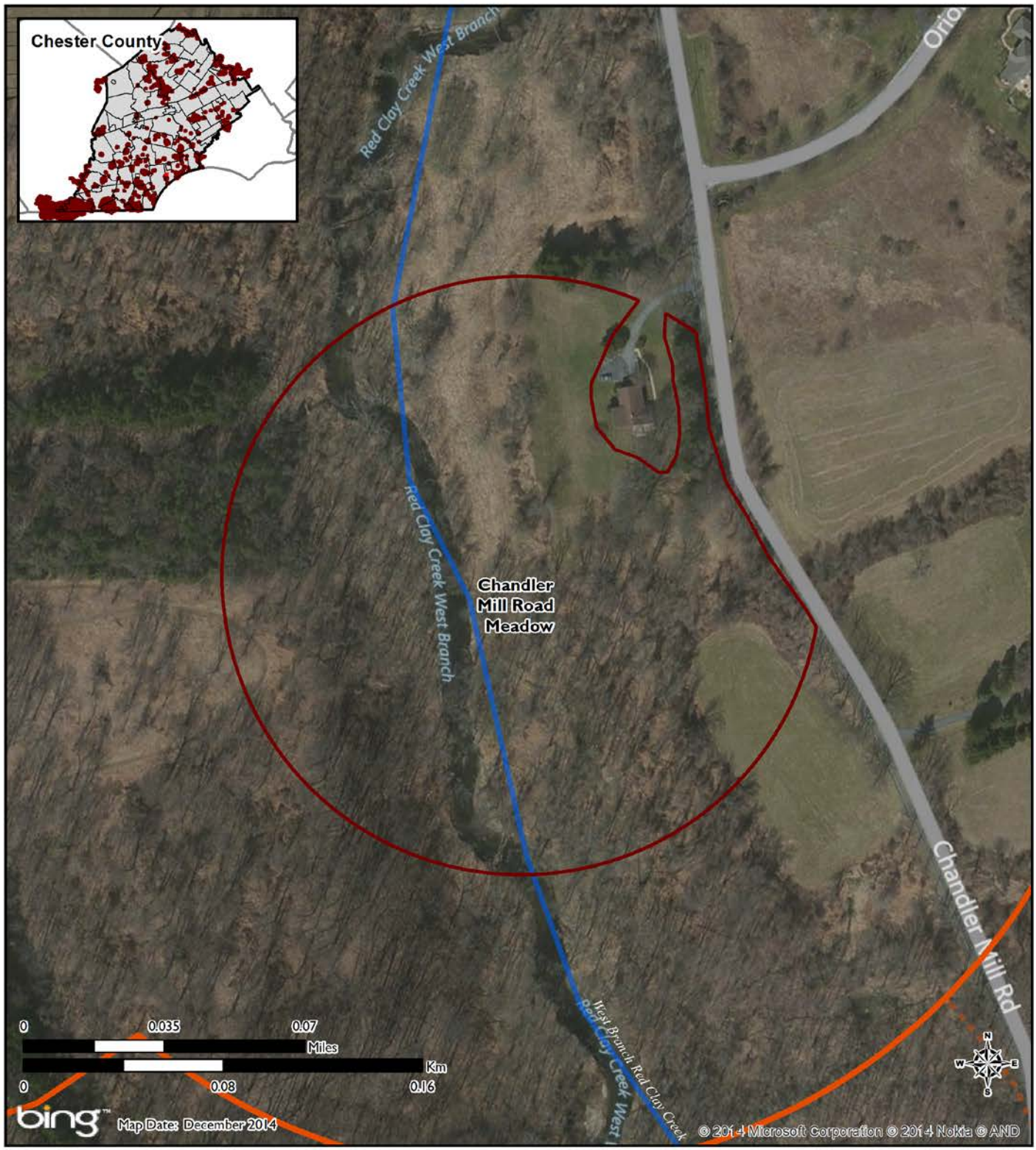
Maintain the existing habitat conditions within this NHA. Periodic maintenance will likely be needed in the early successional habitats. Limit further development in this area, especially in the riparian areas along West Branch Red Clay Creek.

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

- The species of concern at this site require open habitat that needs to be maintained. The needs of this species should be considered when planning the timing and frequency of maintenance.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Widen the native vegetated buffer along the stream. A width of 100 meters is ideal, but any increase will benefit the stream and adjacent wetlands.
- Maintain the existing hydrology. Any activities that occur along the roads should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.

Location

Municipalities: *Kennett Township*
USGS quads: *Kennett Square*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Chandler Mill Road Meadow Natural Heritage Area

Open upland habitat supports a population of Pennsylvania endangered horrible thistle.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Chatham Stream Valley NHA

PNHP Significance Rank: *State*

Site Description

Chatham Stream Valley NHA has been delineated around a section of a tributary of East Branch White Clay Creek that stretches for more than a mile between Clonmell and Chatham. The narrow forested area is surrounded by agricultural fields. Small wetland openings also occur along the riparian habitat. Many of these openings are dominated by red maple and have a dense shrub layer. The open wetlands provide habitat for **stiff cowbane**, a plant species of concern found in a number of locations within this NHA.

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]
Stiff Cowbane (*Oxypolis rigidior*)	G5	S2	TU (PT)	5/14/2006	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.

Stiff cowbane is a plant species in the carrot family. Its range spans from New Jersey west to Minnesota and south to Texas and Florida. It is at the northern edge of its range in Pennsylvania and has mostly been documented in southern counties. Stiff cowbane is found in open, wet habitats.

Threats and Stresses

Invasive species are common throughout the NHA, particularly multiflora rose and Japanese stiltgrass. Both of these species can form dense populations that crowd out native species. Succession can degrade the open wetland habitats, but frequent mowing can also impact native species. Deer density is high in this area, and over-browsing may affect species composition.

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

- Succession that is not controlled by properly timed mowing or other methods of disturbance will likely cause the habitat to become unsuitable for the species of concern to be able to persist at this site.
- Runoff and other sources of water pollution from the surrounding area threaten to degrade the water quality of streams and surrounding wetlands.
- Invasive species are common throughout much of this site and may displace native vegetation, including species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Herbicides sprayed on the agricultural fields and edges may cause direct mortality to the stiff cowbane and other native species.
- Changes in the currently hydrology could significantly alter the habitat for the plant species of concern by making conditions either too wet or too dry to be able to persist at this site.

Conservation Recommendations

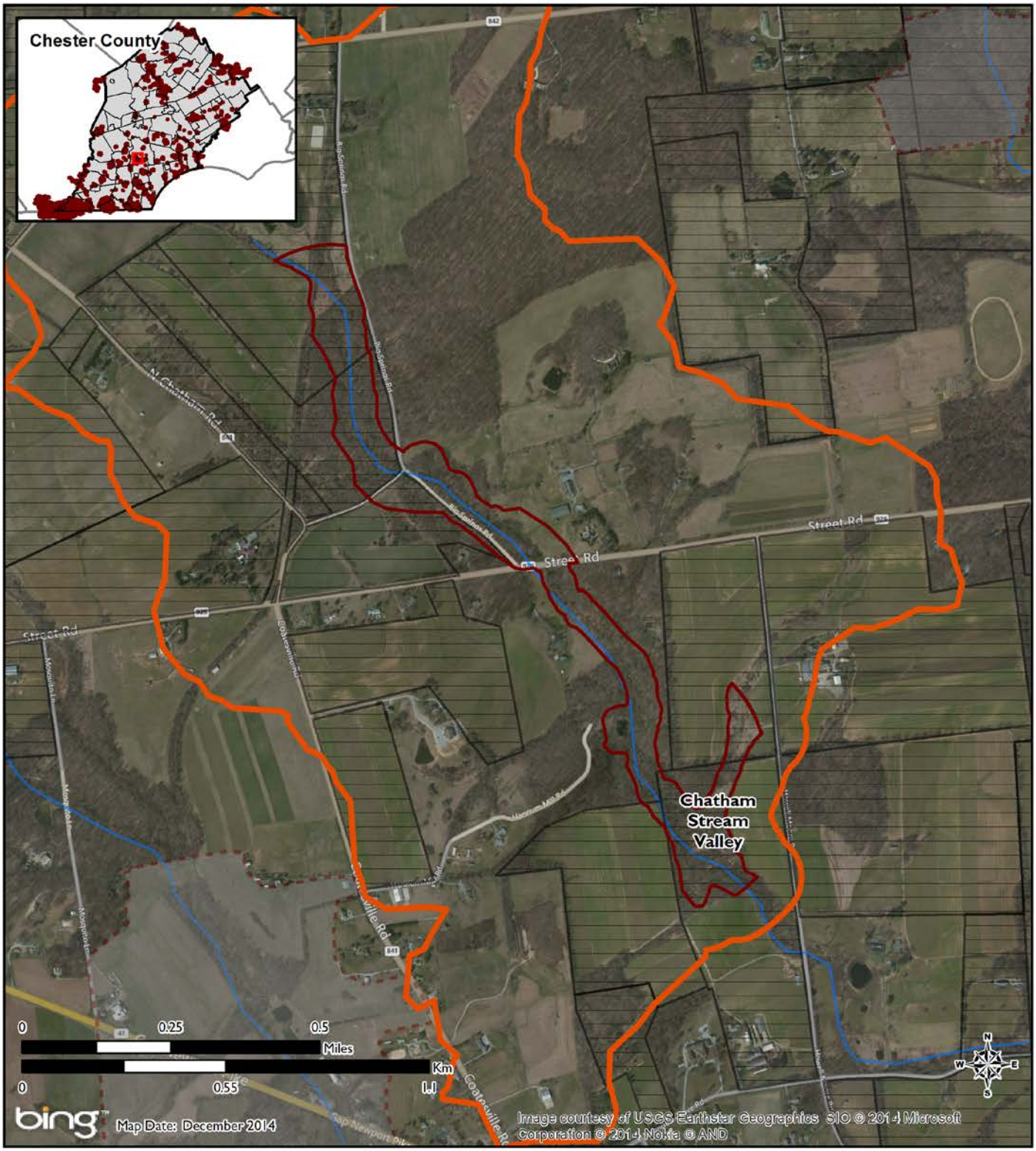
Portions of this polygon are covered under a conservation easement, which should help to protect the existing habitat conditions. Maintain the forested habitat along the stream and wetlands and improve it wherever possible to protect the water quality. Remove invasive species, especially in areas with dense growth that is impacting native species. Reduce the deer density within this NHA and surrounding areas to reduce the pressure from over-browsing.

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

- The species of concern at this site require open habitat that needs to be maintained. The needs of this species should be considered when planning the timing and frequency of maintenance.
- Widen the native vegetated buffer along the stream. A width of 100 meters is ideal, but any increase will benefit the stream and adjacent wetlands.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Reduce the deer density in this area and continue to monitor and maintain it at a level that is able to be supported by the landscape.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Maintain the existing hydrology. Any activities that occur along the roads should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.

Location

Municipalities: *London Grove Township, West Marlborough Township*
USGS quads: *Coatesville, West Grove*
Previous CNHI reference: *Chatham Stream Valley, East Branch White Clay Creek*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Easement, Agricultural Easement*



Chatham Stream Valley Natural Heritage Area

Riparian forest provides habitat for stiff cowbane, a plant 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*

Chesterville Road Woods NHA

PNHP Significance Rank: *State*

Site Description

Chesterville Road Woods NHA has been delineated around a patch of forested habitat approximately 120 acres in size. The eastern half of this site is surrounded by residential housing developments, while the western side is surrounded by agricultural fields. A few houses have been built within the wooded habitat of the NHA. A small tributary to Ways Run flows along the northern edge of the site. This NHA provides habitat for **puttyroot**, a plant species of concern, as well as **two sensitive species of concern**, not named at the request of the jurisdictional agency overseeing their 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]
Puttyroot (*Aplectrum hyemale*)		G5	S3	PR (PR)	8/2/2007	E
Sensitive species of concern A[3]	**S**	---	---	---	8/2/2007	E
Sensitive species of concern B[3]	**S**	---	---	---	8/2/2007	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.

In Pennsylvania, puttyroot is most commonly found in the southeastern counties and grows in moist woodlands and on forested slopes and streambanks. Puttyroot produces leaves that are visible through the fall and winter. The leaves wither in late spring and the plant flowers in May and June.

Threats and Stresses

Invasive species are common throughout the wooded habitat and may outcompete some native species. High density of white-tailed deer may also threaten native species by heavily browsing certain species. Alteration of the hydrology of the tributary may affect the associated wetland habitat. Continued development of this area would cause direct destruction of the wooded habitat.

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

- Invasive species are common in many areas of this site and may displace native vegetation, including species of concern.
- Logging, development, or other major activities will further fragment the existing forest and alter the conditions of the habitat needed by the species of concern. Disturbances may also open areas that can be easily colonized by invasive species.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Herbicides and fertilizers used in lawns, fields, and along roads may wash into the forested area and degrade the habitat conditions.

Conservation Recommendations

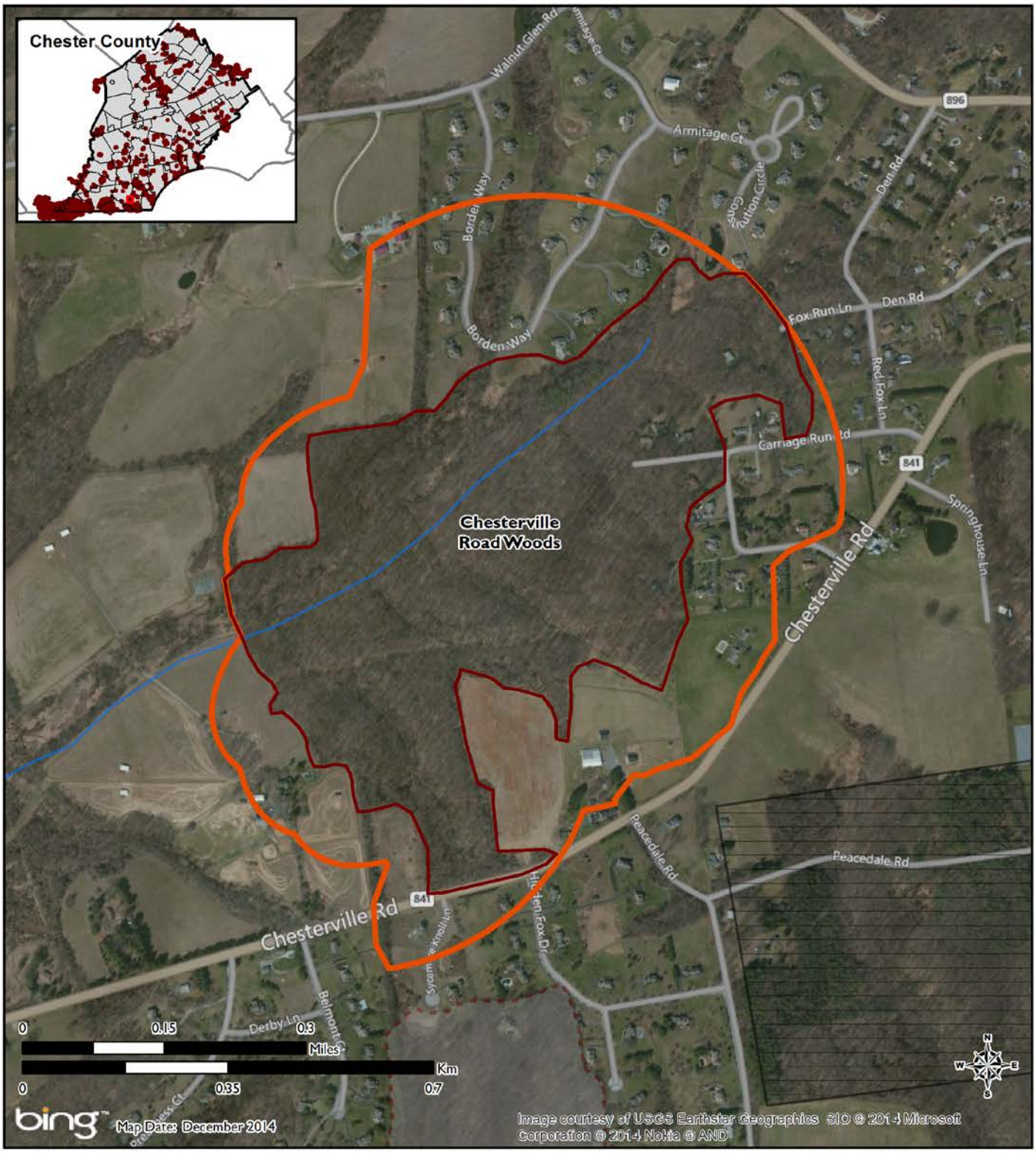
Do not fragment the existing forested area with logging or infrastructure. Attempt to control invasive species with mechanical removal, using herbicides only if necessary. Maintain the existing hydrology of the tributary and associated wetlands.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Protect the existing forested areas from logging and other large scale disturbance. Keep the forest as intact as possible to protect the habitat and species within it.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.

Location

Municipalities: *Franklin Township*
USGS quads: *West Grove, Newark West*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Chesterville Road Woods Natural Heritage Area

This NHA provides upland forest habitat for three species of concern, including puttyroot and two 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***
- ***Conservation Lands***

Chrome Serpentine Barrens NHA

PNHP Significance Rank: *Global*

Site Description

Chrome Serpentine Barrens is one of several serpentine habitats that make up the State Line Serpentine Barrens, an ecologically unique system occurring in scattered, mostly small patches along this part of the PA/MD border. This Eastern Serpentine Barrens community and the early successional forest matrix in which it occurs supports twenty-seven plant species of concern, six moth species of concern and two sensitive species of concern. The serpentine community itself is considered globally uncommon due to the limited occurrences of this habitat type around the world. The serpentine habitats are often referred to as grasslands, and herbaceous openings can have a strong representation of warm season grasses and grass-like plants, but they also contain a good diversity of other plant species, many uncommon at the state and global levels. The barrens proper (the small gravel and grassy areas) are found scattered mostly along the slopes of drainageways of Barren Brook and Jordan Run on the thin, dry Chrome soils that are derived from serpentinite. Recent active management has also created a large clearing along Barren Road that is quickly becoming colonized by characteristic serpentine habitat plant species. Between the two drainages is a mosaic of dry-mesic mixed oak woods, dry pine woods, scrub woodland, abandoned farm fields, agricultural fields and a few homes.

Rocky Gleason (PNHP)

An actively managed portion of Chrome Serpentine Barrens

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]
Dot-lined White Moth (*Artace cribraria*)		G5	S1	N (N)	10/16/1992	E
Packard's Lichen Moth (*Cisthene packardii*)		G5	S1S3	N (N)	8/14/1995	E
A Geometrid Moth (*Cyclophora nanaria*)		G5	S1S2	N (N)	10/16/1992	E
Footpath Sallow Moth (*Metaxaglaea semitaria*)		G5	S2	N (N)	10/15/1992	E
Renia sp. 1 nr. discoloralis (*Renia* sp. 1 nr. *discoloralis*)		G4	S1?	N (N)	10/15/1992	E
Pine Barrens Zanclognatha (*Zanclognatha martha*)		G4	S1S2	N (N)	7/19/1993	E
Arrow-feathered Three-Awn (*Aristida purpurascens*)		G5	S2	PT (PT)	9/29/1992	BC
Whorled Milkweed (*Asclepias verticillata*)		G5	S2	TU (PE)	9/10/2013	C
Field Chickweed (*Cerastium velutinum var. velutinum*)		G5T4?	S3	SP	9/10/2013	E
Fringe-tree (*Chionanthus virginicus*)		G5	S3	N (PT)	9/10/2013	BC
Horrible Thistle (*Cirsium horridulum*)		G5	S1	PE (PE)	10/3/1999	C
Serpentine Panic-grass (*Dichanthelium annulum*)		GNR	S2	TU (PT)	7/21/1992	C

Species or Natural Community Name		PNHP Rank[1] Global	State	PA Legal Status[1]	Last Seen	Quality[2]
Ragged Eupatorium (*Eupatorium pilosum*)		G5	S4	SP	9/10/2013	E
Round-leaved Eupatorium (*Eupatorium rotundifolium*)		G5	S3	TU (TU)	9/10/2013	C
Annual Fimbry (*Fimbristylis annua*)		G5	S2	PT (PT)	9/10/2013	B
Bicknell's Hoary Rockrose (*Helianthemum bicknellii*)		G5	S2	PE (PE)	8/4/1986	E
St Andrew's-cross (*Hypericum stragulum*)		G4	S2	PT (PT)	9/10/2013	BC
Sandplain Wild Flax (*Linum intercursum*)		G4	S1	PE (PE)	9/10/2013	C
Downy Lobelia (*Lobelia puberula*)		G5	S1	PE (PE)	10/3/1999	C
Stagger-bush (*Lyonia mariana*)		G5	S1	PE (PE)	9/10/2013	C
Sweetbay Magnolia (*Magnolia virginiana*)		G5	S2	PT (PT)	10/5/1993	D
Goldenclub (*Orontium aquaticum*)		G5	S4	PR (SP)	9/5/1998	CD
Stiff Cowbane (*Oxypolis rigidior*)		G5	S2	TU (PT)	10/3/1999	C
Plain Ragwort (*Packera anonyma*)		G5	S2	PR (PR)	9/10/2013	BC
Curtis's Milkwort (*Polygala curtissii*)		G5	S1	PE (PE)	7/30/1993	B
Lion's-foot (*Prenanthes serpentaria*)		G5	S3	N (PT)	9/10/2013	B
Southern Red Oak (*Quercus falcata*)		G5	S1	PE (PE)	6/7/2008	BC
Sand Blackberry (*Rubus cuneifolius*)		G5	S1	TU (PE)	9/10/2013	BC
Few Flowered Nutrush (*Scleria pauciflora*)		G5	S2	PT (PT)	9/10/2013	BC
Narrow-leaved White-topped Aster (*Sericocarpus linifolius*)		G5	S1	PE (PE)	8/9/1998	BC
Prairie Dropseed (*Sporobolus heterolepis*)		G5	S1	PE (PE)	9/10/2013	C
Serpentine Aster (*Symphyotrichum depauperatum*)		G2	S2	PT (PT)	9/10/2013	AB
Bushy Aster (*Symphyotrichum dumosum*)		G5	S1	TU (PE)	9/10/2013	C
Serpentine grassland	C	GNR	S1	N (N)	2005	
Serpentine Virginia pine - oak forest	C	GNR	S2	N (N)	2005	BC
Sensitive species of concern A[3]	S	---	---	---	5/7/2009	E
Sensitive species of concern B[3]	S	---	---	---	9/29/1992	BC

[1]See the PNHP website () 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.

Most of the moth species of concern documented at this location are limited in distribution in Pennsylvania to serpentine and other grassland habitats, which are often set in a matrix of open oak and pine woodlands. Conservation of these species requires protection of the habitat they use during all stages of their life cycles. Maintaining a mosaic of grassland, oak, and pine areas at serpentine barrens sites and the surrounding area will create a diverse and healthy habitat capable of supporting the rare moth species listed above. Creation of corridors between barrens sites could also encourage movement of species between sites and help create more secure populations. Pesticide application, especially for the control of gypsy moths, can have a devastating effect on populations of moth species of concern and should not be used in this area.

Many of the plant species of concern found within this Natural Heritage Area are found primarily within the strongly serpentine influenced small herbaceous openings or within the adjacent thin woodlands. Among these include arrow-feathered three-awn, field chickweed, Curtis's milkwort, sandplain wild flax, St Andrew's-cross, annual fimbry, few-flowered nutrush, serpentine aster, plain ragwort, sand blackberry and prairie dropseed. In the past, natural disturbance, such as wildfires, would have helped to keep these areas in an open condition. With the relatively recent suppression of fire, the open areas have gradually closed due to natural succession. An active restoration effort to restore the serpentine openings will be necessary to ensure the continued existence of these habitats and the species they contain. Other plants within this area are not specifically adapted to the open habitats, but are more closely associated with wooded and forested habitats. These include fringe-tree, stagger-bush, sweetbay magnolia and southern red oak. Efforts to restore serpentine openings should take into account the presence of these species and avoid disturbing the habitat where they occur.

Denise Watts (PNHP)

Downy Lobelia (*Lobelia puberula*)

Serpentine aster is a species of plant that deserves special mention based on its potential for global extinction due to its extremely limited global population. This species is predominantly known to occur in the eastern serpentine barrens of Pennsylvania and Maryland, with a few far flung outliers in Virginia and North Carolina (Gustafson 2005; Kartesz 2013). This extremely limited distribution has given this species the status of G2 – globally imperiled. Serpentine aster is found in the more open areas of serpentine barrens, suggesting that fire or other active management may be needed to remove woody overgrowth and maintain this preferred habitat.

Rocky Gleason (PNHP)

Serpentine Aster (*Symphyotrichum depauperatum*)

<u>Threats and Stresses</u>

Historically, wildfires likely helped to maintain the open aspect of these habitats. Early accounts record the intentional setting of fire by Native Americans to help open areas for greater potential hunting success. Because of the past prevalence of intentional or accidental wildfires, this habitat was historically less dominated by woody trees and shrubs, but recent fire suppression has favored the expansion of wooded habitats at the expense of herbaceous openings. Invasion of serpentine herbaceous openings by woody trees and shrubs can influence the surrounding habitat. As woody vegetation encroaches on the openings, they tend to trap more organic debris and allow deeper soils to accumulate. As deeper soils occur on the site, they succeed to more common woodland and forest types. Fire disturbances had maintained these herbaceous openings in the past. In the absence of fire, active woody vegetation removal will be necessary to maintain these openings.

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

- The lack of natural fire disturbance poses one of the greatest threats to this habitat. In the absence of natural fire events, most of the open serpentine barrens habitats will gradually succeed to more common woody vegetation such as junipers, pines and oaks.

- Some residential development has been occurring at the periphery of the serpentine habitat.
- Invasive species of plants are established in much of the early successional habitats within this area and threaten to displace native species of plants.
- Over browsing by white-tailed deer is a serious threat to the overall plant diversity.

Conservation Recommendations

Much of the primary serpentine influenced habitat is owned by Elk Township and The Nature Conservancy. An all-volunteer organization, the Friends of the State Line Serpentine Barrens, has been conducting habitat management on this site for many years to maintain the serpentine openings. These serpentine habitats occur in isolated patches along this section of the Pennsylvania / Maryland border as the bedrock material, serpentinite, is exposed at the surface of the ground in a scattered fashion much like an archipelago chain of islands. Each habitat has a slightly different species composition, largely due to the slightly different environmental conditions found at each distinct location. A long range goal for these isolated habitats is to recognize them as a single system and plan for their ecological needs. The area between and around these habitats should be maintained to provide the necessary buffer to allow prescribed burns to maintain the mosaic of open habitat once a network of the woody species have been removed.

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

- There appears to be no specific formal management plan for Chrome Serpentine Barrens, and the site would benefit from a thorough review of the site-specific goals and procedures for management here. In the interim, general goals and actions could be gleaned from other serpentine management plans such as the Goat Hill Management Plan (Furedi 2008); Unionville Serpentine Barrens Restoration and Management Plan (Latham 2012); Pink Hill Serpentine Barrens Restoration and Management Plan (Latham 2008).
- The plants that characterize these habitats are adapted to the dry, nutrient poor soils and periodic fire events. A priority for the security of these globally rare habitats should be to establish protection for the core habitats as well as to provide for the landscape context in which natural process can be maintained.
- Active stewardship of these habitats is necessary. In the absence of natural fire disturbance, or active vegetation removal, these habitats will succeed into woodlands and forests, replacing the globally rare habitat with a more common type.
- Habitat restoration activities should strive to establish a mosaic of habitat types to accommodate the variety of organisms and their diverse habitat preferences. While some of these plants will only thrive in the open on thin soils, or even bare bedrock conditions, others need the limited shelter of scattered trees or even the deep shade provided by a mature forest. Some of the insect species require conifers during part of their life cycle while others need deciduous trees or specific shrubs or wildflower host plants. There is no "one-size-fits-all" management recommendation for this habitat other than to provide for a mosaic of habitat diversity. "It's essential in restoring and maintaining disturbance-dependent ecosystems to vary the intensity and frequency of the disturbance in patchwork fashion, so that there is always a mosaic of patches of differing disturbance history. …the patchy landscape produced by

Henry Whitesel – Friends of the State Line Serpentine Barrens

Active vegetation management is required to maintain herbaceous openings at serpentine habitats.

John Kunsman (PNHP)

Arrow-feathered Three-Awn (*Aristida purpurascens*)

random variation in disturbance history from one patch to another is essential to sustain the diversity of habitats and organisms that make up the total ecosystem." (Roger Latham, personal communication November 7th, 2014)

- Conservation of the core habitat and supporting landscape should be considered among the highest conservation priorities in the county.
- Management activities should be coordinated with long-term habitat monitoring. "Analysis of desired conditions, inventory of existing conditions, and long-term monitoring of an array of key indicators is essential to know whether restoration and management efforts are accomplishing all of the goals or if some of the threatened or endangered species whose recovery is first and foremost among those goals might be inadvertently falling by the wayside." (Roger Latham, personal communication November 7th, 2014)
- Expand herbaceous openings as needed on convex landscapes by removing trees and other woody plants. Focus woody plant removal on areas of pines and junipers, which tend to indicate drier, thinner soils. The establishment of hardwoods should be taken as an indicator of deeper, moister soils. Where deeper soils occur, soil organic matter reduction may be necessary to establish thin soils over serpentine bedrock. "Soil organic matter reduction has proven effective in restoring serpentine grassland vegetation where it has been fully displaced by forest succession, as long as intact grassland adjoins the treated area to serve as a seed source. SOM reduction consists of skimming the surface organic horizons from the soil profile using a backhoe or front-end loader and transporting the material offsite by dump truck. It is particularly effective in restoring serpentine grassland where it has been invaded by a dense thicket of common greenbrier (*Smilax rotundifolia*)." (Roger Latham, personal communication November 18th, 2014)
- In the past, naturally occurring fires helped maintain the open aspect characteristic of the serpentine barren habitat. Today, active vegetation management, primarily in the form of volunteer work crews of the "Friends of the State Line Serpentine Barrens", helps to remove trees and shrubs that in the past would have been cleared by fire events, or active large mammal grazing. These work crews have made great progress over the years to create the mosaic of patchy openings resembling in places, a grassland, in others, an oak savannah, a pitch pine woodland, a juniper–catbrier shrubland, a mixed oak forest, or bare soil gravel bed. All these, as well as other small patch natural communities, play an important role in sustaining the diversity of plants and animals in these important ecosystems.
- These systems may be best maintained in an agricultural or rural setting. Residential development near or between these barrens should be strongly discouraged. Adjacent residential development can conflict with or greatly reduce the options for management using prescribed fire.
- While much of the core serpentine habitat at this location is protected by the Elk Township and The Nature Conservancy, much more known and potential habitat for species of concern occurs outside of the protected areas. Focus conservation efforts on acquisition of additional adjacent parcels that exhibit serpentine barren potential. Transfer of development rights, conservation easements and fee simple acquisition are all appropriate tools for securing the conservation status of the parcels of varying ecological significance.
- Educate the adjacent landowners on the significance of the globally rare habitat and the need for ongoing management activities.

- Suppress the spread of invasive species of plants to prevent native species from being crowded out of the habitat. Removal of invasive plants in the immediately vicinity of the species of concern can help these populations compete for space against much more aggressive species. Invasive species management should be coordinated by individuals familiar with the rare species as well as the invasive species present. Continual invasive species monitoring and control will be necessary.
- Reduce deer herd density to suitable levels to prevent overbrowsing of sensitive species.

Location

Municipalities: *Elk Township, East Nottingham Township*
USGS quads: *Oxford, Bay View*
Previous CNHI reference: *Chester CNAI 1994: "Chrome Serpentine Barrens", "SP528"*
Chester CNAI 2000: "Chrome Serpentine Barrens", "Little Elk Creek Swamp"
Overlapping Protected Lands: *Elk Township & The Nature Conservancy - Chrome Barrens Preserve*

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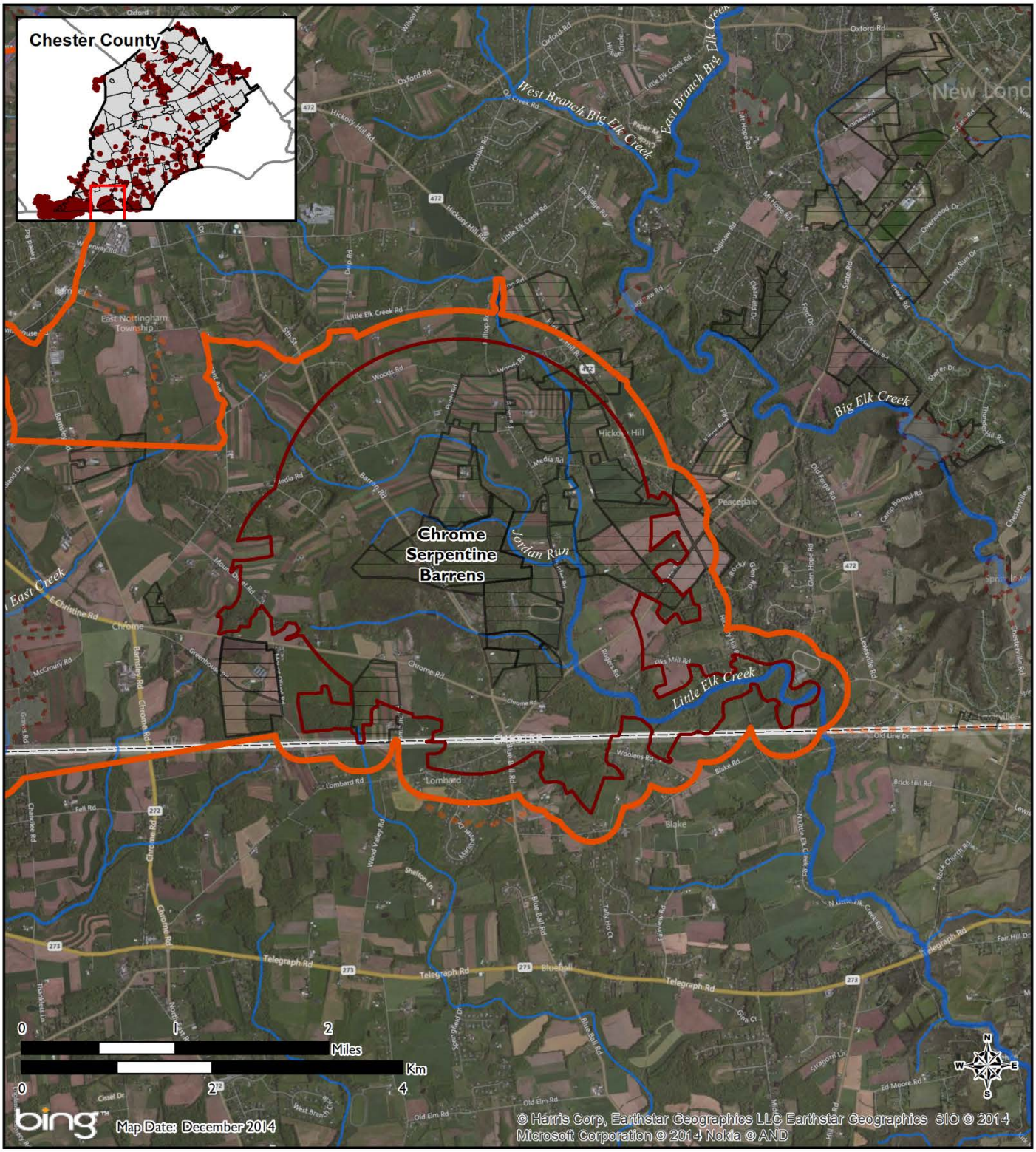

Chrome Serpentine Barrens Natural Heritage Area

This site supports globally rare natural communities of Serpentine Grassland and Serpentine Virginian Pine-Oak Forest. These communities support at least 26 species of concern.

Significance Rank:
GLOBAL

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Clay Creek Road East Wetland NHA

PNHP Significance Rank: *State*

Site Description

Clay Creek Road East Wetland NHA is located along East Branch White Clay Creek south of Avondale. Sparse wooded wetland habitat occurs within the floodplain area on the north side of the stream. The canopy is dominated by red maple, green ash, and black gum. The habitat to the south of East Branch White Clay Creek is a more densely wooded hillside that abuts a housing development. The wet floodplain habitat supports a population of **fringe-tree**, a plant species of concern.

Rocky Gleason (PNHP)

Fringe-tree (*Chionanthus virginicus*)

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]
Fringe-tree (*Chionanthus virginicus*)	G5	S3	N (PT)	7/8/2007	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.

Fringe-tree is a shrub or small tree found from New York and Massachusetts south to Florida and Texas. It is near the northern end of its range in Pennsylvania and has mostly been documented in the southern counties. Most current records are in the southeastern part of the state. Fringe-tree is found in moist woods and along streams. It is threatened by habitat loss, invasive species, and excessive deer browse.

Threats and Stresses

Changes in hydrology along East Branch White Clay Creek may alter the flow of water into the wet floodplain. Logging and other large scale disturbances will fragment the wooded habitat and provide openings for the establishment of invasive species.

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

- Logging, development, or other major activities will further fragment the existing forest and alter the conditions of the habitat needed by the species of concern. Disturbances will also open areas that can be easily colonized by invasive species.
- Changes in hydrology may make the habitat unsuitable to the species of concern found here.
- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Herbicides and fertilizers used in lawns, fields, and along roads may wash into the forested area and degrade the habitat conditions.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

Avoid activities that will fragment the habitat or create other large disturbances. Maintain the existing hydrology of the stream and associated wetlands.

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

- Protect the existing forested areas from logging and other large scale disturbance. Keep the forest as intact as possible to protect the habitat and species within it.
- Maintain the existing hydrology. Any activities that occur near the NHA should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Franklin Township, New Garden Township*
USGS quads: *West Grove*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*

References

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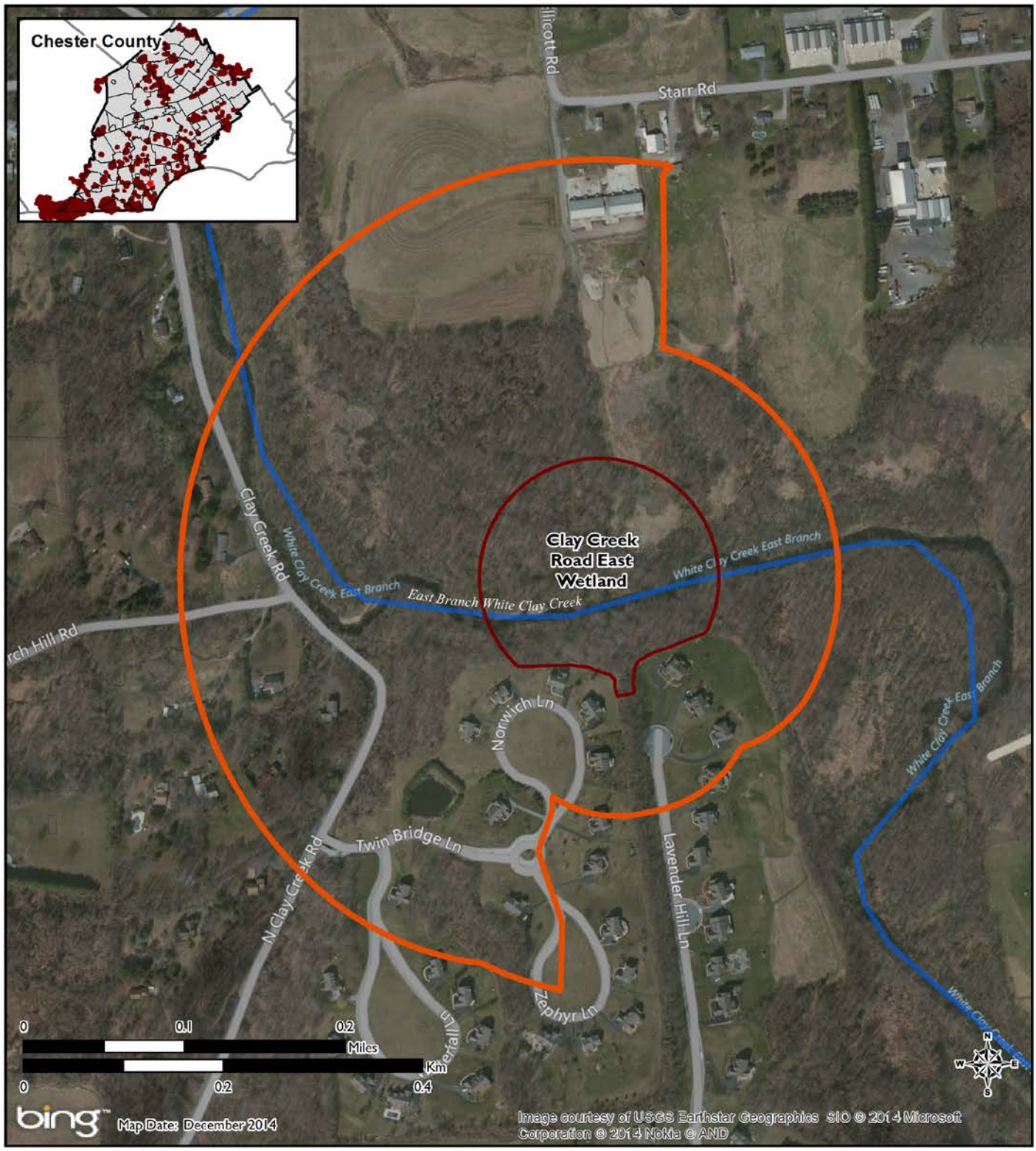


Clay Creek Road East Wetland Natural Heritage Area

Forested wetlands support a population of fringe-tree, a vulnerable plant species in Pennsylvania.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

Clay Line Corridor NHA

PNHP Significance Rank: *State*

Site Description

Clay Line Corridor NHA is located along a powerline right-of-way north of Kemblesville between Route 841 and Hess Mill Road. The surrounding habitat is a mix of residential development, agricultural fields, and small woodlots. The early successional habitat along the right-of-way is maintained by periodic mowing and herbicide use to prevent the growth of woody species. This open habitat supports three plant species of concern, **a eupatorium**, **field dodder**, and **Nuttall's tick-trefoil**.

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]
Field Dodder (*Cuscuta pentagona*)		G5	S2	N (PT)	9/9/2010	E
Nuttalls' Tick-trefoil (*Desmodium nuttallii*)		G5	S2	TU (PT)	9/9/2010	E
A Eupatorium (*Eupatorium rotundifolium*)		G5	S3	TU (TU)	9/9/2010	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.

A variety of open, disturbed habitats are used by a eupatorium, including woodland edge habitat, thickets, and old fields. This species is found from Maine south and west to Florida and Texas. In Pennsylvania, it is found in several southern counties, particularly in the southeast. Habitat loss, succession, and exotic species are major threats. Disturbance is likely necessary to maintain the habitat necessary for this species.

Field dodder is found throughout the United States and in Pennsylvania is found predominately in the southeast, with a few occurrences in southwestern counties. This species is a parasitic vine that grows on host plants in a variety of open habitats.

Nuttall's tick-trefoil is at the northern edge of its range in Pennsylvania. It is found from New Jersey west to Illinois and south to Florida and Texas. It has been documented mostly in the southeastern corner of the state. This species is found on dry, open hillsides, utility right-of-ways and other open habitats.

Threats and Stresses

The habitat within Clay Line Corridor is maintained to preserve the early successional habitat in the right-of-way. This management may not be conducted in a way that supports native species growth. Herbicide use and mowing during the growing season may be detrimental to native species composition.

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

- Invasive species are common throughout this NHA and may displace native vegetation, including species of concern.
- Growth of woody species in the early successional habitat may cause the area used by the species of concern to become overgrown and shaded.

- Herbicides sprayed on the pipeline right-of-way may cause direct mortality to the species of concern and other native species. Fertilizers from surrounding lawns may also wash into the NHA and degrade habitat conditions.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

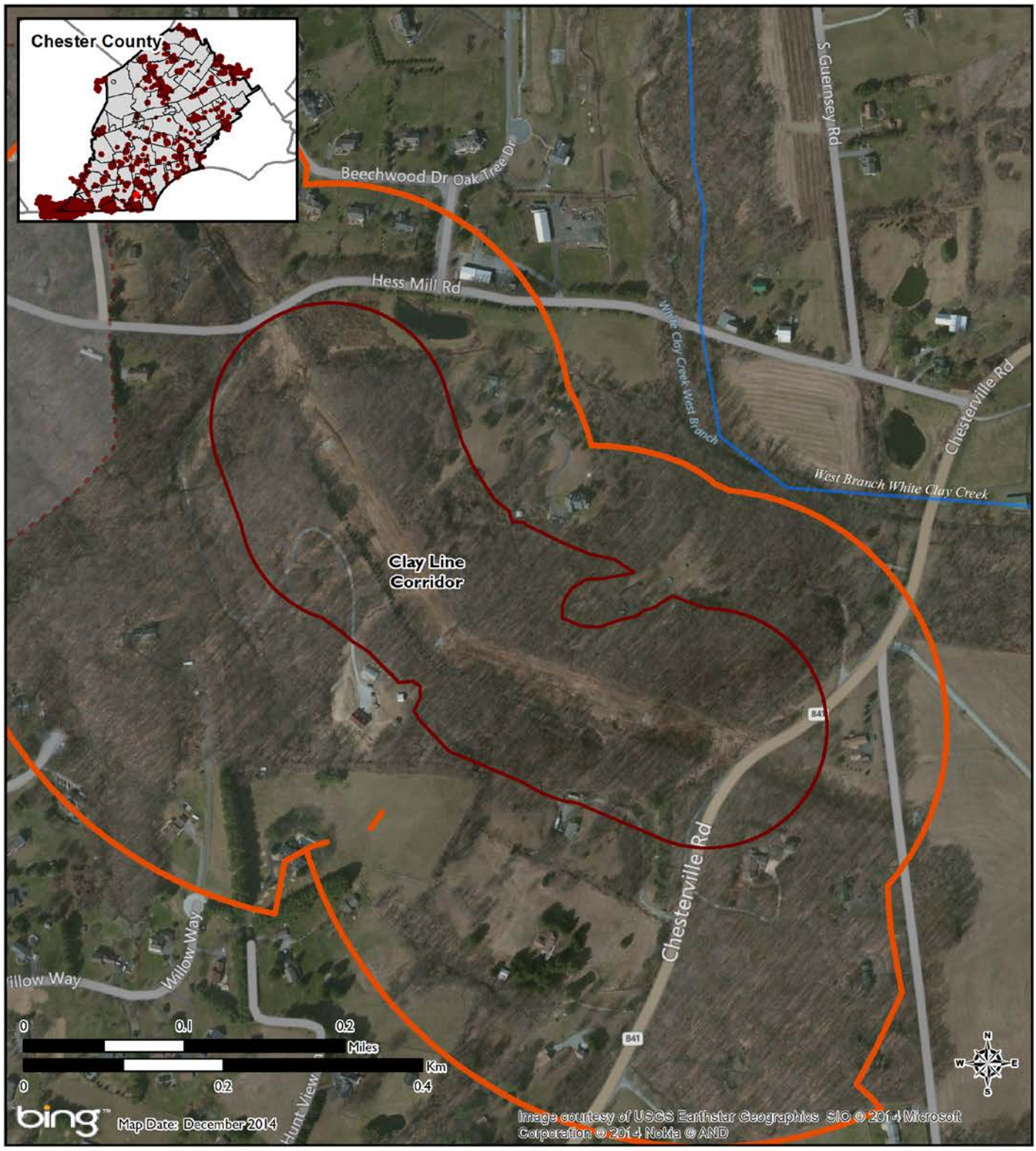
Occasional disturbance will likely be necessary to maintain the habitat conditions and prevent the succession of woody species. Maintenance should be done outside of the growing season with minimal herbicide use to limit impact to native species.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- The species of concern require open habitat that needs to be maintained with mowing or other methods of disturbance. The needs of these species should be considered when planning the timing and frequency of maintenance.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities*: Franklin Township*
USGS quads: *West Grove*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Clay Line Corridor
Natural Heritage Area

Open meadow within an energy transmission corridor provides habitat for three plant species of concern: Eupatorium rotundifolium, field dodder, and Nuttall's tick-trefoil.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

Clearview Road Barrens NHA

PNHP Significance Rank: *State*

Site Description

A small, remnant serpentine influenced habitat at a former quarry supports a sensitive species of concern, which is not named at the request of the jurisdictional agency overseeing its protection. The habitat occurs within the context of a loosely packed housing development, with houses separated by scattered woodlots along Crum 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	State	PA Legal Status[1]	Last Seen	Quality[2]
Sensitive species of concern A[3]	**S**	---	---	---	5/22/1993	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.

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

The sensitive species of concern found within this Natural Heritage Area is associated with the serpentine influenced herbaceous opening and the adjacent thin woodlands. In the past, natural disturbance, such as wild fires, would have helped to keep this area in an open condition. Without active management, the open grassy area will gradually close due to natural succession. An active restoration effort to maintain the serpentine openings will be necessary to ensure the continued existence of this habitat and the species it supports.

Threats and Stresses

Historically, wildfires likely helped to maintain the open aspect of these habitats. Early accounts record the intentional setting of fire by Native Americans to help open areas for greater potential hunting success. Because of the past prevalence of intentional or accidental wildfires, this habitat was historically less dominated by woody trees and shrubs, but recent fire suppression has favored the expansion of wooded habitats at the expense of herbaceous openings. Invasion of serpentine herbaceous openings by woody trees and shrubs can influence the surrounding habitat. As woody vegetation encroaches on the openings, they tend to trap more organic debris and allow deeper soils to accumulate. As deeper soils occur on the site, they succeed to more common woodland and forest types. Fire disturbances had maintained these herbaceous openings in the past. In the absence of fire, active woody vegetation removal will be necessary to maintain these openings.

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

- The lack of natural fire disturbance poses one of the greatest threats to this habitat. In the absence of natural fire events, most of the open serpentine barrens habitats will gradually succeed to more common woody vegetation such as junipers, pines and oaks.
- This site occurs within a residential context with a lot of associated edge habitat.
- Invasive species of plants can displace native species of plants.
- Over browsing by white-tailed deer is a serious threat to the overall plant diversity.

Conservation Recommendations

These serpentine habitats occur in isolated patches as the bedrock material, serpentinite, is exposed at the surface of the ground in a scattered fashion much like an archipelago chain of islands. Each habitat has a slightly different species composition, largely due to the slightly different environmental conditions found at each distinct location. A long range goal for these isolated habitats is to recognize them as a single system and plan for their ecological needs. The area between and around these habitats should be maintained to provide the necessary buffer to allow active management to maintain the mosaic of open habitat once a network of the woody species have been removed.

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

- The sensitive species of concern documented at this location was last observed in 1993 and should be surveyed for again to determine the status of the population and its surrounding habitat.
- There is no specific management plan for this Natural Heritage Area, and the site would benefit from a thorough review of the site-specific goals and procedures for management here. In the interim, general goals and actions could be gleaned from other serpentine management plans such as the Goat Hill Management Plan (Furedi 2008); Unionville Serpentine Barrens Restoration and Management Plan (Latham 2012); Pink Hill Serpentine Barrens Restoration and Management Plan (Latham 2008).
- A priority for the security of these globally rare habitats should be to establish protection for the core habitats as well as to provide for the landscape context in which natural process can be maintained.
- Active stewardship of these habitats is necessary. In the absence of natural fire disturbance, or active vegetation removal, these habitats will succeed into woodlands and forests, replacing the globally rare habitat with a more common type.
- Habitat restoration activities should strive to establish a mosaic of habitat types to accommodate the variety of organisms and their diverse habitat preferences. While some of these plants will only thrive in the open on thin soils, or even bare bedrock conditions, others need the limited shelter of scattered trees or even the deep shade provided by a mature forest. Some of the insect species require conifers during part of their life cycle while others need deciduous trees or specific shrubs or wildflower host plants. There is no "one-size-fits-all" management recommendation for this habitat other than to provide for a mosaic of habitat diversity. "It's essential in restoring and maintaining disturbance-dependent ecosystems to vary the intensity and frequency of the disturbance in patchwork fashion, so that there is always a mosaic of patches of differing disturbance history. …the patchy landscape produced by random variation in disturbance history from one patch to another is essential to sustain the diversity of habitats and organisms that make up the total ecosystem." (Roger Latham, personal communication November 7th, 2014)
- Management activities should be coordinated with long-term habitat monitoring. "Analysis of desired conditions, inventory of existing conditions, and long-term monitoring of an array of key indicators is essential to know whether restoration and management efforts are accomplishing all of the goals or if some of the threatened or endangered species whose recovery is first and foremost among those goals might be inadvertently falling by the wayside." (Roger Latham, personal communication November 7th, 2014)
- Expand herbaceous openings as needed on convex landscapes by removing trees and other woody plants. Focus woody plant removal on areas of pines and junipers, which tend to indicate drier, thinner soils. The establishment of hardwoods should be taken as an indicator of deeper, moister soils. Where deeper soils occur, soil organic matter reduction may be necessary to establish thin soils over serpentine bedrock. "Soil organic matter reduction has proven effective in restoring serpentine grassland vegetation where it has been fully displaced by

forest succession, as long as intact grassland adjoins the treated area to serve as a seed source. SOM reduction consists of skimming the surface organic horizons from the soil profile using a backhoe or front-end loader and transporting the material offsite by dump truck. It is particularly effective in restoring serpentine grassland where it has been invaded by a dense thicket of common greenbrier (Smilax rotundifolia)." (Roger Latham, personal communication November 18th, 2014)

- Educate the adjacent landowners on the significance of the globally rare habitat and the need for ongoing management activities.
- Suppress the spread of invasive species of plants to prevent native species from being crowded out of the habitat. Removal of invasive plants in the immediately vicinity of the species of concern can help these populations compete for space against much more aggressive species. Invasive species management should be coordinated by individuals familiar with the rare species as well as the invasive species present. Continual invasive species monitoring and control will be necessary.
- Reduce deer herd density to suitable levels to prevent overbrowsing of sensitive species.

Location

Municipalities: *Willistown Township*
USGS quads: *Valley Forge*
Previous CNHI reference: *Mill Road Site*
Associated NHAs: *None*
Overlapping Protected Lands: *None*

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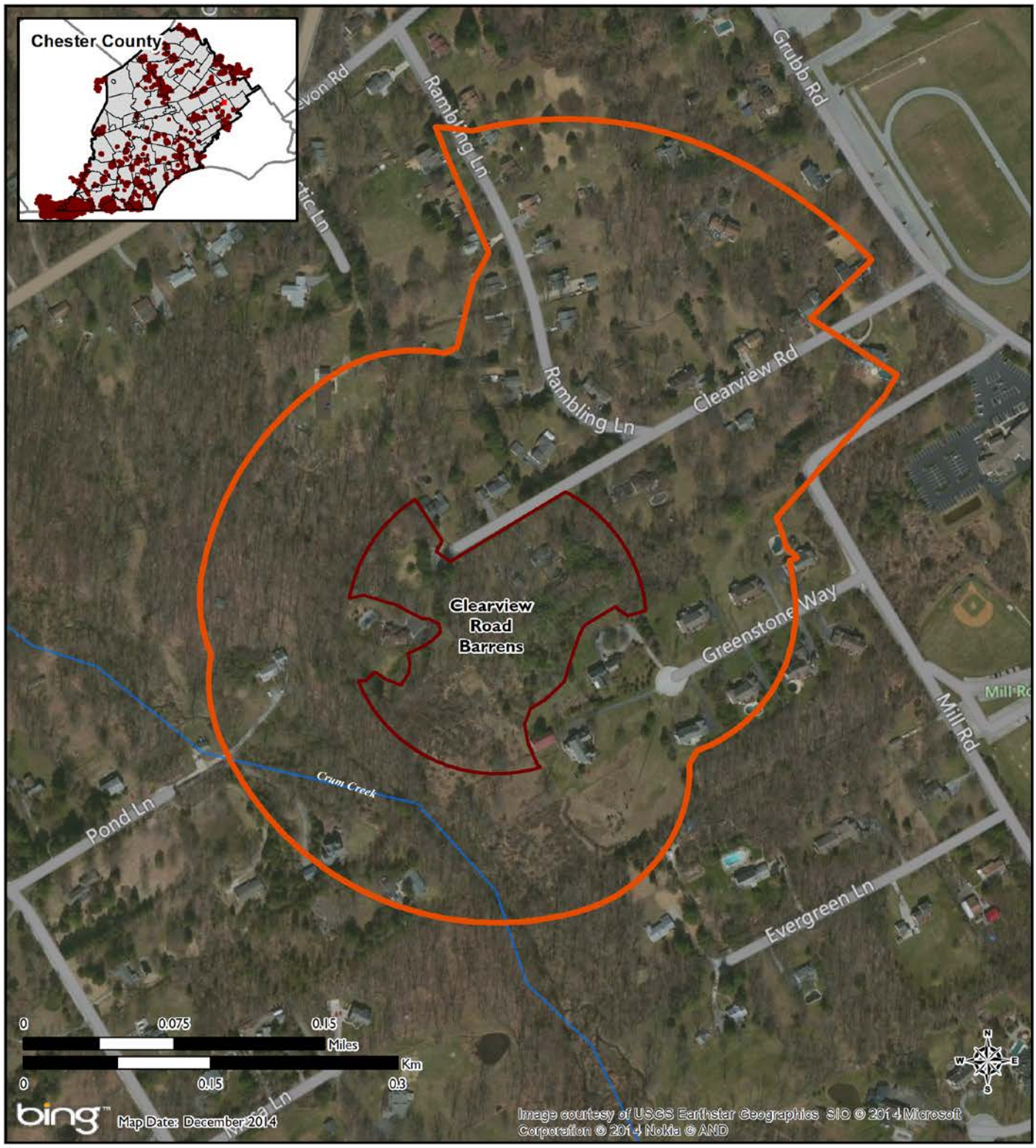


Clearview Road Barrens Natural Heritage Area

A tiny serpentine barren 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 Supporting Landscape***

Clonmell Upland Road NHA

PNHP Significance Rank: *State*

Site Description

This is one of many small woodlots within a landscape dominated by agriculture and pasture. The fragmented nature of the habitat has allowed a number of invasive species to spread throughout the forested area. A small tributary to East Branch White Clay Creek flows through the site. The banks of this stream provide habitat for **autumn bluegrass**, a plant 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]
Autumn Bluegrass (*Poa autumnalis*)	G5	S1	PE (PE)	6/137/2012	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.

In Pennsylvania, autumn bluegrass has been documented in several southwestern counties and is typically found along stream banks and in moist woods. It is more common in the southern portions of its range, which spans from New Jersey west into Michigan and south to Florida and Texas. Autumn bluegrass is considered critically imperiled in Pennsylvania due to the small number of known populations in a small geographical area.

Threats and Stresses

Invasive species are abundant throughout this site, especially along the edge habitat and are the biggest threat to the site and the native species found within it. Fragmentation of the remaining forest will alter the existing habitat conditions.

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

- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Further fragmentation of the small patch of existing forest may alter the structure of the habitat and allow an increase in invasive species.

Conservation Recommendations

Minimize disturbance to the remaining forest. Maintain the forested buffer along the stream and improve it wherever possible. Control invasive species in order to preserve the native species found in this NHA.

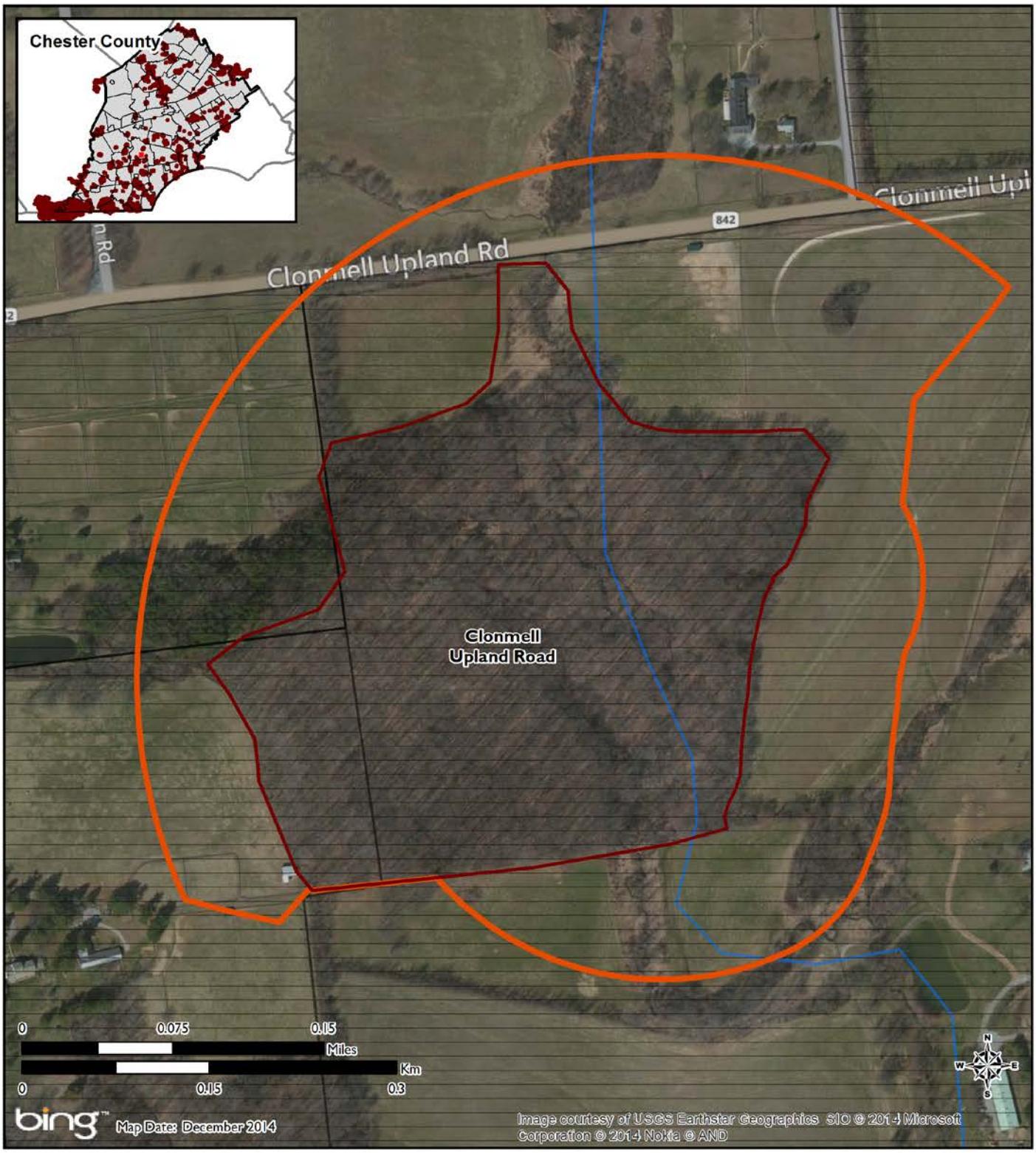
The following steps are recommended to ensure the persistence of these species at this site:

- Protect the existing forested areas from logging and disturbance along the forest edge. Maintaining as many intact habitats as possible, given the location within an agricultural area, will help to preserve habitat for as many species as possible.

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations. Further disturbance within this habitat will create additional opening for the establishment and spread of invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *West Marlborough Township*
USGS quads: *Coatesville*
Previous CNHI reference: *Clonmell Upland Rd Creek Site, East Branch White Clay Creek*
Associated NHAs: *None*
Overlapping Protected Lands: *Agricultural Easement*



Clonmell Upland Road Natural Heritage Area

This forested site supports a population of Autumn bluegrass, 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***
- ***Conservation Lands***

Cold Springs Drive NHA

PNHP Significance Rank: *State*

Site Description

Cold Springs Drive NHA sits between several houses within a housing development near Kennett Square. Most of the area is maintained as an open field, but woody species are beginning to become established in some portions of the site. Housing developments surround most of the NHA, with some small patches of wooded habitat and fields. The meadow habitat that makes up this NHA supports a population of **Elliot's beardgrass**, a plant 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]
Elliott's Beardgrass (*Andropogon gyrans*)	G5	S3	N (PR)	1/13/2001	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.

Elliot's beardgrass is at the northern edge of its range in Pennsylvania and has only been documented in a few southeastern counties. It spans from New Jersey to Illinois, south from Texas to Florida. This species needs open, early successional habitat in order to persist.

Threats and Stresses

Proximity to the housing development may disturb the habitat with frequent mowing and use of chemicals. Succession of the habitat with woody species will alter the conditions and species composition. Erosion is occurring along the slope and may wash out large areas of the habitat if not controlled.

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

- Succession of the open grassy fields may cause the habitat used by Elliot's beardgrass to become overgrown and shaded by woody species.
- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Further development of the habitat currently occupied by Elliot's beardgrass will likely eliminate it from this area.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Herbicide and fertilizer use in lawns, fields, and along roads may wash into the area and degrade the habitat conditions.

Conservation Recommendations

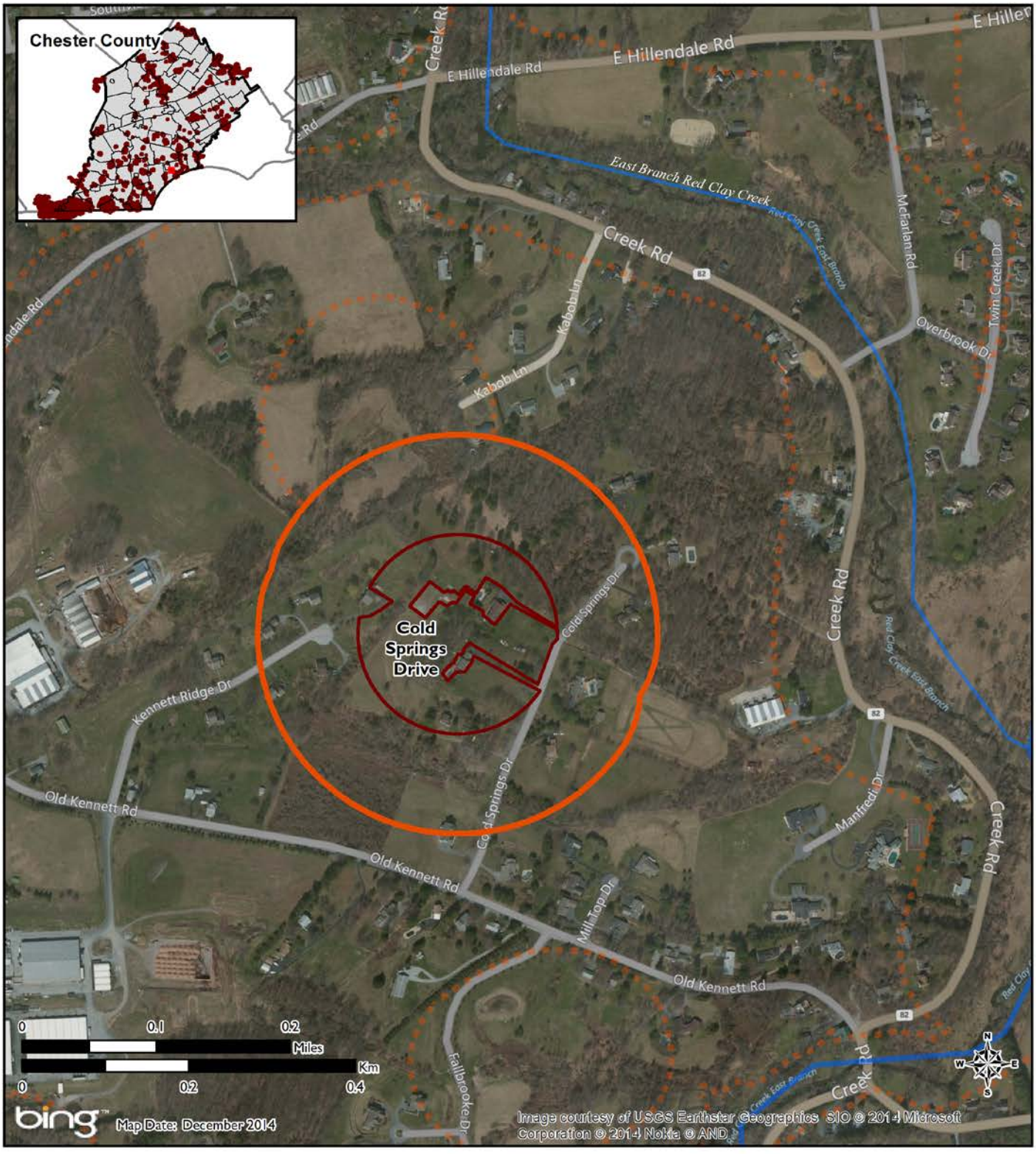
Maintain the existing habitat conditions by using periodic maintenance to preserve open habitat conditions. Avoid further fragmentation of the remaining habitat with additional housing developments or other infrastructure. Improve the vegetation cover to prevent erosion along the bank.

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

- Maintain the grassy habitat openings for Elliot's beardgrass and other early successional species. Perform periodic maintenance, such as mowing, to prevent woody species from becoming established. The needs of this species should be considered when planning the timing and frequency of maintenance.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Avoid building additional houses or infrastructure in the area where Elliot's beardgrass is known to occur.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.

Location

Municipalities: *Kennett Township*
USGS quads: *Kennett Square*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Cold Springs Drive Natural Heritage Area

Open, disturbed habitat along Cold Springs Drive supports a population of state vulnerable Elliott's beardgrass.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

Constant Spring Lane Meadow NHA

PNHP Significance Rank: *State*

Site Description

Constant Spring Lane Meadow NHA is a site with a combination of meadow and forested habitats just north of the Pennsylvania Turnpike near Devault. The meadow is mowed every year, which maintains the early successional habitat. This habitat supports a population of **Elliot's beardgrass**, a plant 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]
Elliott's Beardgrass (*Andropogon gyrans*)	G5	S3	N (PR)	10/13/2007	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.

Elliot's beardgrass is at the northern edge of its range in Pennsylvania and has only been documented in a few southeastern counties. It spans from New Jersey to Illinois, south from Texas to Florida. This species needs open, early successional habitat in order to persist.

Threats and Stresses

Lack of disturbance will allow succession of woody species to eliminate the open habitat. Invasive species are present, and mowing will also help to slow their spread throughout the NHA and adjacent habitat. Development can eliminate the small patches of habitat that remain in this area.

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

- Succession that is not controlled by mowing or other methods of disturbance will likely cause the habitat to become unsuitable for the species of concern to be able to persist at this site.
- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Further development of the habitat currently occupied by Elliot's beardgrass will likely eliminate it from this area.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Herbicide use along the road may cause direct mortality to the species of concern.

Conservation Recommendations

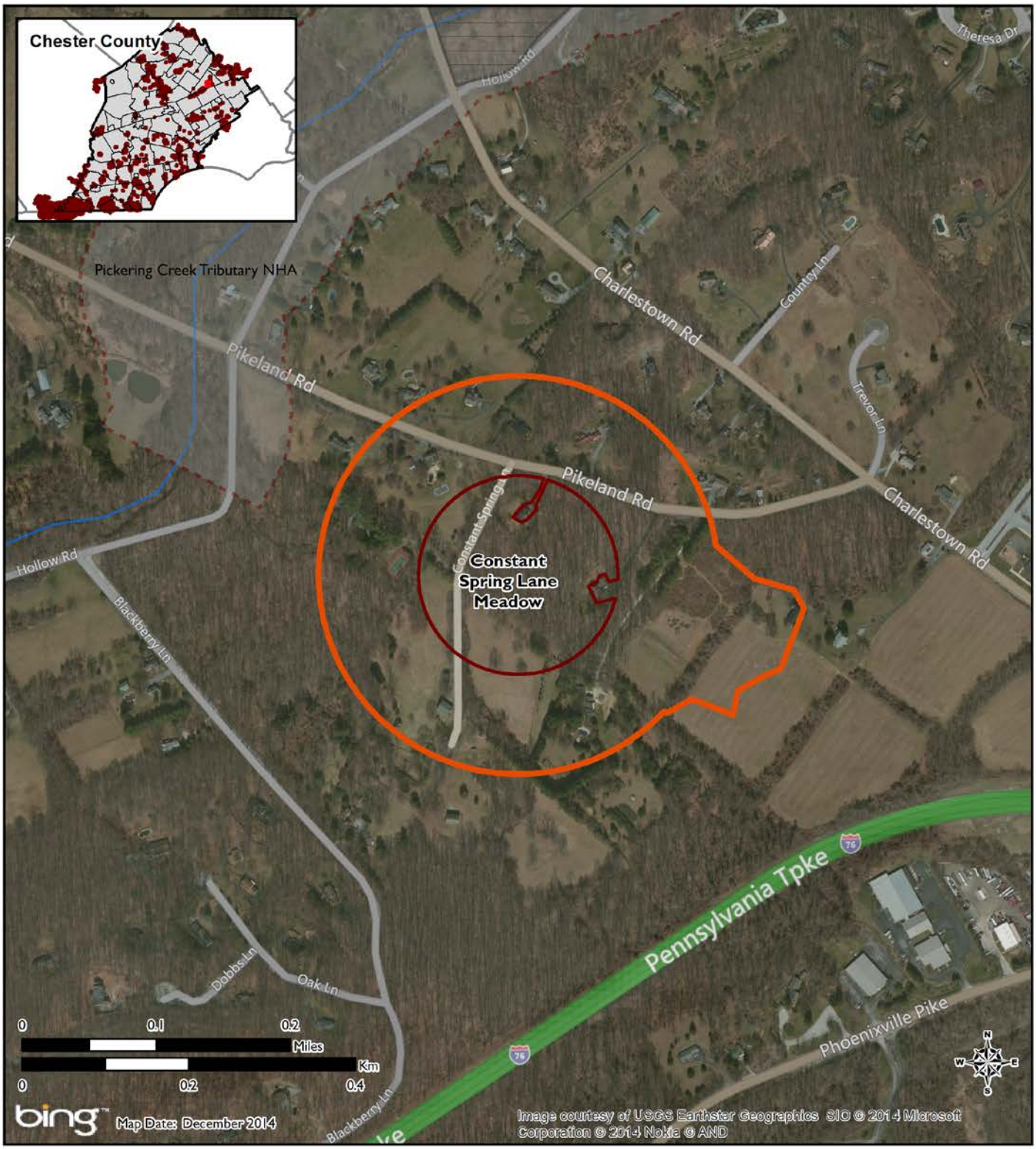
Maintain the existing habitat conditions by limiting disturbance in the forested area and using periodic maintenance to preserve open habitat conditions. Avoid further fragmentation of the remaining habitat with additional housing developments or other infrastructure.

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

- Maintain the grassy habitat openings for Elliot's beardgrass and other early successional species. Perform periodic maintenance, such as mowing, to prevent woody species from becoming established. The needs of this species should be considered when planning the timing and frequency of maintenance.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Avoid building additional houses or infrastructure in the area where Elliot's beardgrass is known to occur.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.

Location

Municipalities: *Charlestown Township*
USGS quads: *Malvern*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Constant Spring Lane Meadow Natural Heritage Area

This site provides habitat for Elliott's beardgrass, a vulnerable 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***
- ***Conservation Lands***

Coventryville Road Woods NHA

PNHP Significance Rank: *State*

Site Description

Coventryville Road Woods NHA is located south of French Creek in a landscape that is comprised of mostly woodlots and agricultural fields. A powerline right-of-way cuts through the NHA and is heavily invaded by mile-a-minute, an invasive vine that can grow over other species. This wooded area provides habitat for **three sensitive species of concern**, not named at the request of the jurisdictional agency overseeing their 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**	---	---	---	8/12/2011	A
Sensitive species of concern B[3]	**S**	---	---	---	8/12/2011	CD
Sensitive species of concern C[3]	**S**	---	---	---	8/11/2011	CD

[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

A large number of invasive species occupy this habitat and may continue to spread and change the overall species composition. Maintenance along the right-of-way may disturb natural habitats with mowing or herbicide spraying. Excessive deer browse may hamper the growth of native species.

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

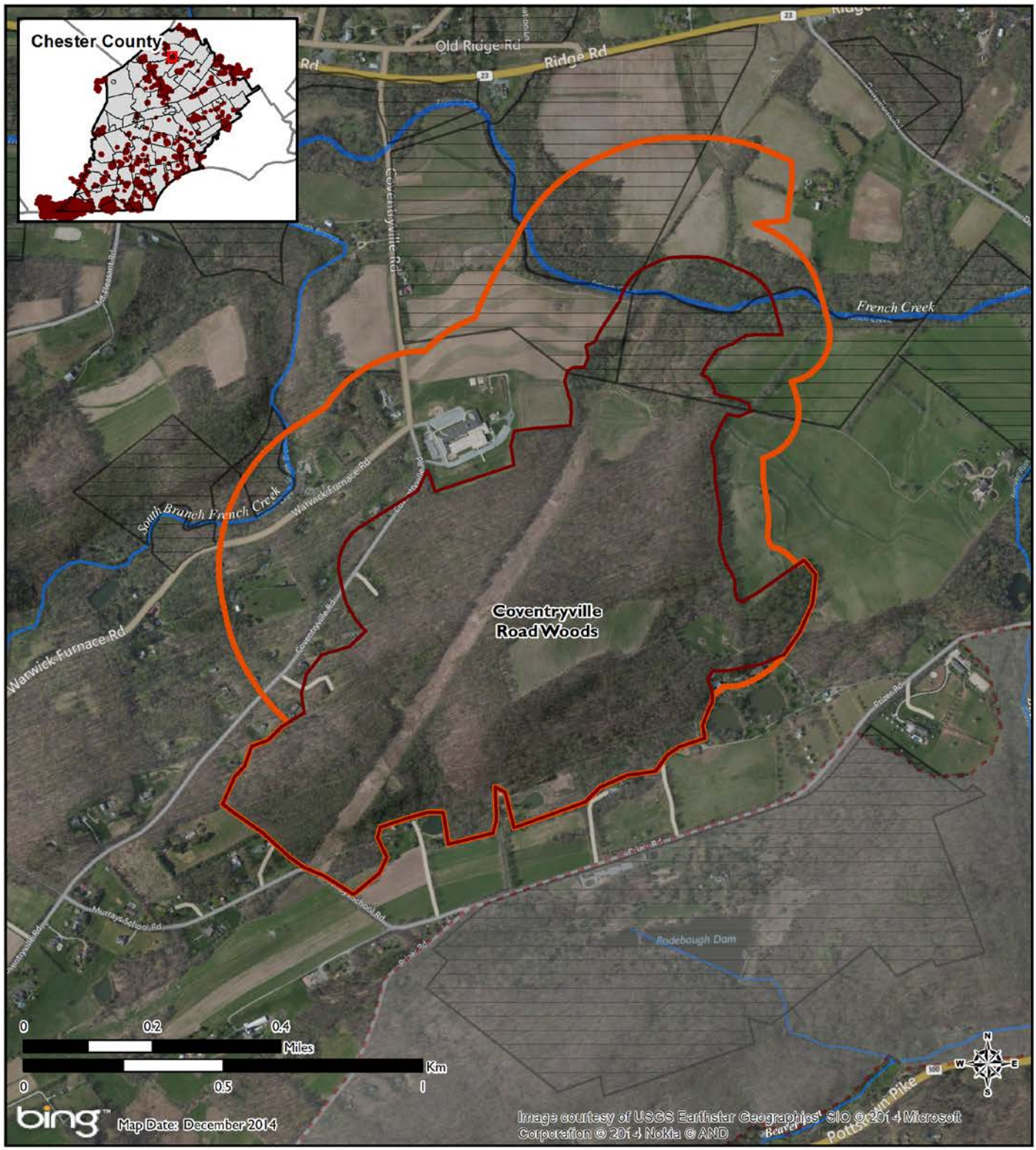
- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Herbicide and fertilizer used along right-of-ways, roads, and fields may wash into the forested area and degrade the habitat or cause direct mortality.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

Attempt to remove invasive species, while taking care to not open large gaps that may cause an increase in other invasive species. Minimize disturbance along the right-of-way and other portions of the NHA that will fragment the existing habitat. Reduce the size of the deer herd in order to limit the impact on native species.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.



Coventryville Road Woods Natural Heritage Area

This site supports a population of a sensitive species of concern as well as two Watch List plant species

Significance Rank:
REGIONAL

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Cox Farm NHA

PNHP Significance Rank: *State*

Site Description

Most of Cox Farm NHA is predominately a mowed meadow surrounded by agricultural fields and residential areas. A small man made pond is found along the eastern edge of the site with the outflow creating a narrow band of wet meadow habitat. This wet habitat supports a population of **downy lobelia**. An additional plant species of concern on the watchlist, **ragged thoroughwort**, has been documented along the woodland habitat edge.

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]
Ragged thoroughwort (*Eupatorium pilosum*)	G5	S4	N (SP)	9/9/2010	E
Downy Lobelia (*Lobelia puberula*)	G5	S1	PE (PE)	9/9/2010	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.

Downy lobelia is a state endangered species that ranges from New Jersey to Illinois and south into Florida and Texas. In Pennsylvania, it is considered a southerly species and has been documented historically in the southeastern counties. It grows in moist clearings and openings, grasslands, woods borders, and right-of-ways.

Ragged thoroughwort has been documented from Massachusetts and New York south to Florida and Louisiana. In Pennsylvania, it is found mostly in the southeastern region of the state, but is found in the south central and northeast as well. This species is found in a number of open habitats and edges.

Threats and Stresses

Excessive mowing and herbicide use in the agricultural fields and right-of-way may impact the quality of the wetland habitat and native species found here. Invasive species are dominant throughout much of this habitat and may spread into other areas, displacing native species.

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

- Invasive species are common in many areas of this site and may displace native vegetation, including species of concern.
- Further development or other major activities will further fragment the habitat and alter the conditions needed by the species of concern. Disturbances will also open areas that will be easily colonized by invasive species.
- Runoff and sedimentation from the surrounding agricultural and residential areas may degrade the water quality of stream and surrounding wetlands, especially given the limited riparian areas upstream of this site.
- Succession that is not controlled by mowing or other methods of disturbance will likely cause the habitat to become unsuitable for the species of concern to be able to persist at this site.

- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

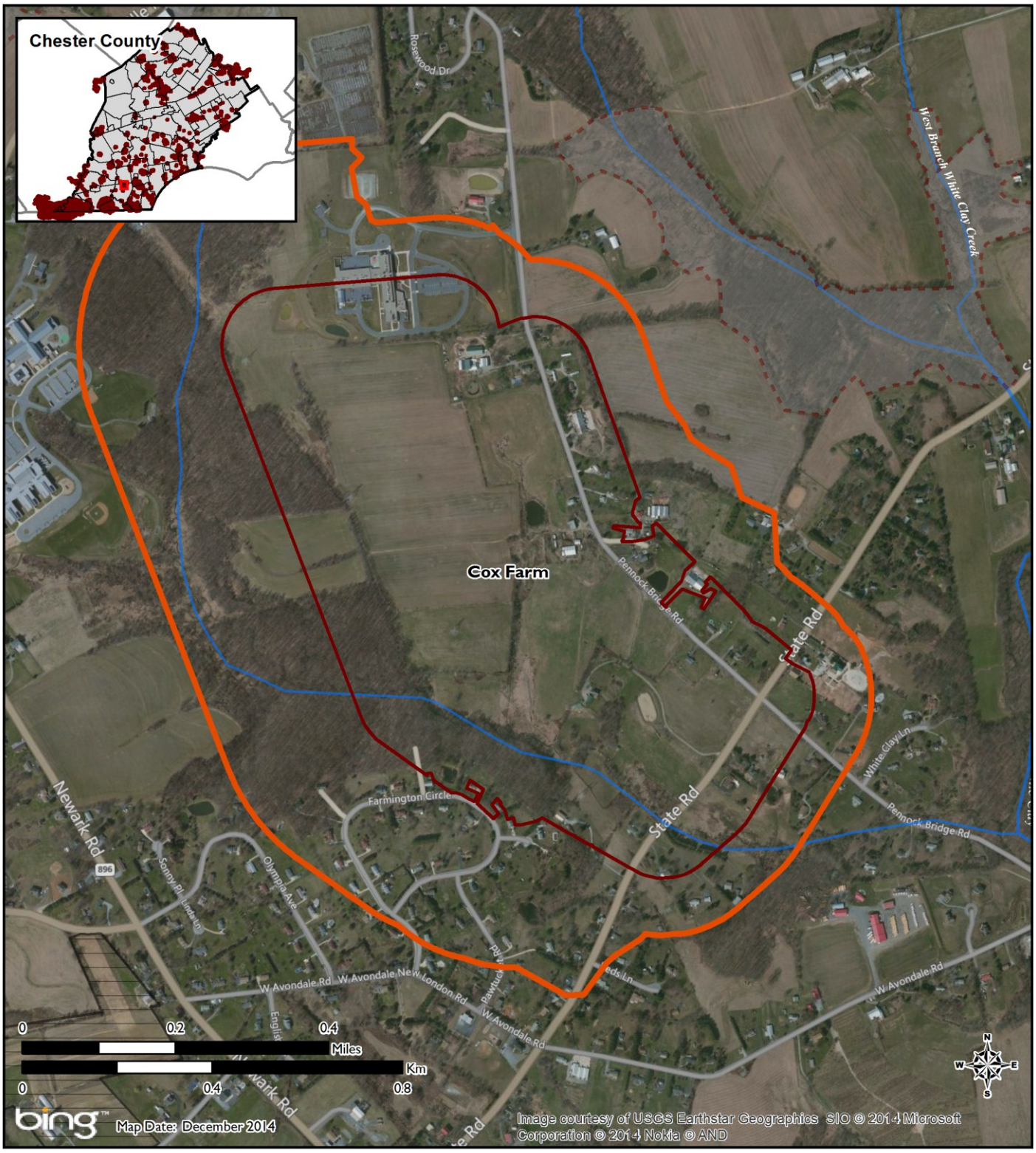
Mowing and other management should be done in a way to prevent colonization of woody species and support the growth of native species.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Protect the existing habitats from development and other large scale disturbance. Keep the NHA as intact as possible to protect the habitat and species within it.
- Avoid altering the current hydrology of the site, including draining or filling the wetlands and altering the flow of surface water. Consider potential changes to the flow of water when doing any activities within and around this NHA.
- Widen the unmowed vegetated buffer along the stream. A width of 100 meters is ideal, but any increase will benefit the stream and adjacent wetlands.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- The species of concern require open habitat that needs to be maintained. The needs of these species should be considered when planning the timing and frequency of maintenance in the open habitat.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: Penn Township, New London Township
USGS quads: West Grove, Oxford
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Cox Farm
Natural Heritage Area

Wet meadow habitat supports a population of downy lobelia, an endangered plant species in Pennsylvania.

Significance Rank:
STATE

Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Crum Creek NHA

PNHP Significance Rank: *State*

Site Description

The riparian forested habitat along Crum Creek creates the boundary for this NHA. This site consists of floodplain habitat along the creek surrounded by steeper forested habitat. Tulip poplar dominates the canopy with an understory of flowering dogwood and spicebush. Some alterations have been made to the natural flow of Crum Creek within this NHA. Residential development surrounds much of Crum Creek NHA, along with some houses within this site. The forested riparian habitat supports a population of **autumn bluegrass**, a state endangered plant 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]
Autumn Bluegrass (*Poa autumnalis*)	G5	S1	PE (PE)	6/8/2008	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.

In Pennsylvania, autumn bluegrass has been documented in several southwestern counties and is typically found along stream banks and in moist woods. It is more common in the southern portions of its range, which spans from New Jersey west into Michigan and south to Florida and Texas. Autumn bluegrass is considered critically imperiled in Pennsylvania due to the small number of known populations in a small geographical area.

Threats and Stresses

Invasive species are abundant throughout this site, especially along the edge habitat and are the biggest threat to the site and the native species found within it. Fragmentation of the remaining forest will alter the existing habitat conditions.

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

- Further development or other major activities will further fragment the habitat and alter the conditions needed by the species of concern. Disturbances will also open areas that will be easily colonized by invasive species.
- Runoff and sedimentation from the surrounding agricultural and residential areas may degrade the water quality of stream and surrounding wetlands.
- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Further fragmentation of the small patch of existing forest may alter the structure of the habitat and allow an increase in invasive species.

Conservation Recommendations

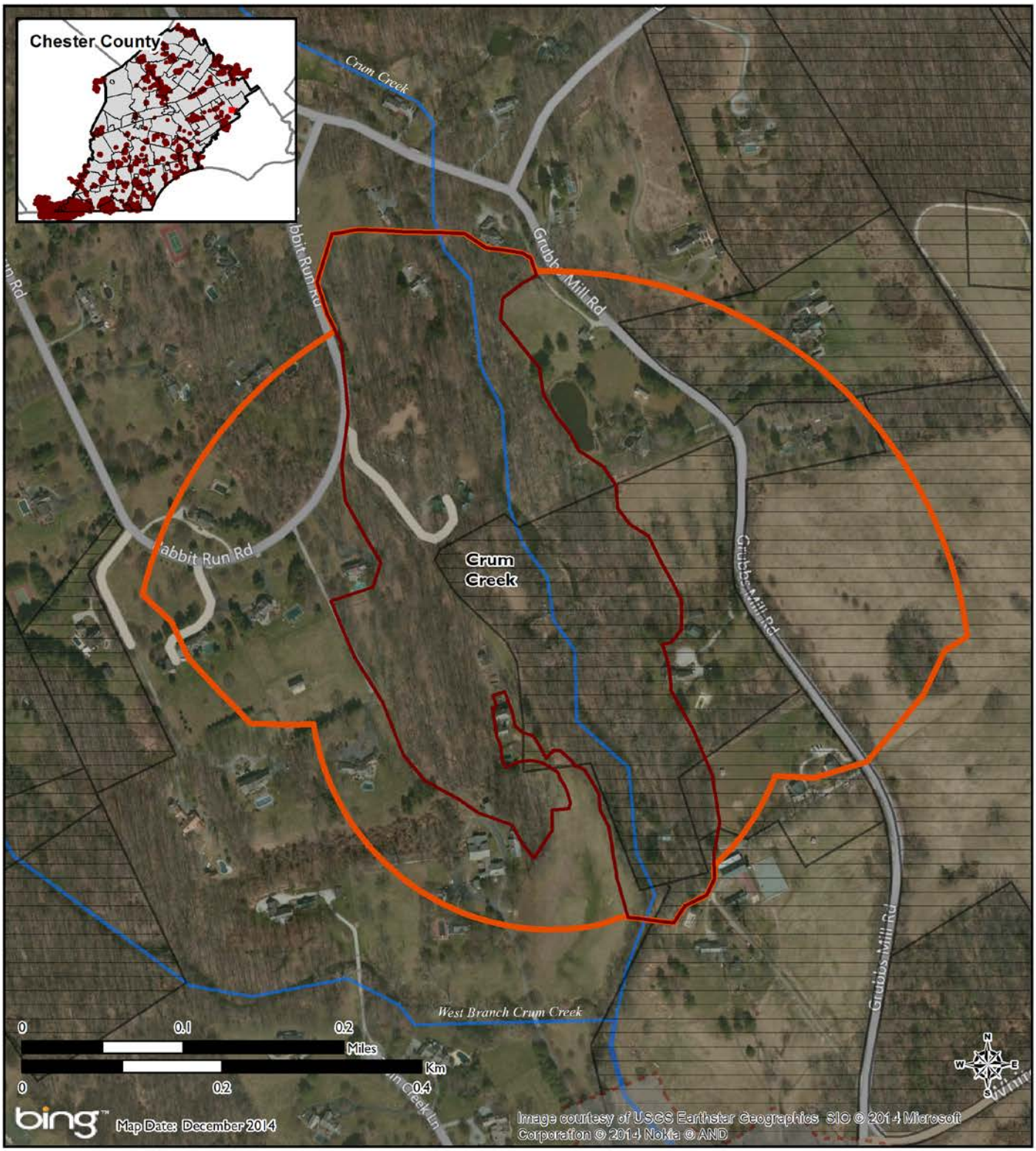
Minimize disturbance to the remaining forest. Maintain the forested buffer along the stream and improve it wherever possible. Control invasive species in order to preserve the native species found in this NHA.

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

- Protect the existing forested areas from logging and disturbance along the forest edge. Maintaining as many intact habitats as possible, given the location within a residential area, will help to preserve habitat for as many species as possible.
- Widen the unmowed vegetated buffer along the stream. A width of 100 meters is ideal, but any increase will benefit the stream and adjacent wetlands.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations. Further disturbance within this habitat will create additional opening for the establishment and spread of invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Willistown Township*
USGS quads: *Valley Forge*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Willistown Conservation Trust Easement*



Crum Creek
Natural Heritage Area

The forested floodplain of Crum Creek supports a population of Autumn bluegrass, a state endangered plant species.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Crum Creek Barrens NHA

PNHP Significance Rank: *State*

Site Description

A small herbaceous opening on a low bluff above Crum Creek supports two plant species of concern that, in Pennsylvania, are typically associated with serpentine bedrock influenced habitats. The context is residential with scattered small woodlots.

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]
Plain Ragwort (*Packera anonyma*)	G5	S2	PR (PR)	7/1/1993	D
Few Flowered Nutrush (*Scleria pauciflora*)	G5	S2	PT (PT)	7/1/1993	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.

The two plant species of concern found within this Natural Heritage Area are associated with the serpentine influenced herbaceous opening and the adjacent thin woodlands. In the past, natural disturbance, such as wildfires, would have helped to keep this area in an open condition. Without active management, the open grassy area will gradually close due to natural succession. In this residential setting, typical regular lawn mowing likely has helped to preserve the open aspect preferred by the species of concern.

Rocky Gleason (PNHP)

Few Flowered Nutrush (*Scleria pauciflora*)

Threats and Stresses

Reviews of aerial photos taken in 1937 show this area as dominated by active agriculture. This specific location does not appear to have been in cultivation, likely due to the thin stony serpentine influenced soils present, but was likely used as pasture, which would have been a suitable habitat for the plant species of concern. The farms in the area have since been replaced by residential development, though the dry, grassy yards appear to have offered the plant species of concern some refuge.

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

- Houses and their associated infrastructure have eliminated most of the suitable habitat for the species of concern at this location.
- Efforts to replace the dry, grassy opening with other landscaping would likely eliminate the habitat for the plant species of concern.
- This site occurs within a residential context with a lot of associated edge habitat.
- Invasive species of plants can displace native species of plants.
- Over browsing by white-tailed deer is a serious threat to the overall plant diversity.

Conservation Recommendations

These serpentine habitats occur in isolated patches as the bedrock material, serpentinite, is exposed at the surface of the ground in a scattered fashion much like an archipelago chain of islands. Each habitat has a slightly different species composition, largely due to the slightly different environmental conditions found at each distinct location. A long range goal for these isolated habitats is to recognize them as a single system and plan for their ecological needs.

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

- The plant species of concern documented at this location were last observed in 1993 and should be surveyed for again to determine the status of the populations and their surrounding habitat.
- The serpentine influenced plant species are considered quite rare in the state and could be cultivated at this location as part of the residential landscape. Maintain the dry, herbaceous openings, fostering the populations of serpentine influenced plants by removing their more common competitors. This is a relatively unique assortment of plants and there will be very few other landscapes with this assortment of species.

Rocky Gleason (PNHP)

Plain Ragwort (*Packera anonyma*)

- Suppress the spread of invasive species of plants to prevent native species from being crowded out of the habitat. Removal of invasive plants in the immediately vicinity of the species of concern can help these populations compete for space against much more aggressive species. Invasive species management should be coordinated by individuals familiar with the rare species as well as the invasive species present. Continual invasive species monitoring and control will be necessary.
- Reduce deer herd density to suitable levels to prevent overbrowsing of sensitive species.

Location

Municipalities: *Willistown Township*
USGS quads: *Malvern*
Previous CNHI reference: *Crum Creek Barrens*
Associated NHAs: *None*
Overlapping Protected Lands: *None*

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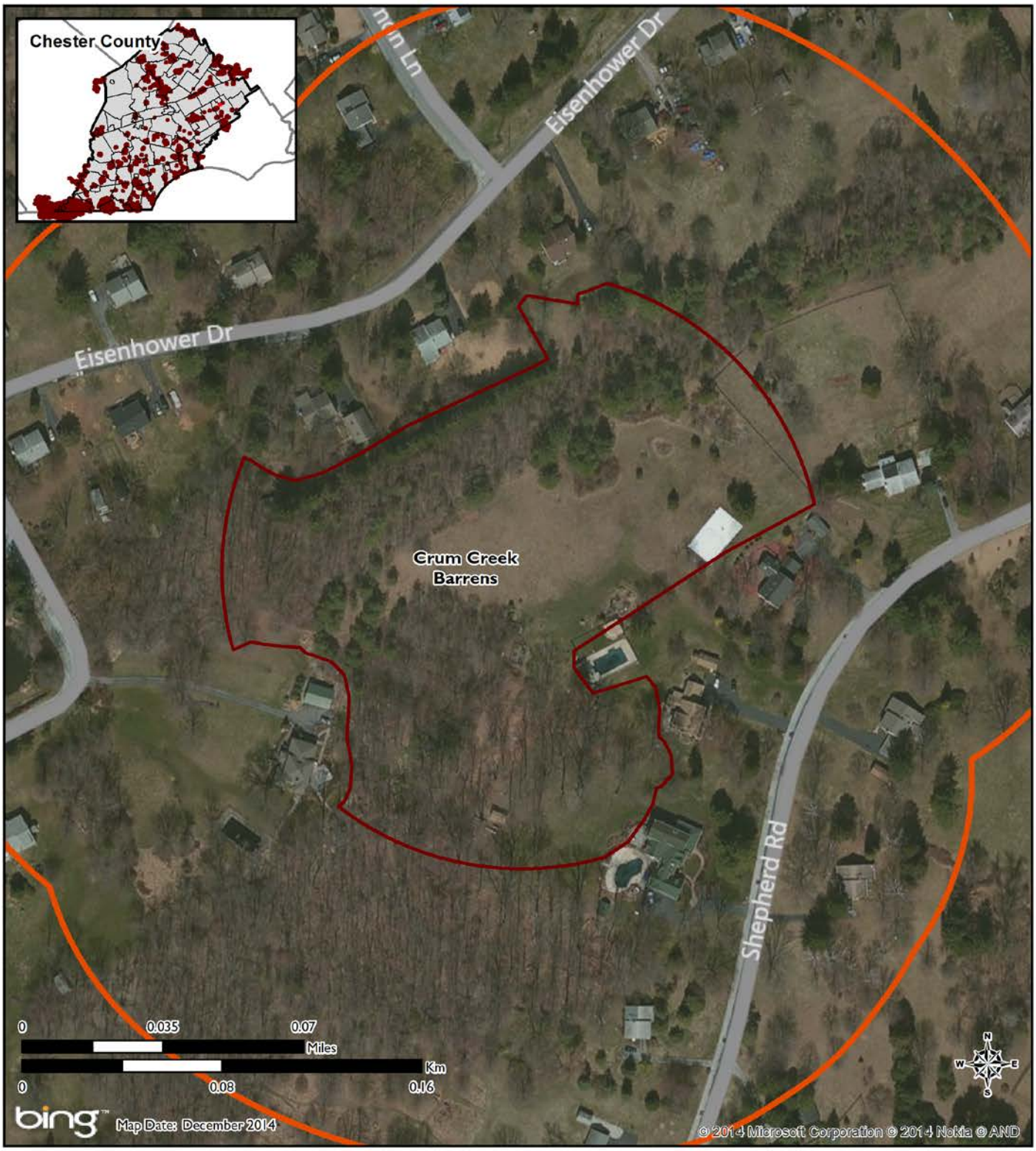


Crum Creek Barrens
Natural Heritage Area

Serpentine barrens support populations of two plant imperiled plant species in Pennsylvania, few flowered nutrush and plain ragwort.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

Cullen Road Pasture NHA

PNHP Significance Rank: *State*

Site Description

Cullen Road Pasture NHA is located near Russellville off of Route 10. The pasture is surrounded by agricultural fields and housing developments. A small stream flows through the NHA that begins at the outflow of a man made pond to the north of the site. The early successional habitat within Cullen Road Pasture NHA supports a population of **bushy aster**, a plant species of concern. This NHA also provides habitat for a **sensitive species of concern**, not named 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]
Bushy Aster (*Symphyotrichum dumosum*)		G5	S1	TU (PE)	10/23/1999	C
Sensitive species of concern A[3]	S	---	---	---	10/23/1999	CD

[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.

Bushy aster is located throughout the eastern United States from Maine west to Wisconsin and south to Florida and Texas. It occurs through some parts of Canada as well. Most occurrences in Pennsylvania have been documented in the southeastern counties. It is considered to be critically imperiled in the state due to the small number of occurrences. Bushy aster is most often found in open habitat and along shrubby edge habitat.

Threats and Stresses

Succession of woody species can shade out early successional species, but excessive mowing may also have a negative impact on native species. Invasive species may crowd out native species that currently exist in this NHA. Herbicides sprayed on the field, lawns, and roads may cause mortality to native species.

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

- Invasive species are found in this NHA and may displace native vegetation, including species of concern.
- Succession of the open pasture habitat may cause the area used by species of concern to become overgrown and shaded by woody species.
- Changes in the currently hydrology could significantly alter the habitat for the plant species of concern by making conditions either too wet or too dry to be able to persist at this site.
- Herbicides sprayed on the fields and along roads may cause direct mortality to the species of concern and other native species. Fertilizers from surrounding areas may also wash into the NHA and degrade habitat conditions.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

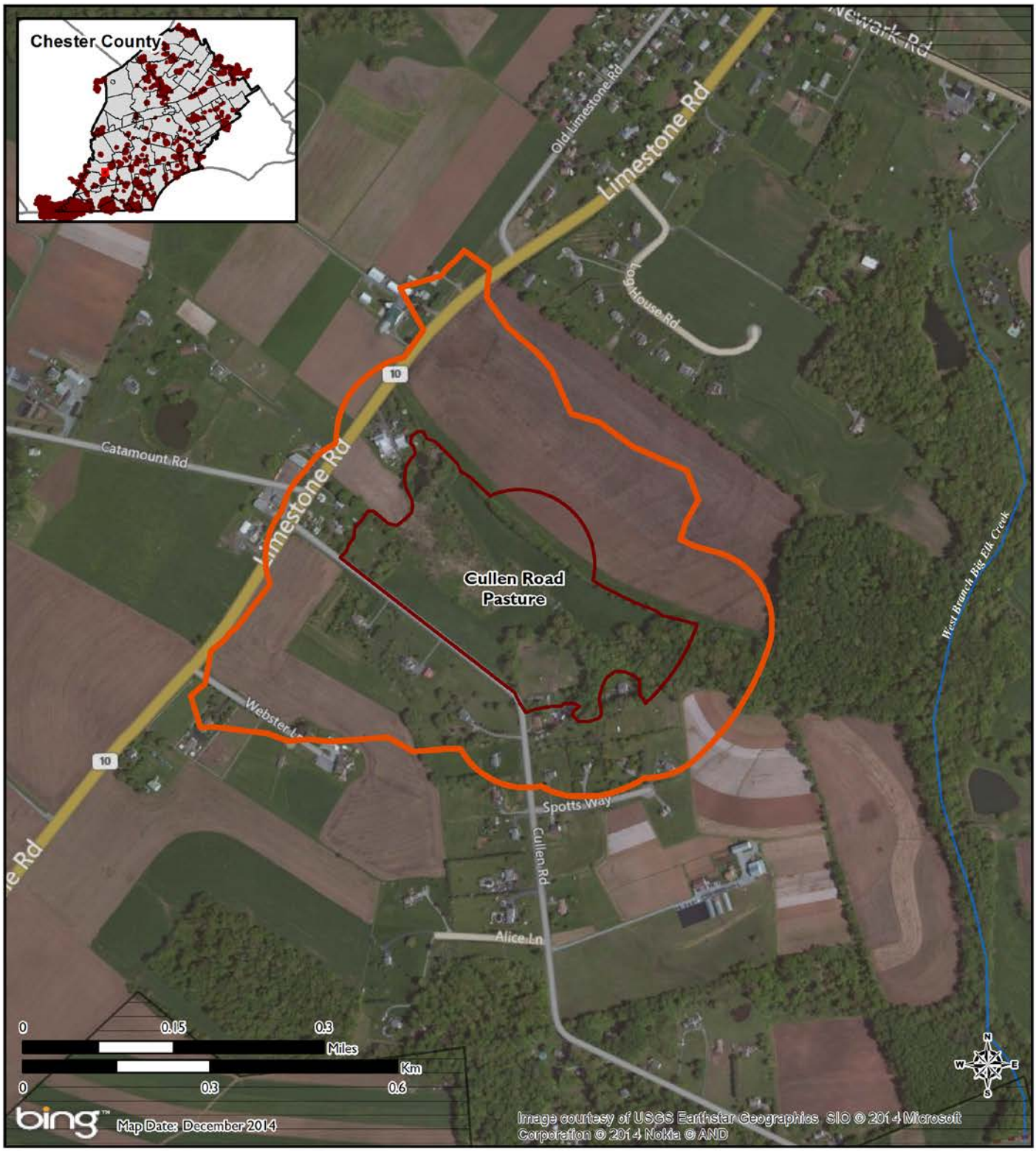
Occasional disturbance will likely be necessary to maintain the habitat conditions and prevent the succession of woody species. Maintenance should be done outside of the growing season with minimal herbicide use to limit impact to native species.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- The species of concern found at this NHA require open habitat that needs to be maintained with mowing or other methods of disturbance. The needs of the species should be considered when planning the timing and frequency of maintenance.
- Maintain the existing hydrology. Any activities that occur along the roads and other areas surrounding the NHA should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Upper Oxford Township*
USGS quads: *Oxford*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Cullen Road Pasture
Natural Heritage Area

Old pasture habitat at this site supports Pennsylvania critically imperiled bushy aster and 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***

Delaware Line Woods NHA

PNHP Significance Rank: *State*

Site Description

Delaware Line Woods NHA is a patch of wooded habitat approximately 130 acres in size that spans the Pennsylvania – Delaware State border along Red Clay Creek. These woods are dominated by tulip poplar, American beech, and red oak. A utility right-of-way cuts through the middle of the NHA, and agricultural fields surround much of the wooded habitat. This habitat supports a population of **puttyroot**, a plant species of concern, as well as a **sensitive species of concern** not named at the request of the jurisdictional agency overseeing its protection. More open habitat along the edge of the woodland supports a population of another plant species of concern, **tawny ironweed**.

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]
Puttyroot (*Aplectrum hyemale*)		G5	S3	PR (PR)	3/8/1992	B
Tawny Ironweed (*Vernonia glauca*)		G5	S1	PE (PE)	8/20/2002	C
Sensitive species of concern A[3]	**S**	---	---	---	3/1/1992	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.

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

In Pennsylvania, puttyroot is most commonly found in the southeastern counties and grows in moist woodlands and on forested slopes and stream banks. Puttyroot produces leaves that are visible through the fall and winter. The leaves wither in late spring, and the plant flowers in May and June.

Tawny ironweed is a perennial herb that flowers in the late summer and fall. It often grows in open habitats and upland forests. This species is endangered in Pennsylvania due to the small number of populations in a limited area of the state. Tawny ironweed is found from Pennsylvania and New Jersey south to Florida and Mississippi. In Pennsylvania, it is at the northern edge of its range and found in a few southern counties. Habitat loss and succession are the major threats to this species.

Threats and Stresses

Further disturbance will degrade the quality of the forest and may make it unsuitable for some existing species. Invasive species are common throughout much of the habitat and may alter the conditions and species composition.

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

- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Logging will further fragment the existing forest and alter the conditions of the habitat needed by the species of concern.
- Woody species growth in the early successional habitat may cause the area used by tawny ironweed to become overgrown and shaded by woody species.

- Herbicides sprayed on the pipeline right-of-way may cause direct mortality to the species of concern and other native species. Fertilizers from surrounding fields may also wash into the NHA and degrade habitat conditions.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

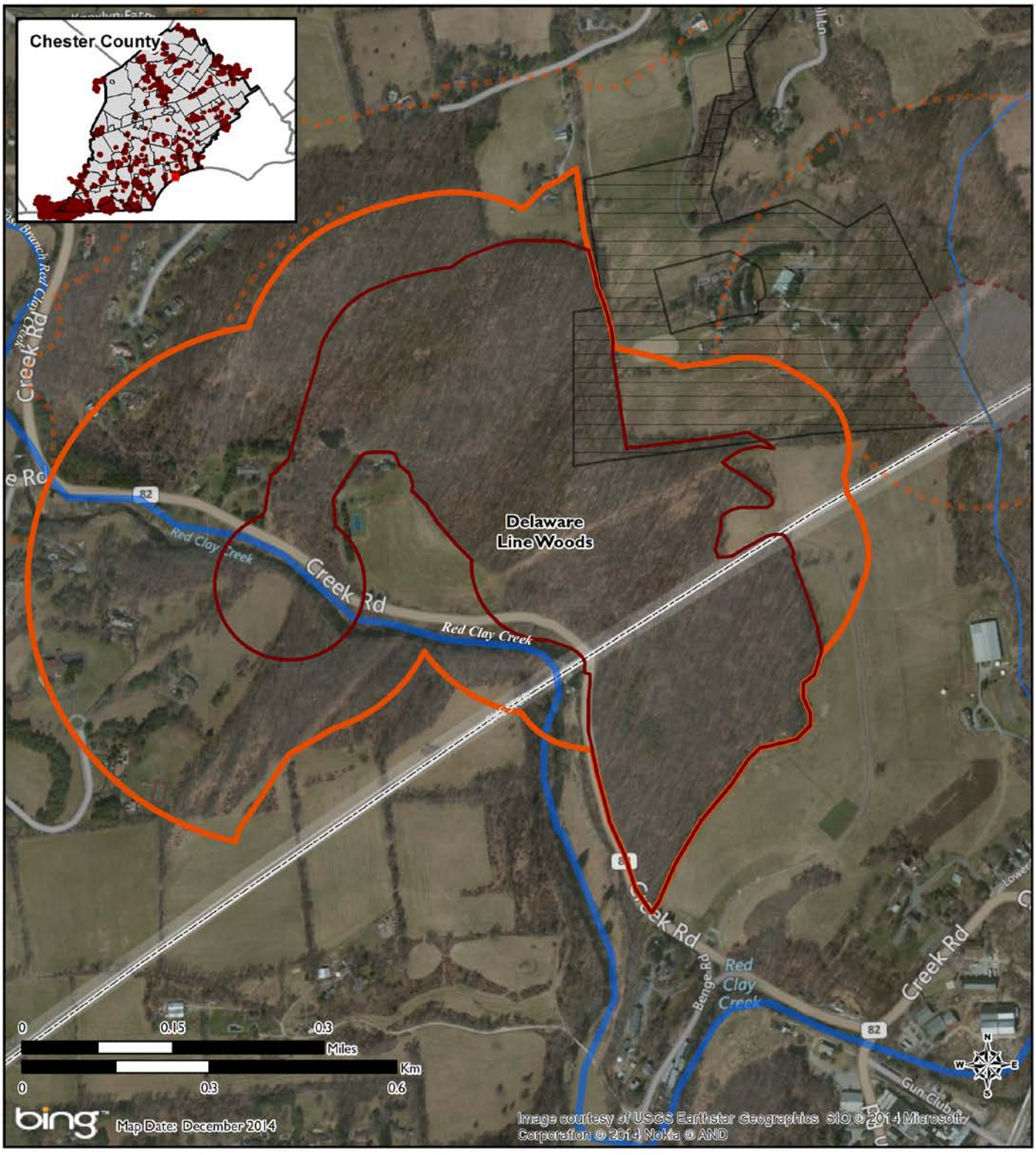
A small part of this NHA is covered under a conservation easement, but most of this site has no formal protection. Avoid further fragmentation of the existing forest in order to protect the habitat structure and species composition. Attempt to remove invasive species and limit disturbances that may create openings for additional invasive species to become established.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Protect the existing forested areas from logging. Avoid further fragmentation of the habitat with roads, houses, or other disturbances in order to preserve habitat for as many species as possible.
- Tawny ironweed requires open habitat that needs to be maintained with mowing or other methods of disturbance. The needs of this species should be considered when planning the timing and frequency of maintenance.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Kennett Township*
USGS quads: *Kennett Square*
Previous CNHI reference: *State Line Woods*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Easement*



Delaware Line Woods Natural Heritage Area

This forested site supports populations of tawny ironweed and puttyroot, both plant species of concern, and 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***
- ***Conservation Lands***

Derry Meeting Road Wetland NHA

PNHP Significance Rank: *State*

Site Description

Derry Meeting Road Wetland NHA is located north of Daleville along Route 41. This patch of wooded habitat is approximately 75 acres in size surrounded by agricultural fields and residential development. A small stream flows through the site. The NHA is a young, wet red maple woods and edge habitat that supports populations of **screw-stem** and **stiff cowbane**, two plant 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]
Screw-stem (*Bartonia paniculata*)	G5	S3	N (PR)	8/28/2005	C
Stiff Cowbane (*Oxypolis rigidior*)	G5	S2	TU (PT)	8/28/2005	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.

Screw-stem is a small plant species that is found from Maine west into Wisconsin and south to Florida and Texas. It is uncommon in many parts of its range, which extends into Canada. In Pennsylvania, screw-stem has been documented from many counties, mostly in the eastern half of the state. Screw-stem is found in wetland habitats, including bogs, swamps, and wet meadows. Loss of wetland habitat and invasive species are major threats to this species.

Stiff cowbane is a plant species in the carrot family. Its range spans from New Jersey west to Minnesota and south to Texas and Florida. It is at the northern edge of its range in Pennsylvania and has mostly been documented in southern counties. Stiff cowbane is found in open, wet habitats.

Threats and Stresses

Changes in hydrology in and near this area would negatively impact the wetland habitats in this NHA. Succession of the young woods and woodland edge may increase the shaded habitat and alter the species composition. Invasive species, especially Japanese stiltgrass, may out compete native species.

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

- Logging, development, or other major activities will further fragment the existing habitat and alter the conditions needed by the species of concern. Disturbances will also open areas that will be easily colonized by invasive species.
- Changes in the currently hydrology could significantly alter the habitat for the plant species of concern by making conditions either too wet or too dry to be able to persist at this site.
- Invasive species can take over portions of the habitat currently used by the species of concern and other native species.
- Herbicide and fertilizer use in fields, lawns, and along roads may wash into the wooded habitat and degrade the habitat conditions and cause direct mortality.

- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

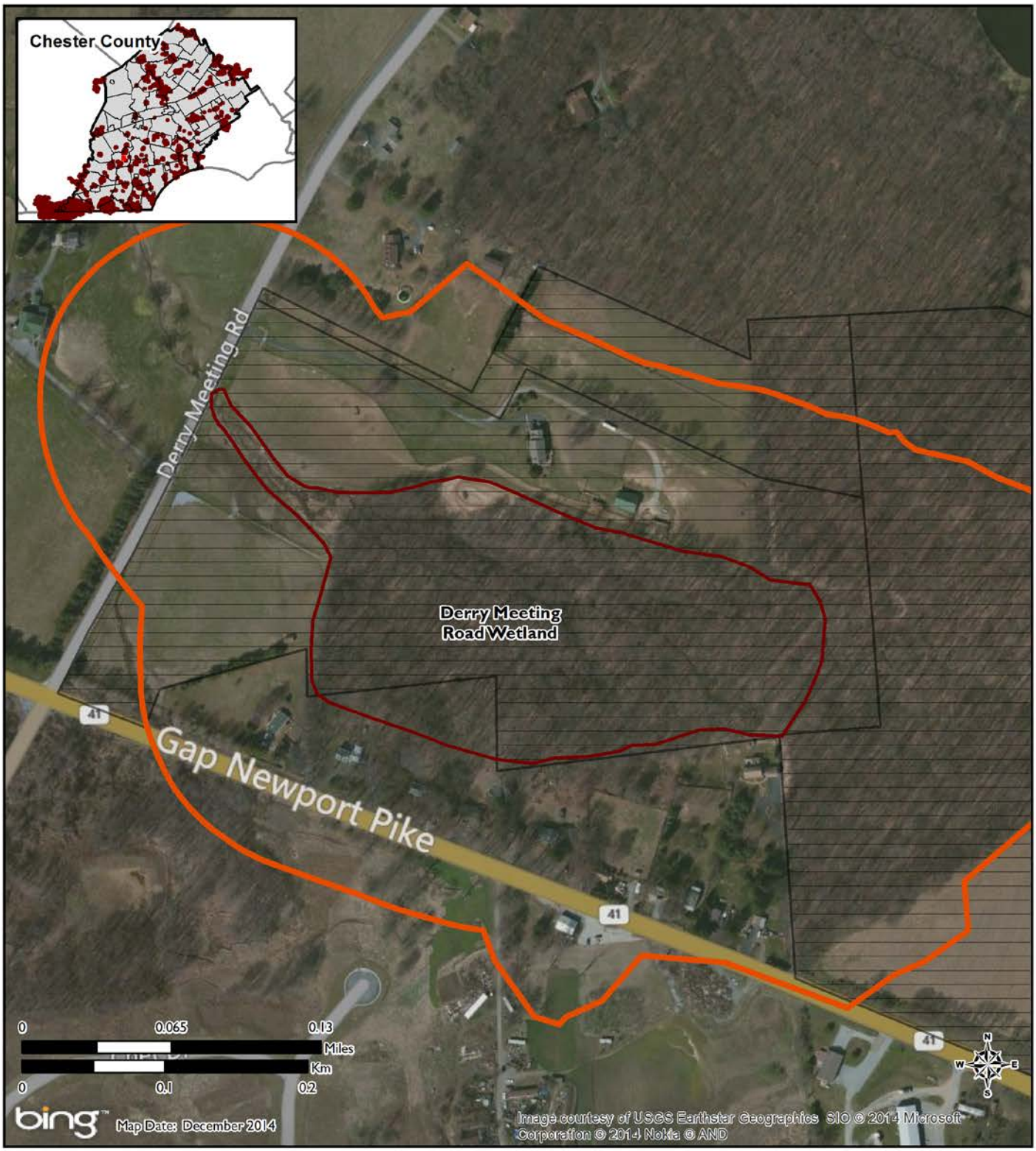
Conservation easements cover most of Derry Meeting Road Wetland NHA, which should provide some protection from development and other major disturbances. Maintain the existing hydrology and wooded habitat to preserve the habitat conditions. Attempt to slow the spread of Japanese stiltgrass in order to protect the habitat for native species.

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

- Protect the existing wooded areas from logging and other large scale disturbance. Keep the forest as intact as possible to protect the habitat and species within it.
- Widen the native vegetated buffer along the stream, especially above the NHA. A width of 100 meters is ideal, but any increase will benefit the stream and adjacent wetlands.
- Maintain the existing hydrology. Any activities that occur along the roads and other areas surrounding the NHA should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Reduce deer density, then continue to monitor and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Londonderry Township*
USGS quads: *West Grove, Oxford*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Easement*



Derry Meeting Road Wetland Natural Heritage Area

A wet maple woods supports populations of two plant species of concern, stiff cowbane and screw-stem.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Doe Run Fields NHA

PNHP Significance Rank: *State*

Site Description

Doe Run Fields NHA is a group of hayfields east of Cochranville. Other agricultural fields and small woodlots surround the NHA. The maintained early successional habitat in fields and along roadsides supports a population of **Elliot's beardgrass**, a plant species of concern. The large amount of grassy habitat also supports a **sensitive species of concern**, not named 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]
Elliott's Beardgrass (*Andropogon gyrans*)		G5	S3	N (PR)	10/2/2005	AB
Sensitive species of concern A[3]	**S**	---	---	---	6/10/2009	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.

Elliot's beardgrass is at the northern edge of its range in Pennsylvania and has only been documented in a few southeastern counties. It spans from New Jersey to Illinois and south from Texas to Florida. This species needs open, early successional habitat in order to persist.

Threats and Stresses

The early successional habitats are maintained by consistent mowing, but this may not be done in a way that supports native species growth. Excessive or ill-timed mowing may not allow some species to reproduce.

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

- Succession that is not controlled by mowing or other methods of disturbance will likely cause the habitat to become unsuitable for the species of concern to be able to persist at this site.
- Development of the habitat currently occupied by the species of concern will likely eliminate them from this area.
- Herbicide use along the road may cause direct mortality to Elliot's beardgrass.
- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

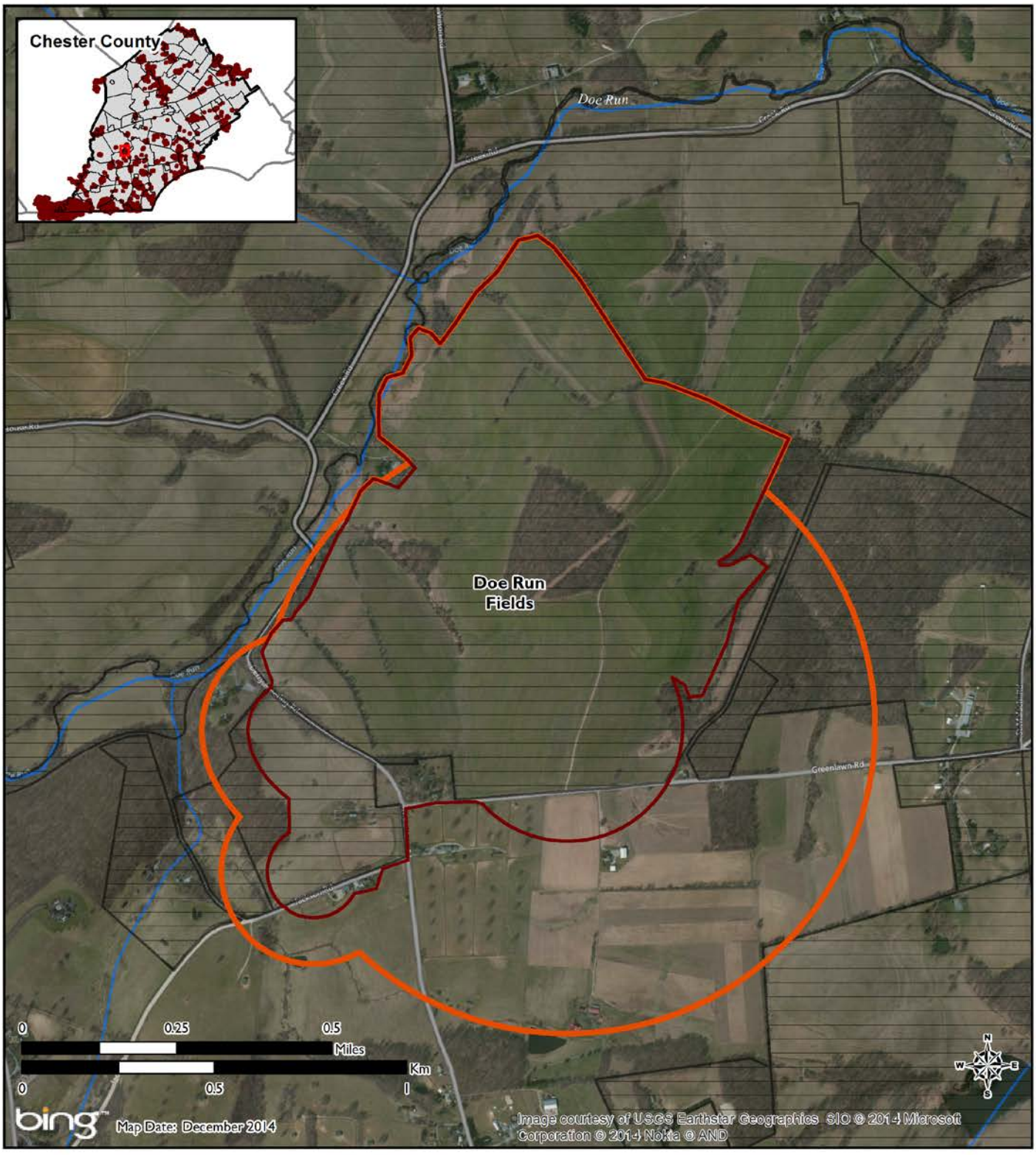
Almost the entire NHA is covered by a conservation easement, with the exception of the cemetery. This protection will allow the habitat to remain in a similar condition. Conduct mowing in the fall or winter, after the growing season. Limit herbicide and fertilizer use in fields and along roads.

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

- Elliot's beardgrass requires open habitat that needs to be maintained. The needs of this species should be considered when planning the timing and frequency of maintenance. The sensitive species of concern is also negatively impacted by mowing in the spring and summer.
- Avoid building additional houses or infrastructure where the species of concern are known to occur.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Highland Township, Londonderry Township*
USGS quads: *Coatesville, Parkesburg*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Easement*



Doe Run Fields
Natural Heritage Area

Open fields, roadsides, and grasslands support a population of a plant species of concern, Elliott's beardgrass, and another sensitive species of concern.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Doe Run Headwaters NHA

PNHP Significance Rank: *State*

Site Description

This small woodlot is approximately 40 acres in size and is almost completely surrounded by agricultural fields. A small stream begins at the outflow of a manmade pond and runs through the southern end of the site. The moist wooded area around the stream is dominated by skunk cabbage with a red maple overstory. This NHA supports a small population of a **sensitive species of concern**, which is not named at the request of the 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**	---	---	---	9/6/2002	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.

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

Threats and Stresses

Clearing the forest around this site for agriculture has created disturbances that have allowed for the introduction of invasive species. Invasive species are more abundant along the edges of the habitat, but may continue to spread throughout the forested area. High deer density may also have a negative impact on native species, particularly the species of concern.

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

- Invasive species are present in many areas of this site and may displace native vegetation and alter the habitat required by the species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Logging may disturb the small amount of remaining habitat, as well as cause changes in hydrology and allow for the introduction of additional invasive species.
- Runoff and other sources of water pollution from the surrounding area threaten to degrade the water quality of streams and seeps.

Conservation Recommendations

This NHA is privately owned, but is protected by a conservation easement. This may limit the activities that may negatively impact this habitat. Avoid further fragmentation of the small amount of remaining habitat in order to maintain the habitat conditions.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

- Protect the existing forested areas from logging and other large scale disturbance. Keep the forest as intact as possible to protect the habitat and species within it.
- Maintain a vegetated buffer along the roads and limit the use of pesticides and herbicides used along the road and fields to protect the water quality.

Location

Municipalities: *Highland Township*
USGS quads: *Parkesburg*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Easement, Agricultural Easement*

Doe Run Headwaters Natural Heritage Area

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 Supporting Landscape***
- ***Conservation Lands***

Dowlin Forge Road NHA

PNHP Significance Rank: *State*

Site Description

Dowlin Forge Road NHA is a forested area that surrounds a pipeline right-of-way that is mowed to keep it free from woody species. Forested habitat surrounds much of this NHA. Shamona Creek flows from the northeastern corner of Dowlin Forge Road NHA to the southwest, where is enters into East Branch Brandywine Creek. East Branch Brandywine Creek crosses through a small portion of the western end of the site. The early successional area along the pipeline right-of-way provides habitat for **St. Andrew's cross**, a plant 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]
St Andrew's-cross (*Hypericum stragulum*)	G4	S2	N (PT)	7/4/2001	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.

St. Andrew's-cross is near the northern edge of its range in Pennsylvania. This species occurs from New York and Massachusetts south into Georgia and west to Kansas and Texas. It is common in the southern portions of its range. In Pennsylvania, it has been documented in several southern counties, most commonly in the southeast. It is found in a number of dry, open habitat types.

Threats and Stresses

Succession that is not controlled by some type of maintenance will fill in the open habitat with woody species. Excessive mowing and herbicide use will also negatively impact the early successional species. Heavy herbicide use will also reduce the water quality. Disturbance in the forested area may create openings that will allow for the establishment of invasive species.

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

- Succession that is not controlled by mowing or other methods of disturbance will likely cause the habitat to become unsuitable for the species of concern to be able to persist at this site.
- Herbicide and fertilizer use in the right-of-way, lawns, and along roads may cause direct mortality to the species of concern and degrade habitat conditions.
- Invasive species are present in this site and may displace native vegetation, including species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

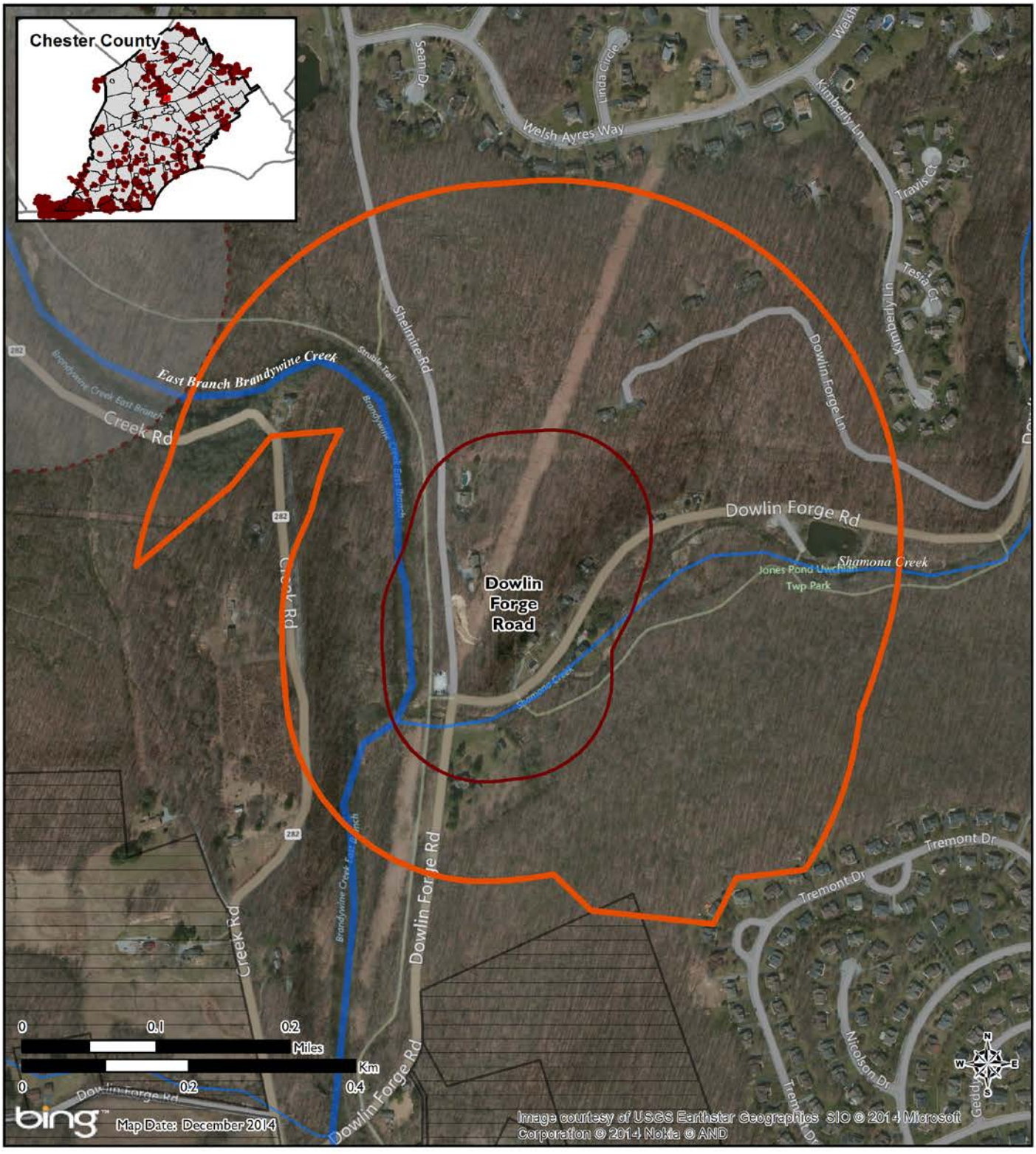
The right-of-way is actively managed to control succession within that corridor. Maintenance should be done outside of the growing season in order to limit the impact on the native species at this site. Limit disturbance within the rest of the NHA to protect the forested habitat.

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

- St. Andrew's-cross requires open habitat that needs to be maintained. The needs of this species should be considered when planning the timing and frequency of maintenance.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *East Brandywine Township, Uwchlan Township*
USGS quads: *Downingtown*
Previous CNHI reference: *Dowlin Woods*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Dowlin Forge Road Natural Heritage Area

Open, disturbed upland habitat hosts a population of St. Andrew's-cross, an imperiled 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***
- ***Conservation Lands***

East Branch Brandywine Creek NHA

PNHP Significance Rank: *State*

Site Description

The East Branch Brandywine Creek NHA encompasses a landscape mostly composed of hardwood forest with some agricultural fields and surrounds a tributary of East Branch Brandywine Creek. The large forest block within this NHA provides suitable summer roosting and foraging habitat for the **Northern Myotis** (*Myotis septentrionalis*).

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]
Northern Myotis (Myotis septentrionalis)	G4	S1	---	7/6/2007	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.

By day, the Northern Myotis roosts within tree cavities or under the exfoliating bark of both live and dead trees. By night, this bat prefers to forage at canopy level along stream corridors and throughout forested habitats. Because of its preference for forested settings, large blocks of un-fragmented forest are preferred summer habitats. The rampant spread of White Nose Syndrome caused by the fungus *Pseudogymnoascus destructans* has caused dramatic losses to this species. Because of this, it is ever more important to protect summer foraging habitat in order to give bats the opportunity to gain crucial fat reserves for winter hibernation.

Charlie Eichelberger, PNHP

Ears that extend past the muzzle and a dagger-like tragus, the central external ear projection, distinguish the Northern Myotis from other *Myotis*

Threats and Stresses

Fragmentation of the large forest block contained within this NHA and degradation of water quality are threats to this site.

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

- Degradation of water quality can have indirect negative impacts on the species of concern found within this NHA. The storm water runoff from roadways, suburban development and agriculture should be considered a potential source of significant contamination. Runoff from these sources have significantly higher levels of sediment, nutrients, pesticides, herbicides and other pollutants than runoff filtered through a natural habitat.
- Fragmentation due to development or infrastructure activities can result in habitat loss and degradation of the site.
- Removal of live or dead trees with exfoliating bark can ruin existing or potential summer roosting habitat.
- Exotic invasive plant species threaten to compete with and displace native species.

- Over-browsing by white-tailed deer is a serious threat to the overall plant diversity and forest regeneration.

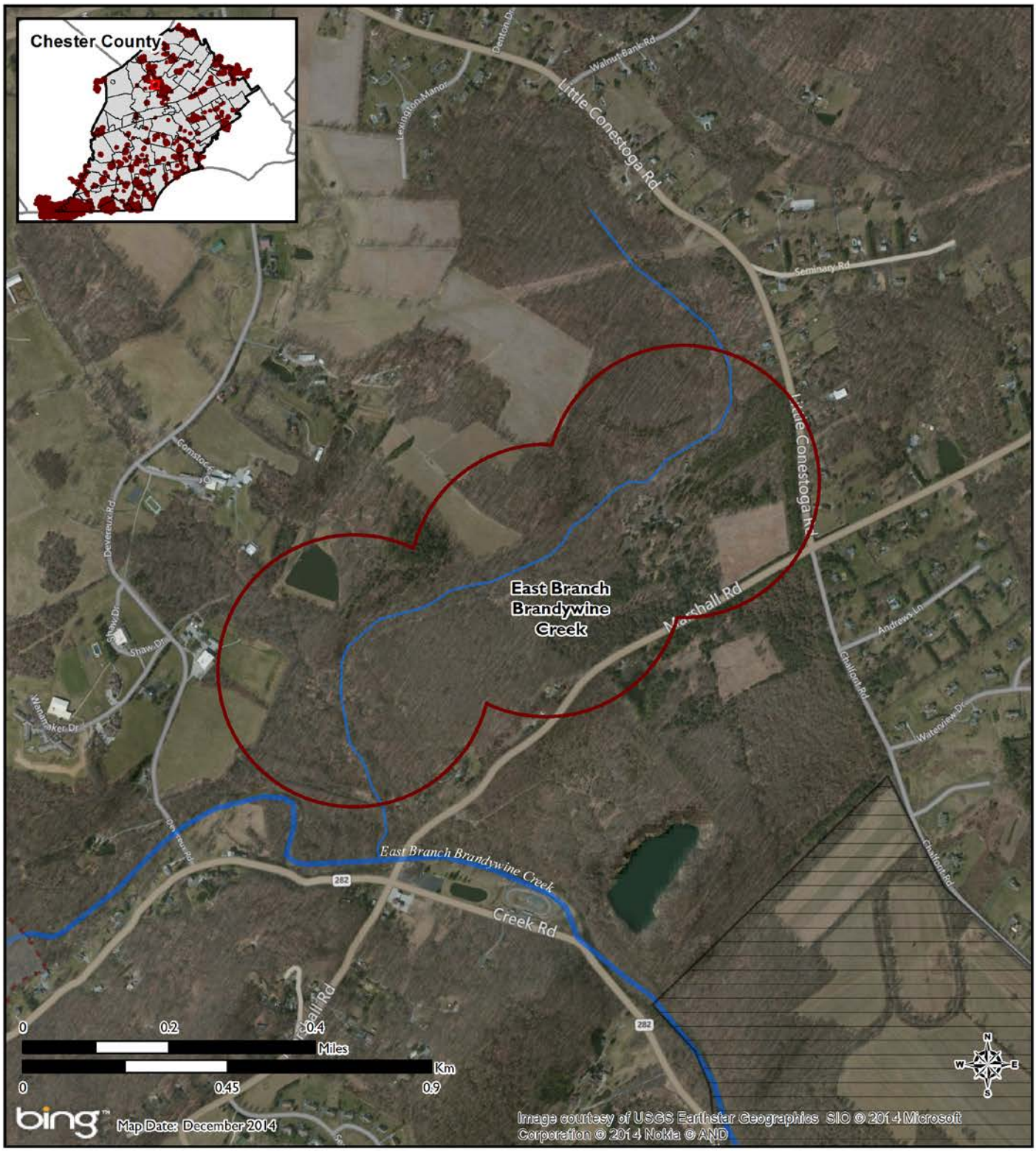
Conservation Recommendations

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

- Discourage the removal of live or dead trees with exfoliating bark. Trees such as Shagbark Hickory (*Caraya ovata*) and Shellbark Hickory (*Caraya laciniosa*) provide especially good daytime bat roosts. When tree removal is absolutely necessary, it should be carried out over the winter months during hibernation.
- While the Northern Myotis does not frequently roost or hibernate in manmade structures, structures destined for removal should be inspected for bat usage prior to demolition.
- 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 population of species of concern, the natural landscape also helps to protect water quality of the stream that drains through this NHA.
- Control invasive plant species to prevent native species from being crowded out by introduced species. 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 and repair a heavily infested habitat. Invasive species management should be coordinated by individuals familiar with the rare species as well as the invasive species present. Continual invasive species monitoring and control will be necessary.
- Reduce the deer density in the area. Uncommon species of native plants are particularly susceptible to deer herbivory.

Location

Municipalities: *Wallace Township*
USGS quads: *Downingtown, Wagontown*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



East Branch Brandywine Creek Natural Heritage Area

Riparian forest and forested wetland provide habitat for a population of northern myotis, a bat species critically imperiled 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***

East Green Valley Road Woods NHA

PNHP Significance Rank: *State*

Site Description

This site is designated around a population of **Nuttall's tick-trefoil** located on a lightly sloping dry woodland. This species is at the northern edge of its range in Pennsylvania. It is found from New Jersey west to Illinois and south to Florida and Texas. It has been documented mostly in the southeastern corner of the state.

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]
Nuttalls' Tick-trefoil (*Desmodium nuttallii*)	G5	S2	TU (PT)	10/8/1990	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

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

- Succession that is not controlled by mowing or other methods of disturbance will likely cause the habitat to become unsuitable for the species of concern to be able to persist at this site.
- Over-browsing by white-tailed deer impacts native vegetation and structure of the habitat.
- Invasive species can take over portions of the habitat currently used by the species of concern and other native species.

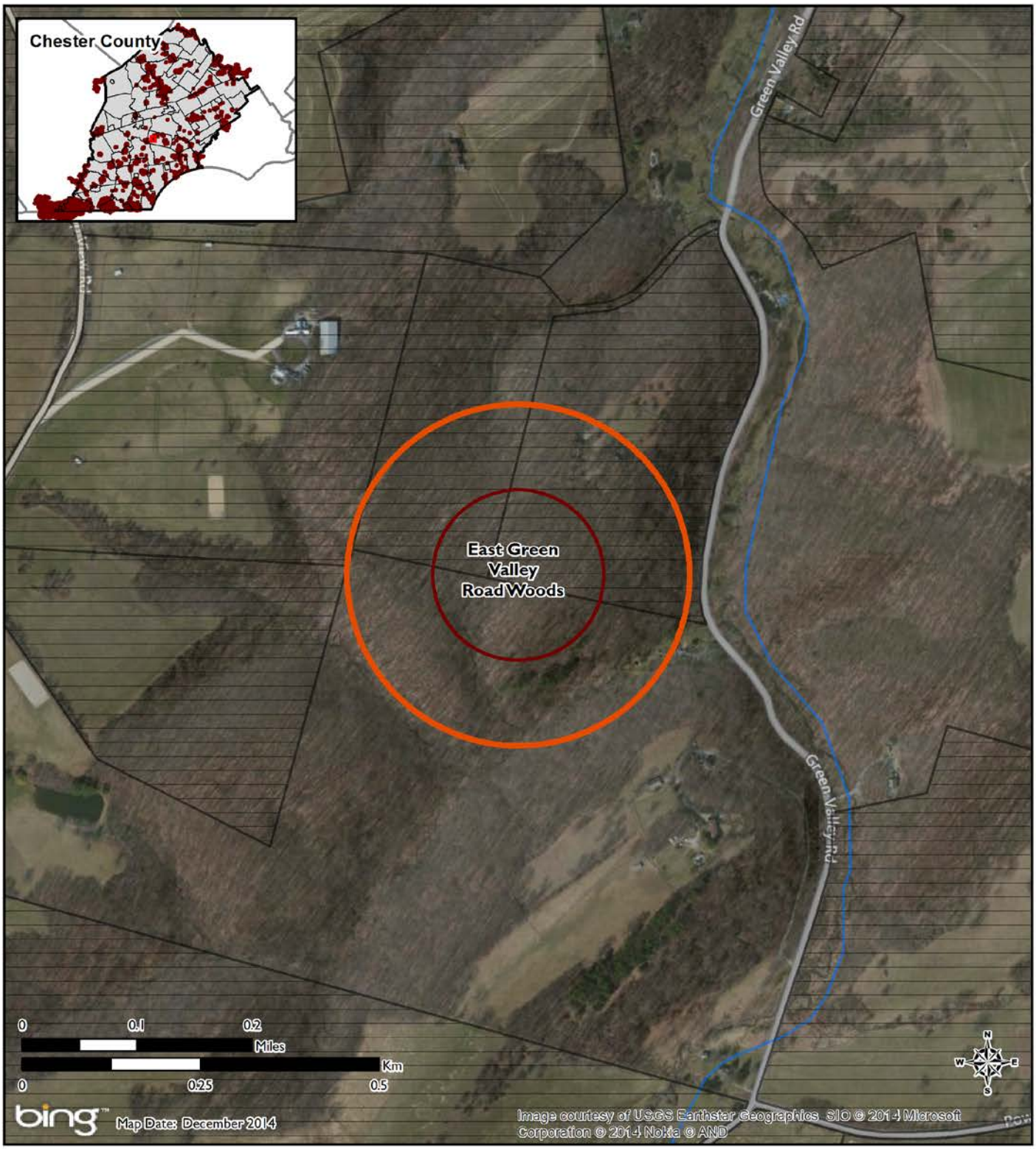
Conservation Recommendations

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

- Smooth tick-trefoil requires open habitat that needs to be maintained. The needs of this species should be considered when planning the timing and frequency of maintenance.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.

Location

Municipalities: *Newlin Township*
USGS quads: *Coatesville*
Previous CNHI reference: *East Green Valley Road Site*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Easement*



East Green Valley Road Woods Natural Heritage Area

An old meadow opening in this forest patch supports Nuttall's tick-trefoil, an imperiled plant species in Pennsylvania.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Edgemoor Lane Meadow NHA

PNHP Significance Rank: *State*

Site Description

Edgemoor Lane Meadow NHA is a wooded site with early successional habitat along a utility right-of-way with adjacent open, wet meadow habitat. The wet meadow is dominated by grasses and herbaceous species. The surrounding habitat is a mix of agricultural fields and residential developments with small remnant woodlots. The early successional habitat within Edgemoor Lane Meadow NHA supports a population of **bushy bluestem**, a plant 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]
Bushy Bluestem (*Andropogon glomeratus*)	G5	S3	TU (PR)	9/24/2006	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.

Bushy bluestem has a range across the continent in the southern states, with an extension northeastward into southern New England. In Pennsylvania, it has been documented historically in scattered locations, particularly in the southern counties. Bushy bluestem grows in a variety of damp to wet open places, clearings, and sometimes in human-created disturbed ground. Given the preference of the species for open habitats, active management, such as fire, mowing, or invasive species removal, is often required to maintain the proper successional stage at sites where it grows.


Denise Watts, PNHP
Bushy bluestem (*Andropogon glomeratus*)

Threats and Stresses

Invasive species are found throughout this site and may alter the native species composition. Further development of the area may destroy the remaining habitat within the NHA. Maintenance within the right-of-way may negatively impact native species with excessive mowing and herbicide use.

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

- Invasive species are common in many areas of this site and may displace native vegetation, including species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Succession of the open grassy fields may cause the habitat used by bushy bluestem to become overgrown and shaded by woody species.

- Herbicides, fertilizers, and sediment from lawns, right-of-way, and roads may wash into the forested area and degrade the habitat conditions.

Conservation Recommendations

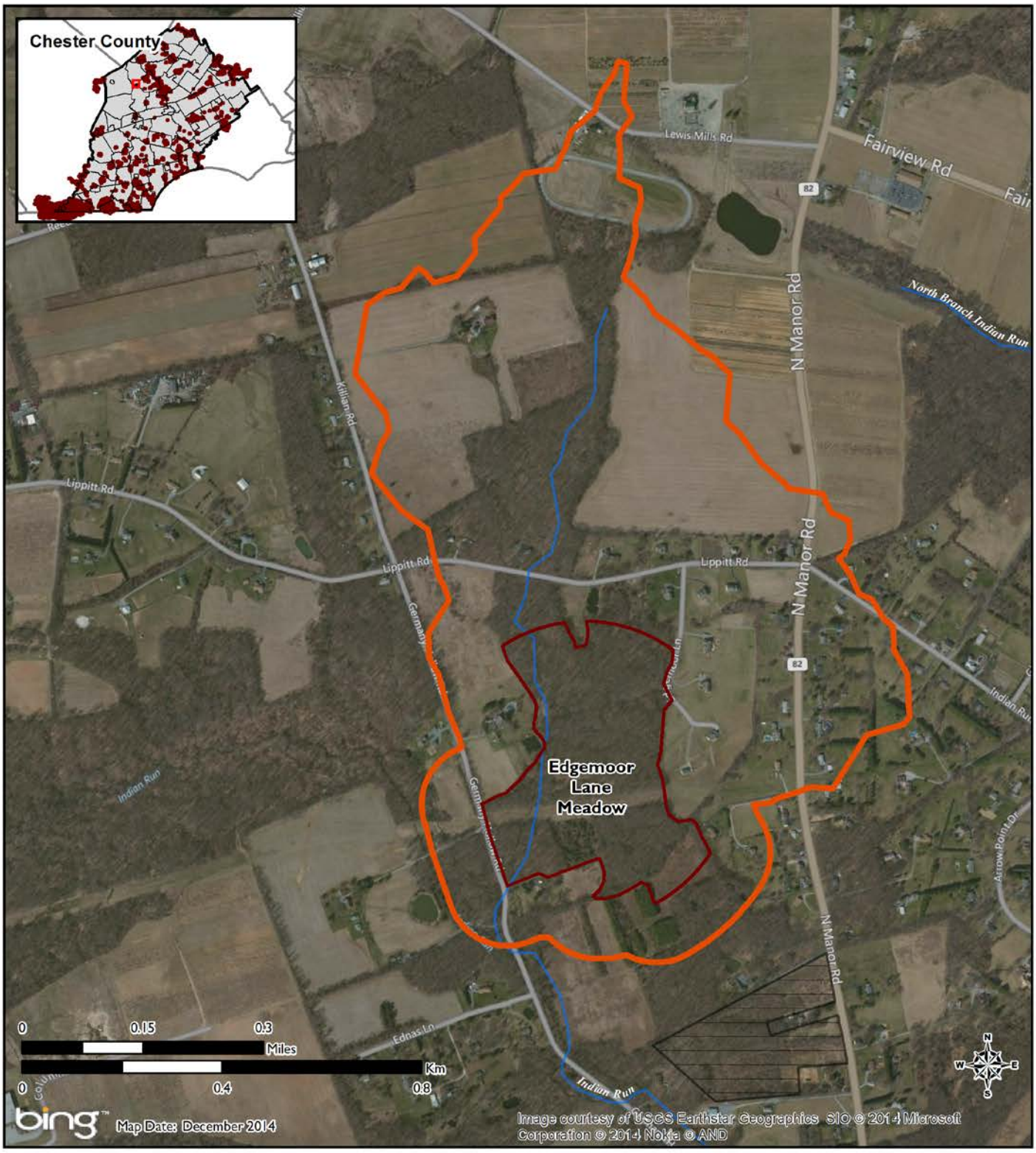
Avoid fragmenting the NHA with additional infrastructure in order to protect the quality of the habitat. Conduct maintenance in the right-of-way and other early successional habitat outside of the growing season and limit the use of herbicides.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Reduce the number of deer, then continue to monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Remove woody species and maintain the grassy habitat openings for bushy bluestem and other early successional species. Perform periodic maintenance, such as mowing, outside of the growing season to prevent woody species from taking over the area. The needs of the species of concern should be considered when planning the timing and frequency of maintenance.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.

Location

Municipalities: *Wallace Township, West Nantmeal Township, West Brandywine Township*
USGS quads: *Wagontown*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Edgemoor Lane Meadow Natural Heritage Area

A small meadow supports a population of bushy bluestem, 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***
- ***Conservation Lands***

Elm Creek Wet Woods NHA

PNHP Significance Rank: *State*

Site Description

Elm Creek Wet Woods is a patch of wooded habitat near Daleville that contains the headwaters of a small tributary to East Branch Big Elk Creek. The larger wooded area at the northern end of this site is dominated by tulip poplar, red maple, and black cherry. The wooded habitat at the southern end of the NHA is a narrow band of riparian woods dominated by red maple with a number of seeps. The wet wooded habitat throughout this NHA supports a population of **fringe-tree**. The edge of the woodland provides habitat for **stiff cowbane**. Both of these are plant species of concern found in wetland habitats.

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]
Fringe-tree (*Chionanthus virginicus*)		G5	S3	N (PT)	6/18/2005	BC
Stiff Cowbane (*Oxypolis rigidior*)		G5	S2	TU (PT)	5/9/1999	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.

Fringe-tree is a shrub or small tree found from New York and Massachusetts south to Florida and Texas. It is near the northern end of its range in Pennsylvania and has mostly been documented in the southern counties. Most current records are in the southeastern part of the state. Fringe-tree is found in moist woods and along streams. It is threatened by habitat loss, invasive species, and excessive deer browse.

Stiff cowbane is a plant species in the carrot family. Its range spans from New Jersey west to Minnesota and south to Texas and Florida. It is at the northern edge of its range in Pennsylvania and has mostly been documented in southern counties. Stiff cowbane is found in open, wet habitats.

Threats and Stresses

Portions of this habitat have been logged. Further logging and other disturbances will fragment the habitat and allow for the introduction and spread of invasive species. Invasive species are found throughout this NHA and threaten the habitat conditions and species composition.

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

- Logging, development, or other major activities will further fragment the existing habitat and alter the conditions needed by the species of concern. Disturbances will also open areas that will be easily colonized by invasive species.
- Runoff and other sources of water pollution from the surrounding area threaten to degrade the water quality of streams and surrounding wetlands.
- Changes in the currently hydrology could significantly alter the habitat for the plant species of concern by making conditions either too wet or too dry to be able to persist at this site.

- Invasive species can take over portions of the habitat currently used by the species of concern and other native species.
- Herbicide and fertilizer use in fields, the powerline right-of-way, and along roads may wash into the wooded habitat and degrade the habitat conditions and cause direct mortality.
- Over-browsing by white-tailed deer and livestock impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

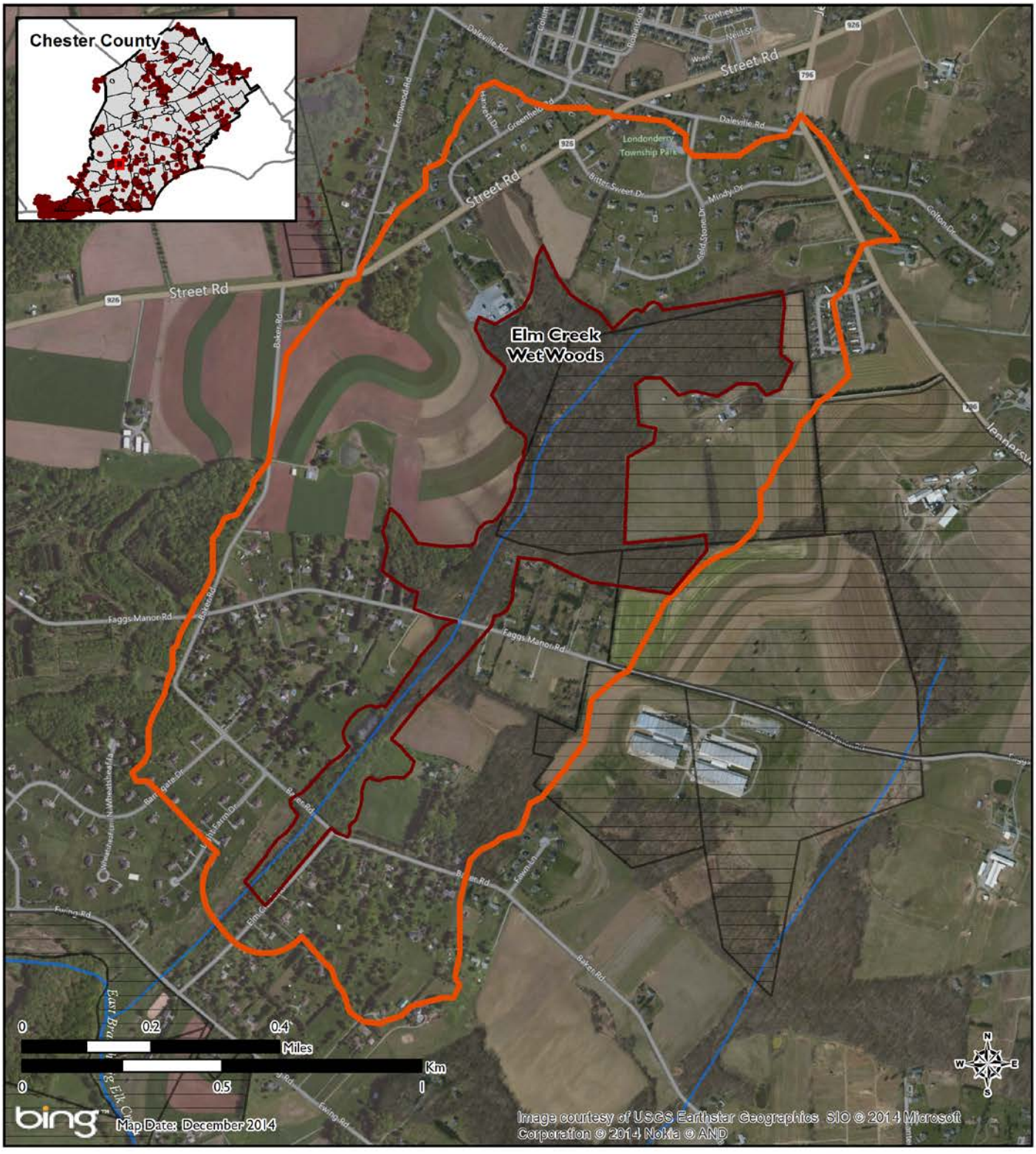
A portion of the upper end of this NHA is covered under an agricultural easement. This should help to protect this area from development. Further disturbances to this area should be avoided in order to protect the quality of the habitat.

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

- Protect the existing wooded areas from logging and other large scale disturbance. Keep the forest as intact as possible to protect the habitat and species within it.
- Widen the native vegetated buffer along stream, especially the lower end of the NHA. A width of 100 meters is ideal, but any increase will benefit the stream and adjacent wetlands.
- Maintain the existing hydrology. Any activities that occur along the roads and other areas surrounding the NHA should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Keep livestock out of the wooded habitat.

Location

Municipalities: *Londonderry Township*
USGS quads: *Oxford*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Agricultural Easement*



Elm Creek Wet Woods Natural Heritage Area

Forest and forested wetland at this site supports two plant species of concern in Pennsylvania: fringe-tree and stiff cowbane.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Embreeville Road Wetlands NHA

PNHP Significance Rank: *State*

Site Description

Embreeville Road Wetlands is located along Brandywine Creek near the waste water treatment plant. Agricultural fields and woodlots surround much of the NHA, with some commercial development. The open wetland habitat is dominated by black willow and herbaceous species. The water level in this floodplain area has been altered from its natural conditions. The open, wetland habitat supports a population of **tooth-cup**, a plant 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]
Tooth-cup (*Rotala ramosior*)	G5	S3	PR (PR)	9/27/1998	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.

Tooth-cup grows in exposed, wet habitats. This species has a wide range covering most of the United States and into Canada. In Pennsylvania, it is most commonly seen along the Susquehanna River, and has been documented in southeastern counties as well.

Threats and Stresses

Changes in hydrology to this site and surrounding streams and wetlands may change the habitat conditions and species composition within the NHA. Invasive species can displace native species and alter the water level of the habitat.

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

- Runoff and other sources of water pollution from the surrounding area threaten to degrade the water quality of streams and surrounding wetlands.
- Changes in the currently hydrology could significantly alter the habitat for the plant species of concern by making conditions either too wet or too dry to be able to persist at this site.
- Succession of the open muddy areas and other early successional habitat may cause the area used by tooth-cup to become overgrown and shaded by woody species.
- Invasive species can take over portions of the habitat currently used by the species of concern and other native species.
- Herbicide and fertilizer use in fields and along roads may wash into the wooded habitat and degrade the habitat conditions and cause direct mortality.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

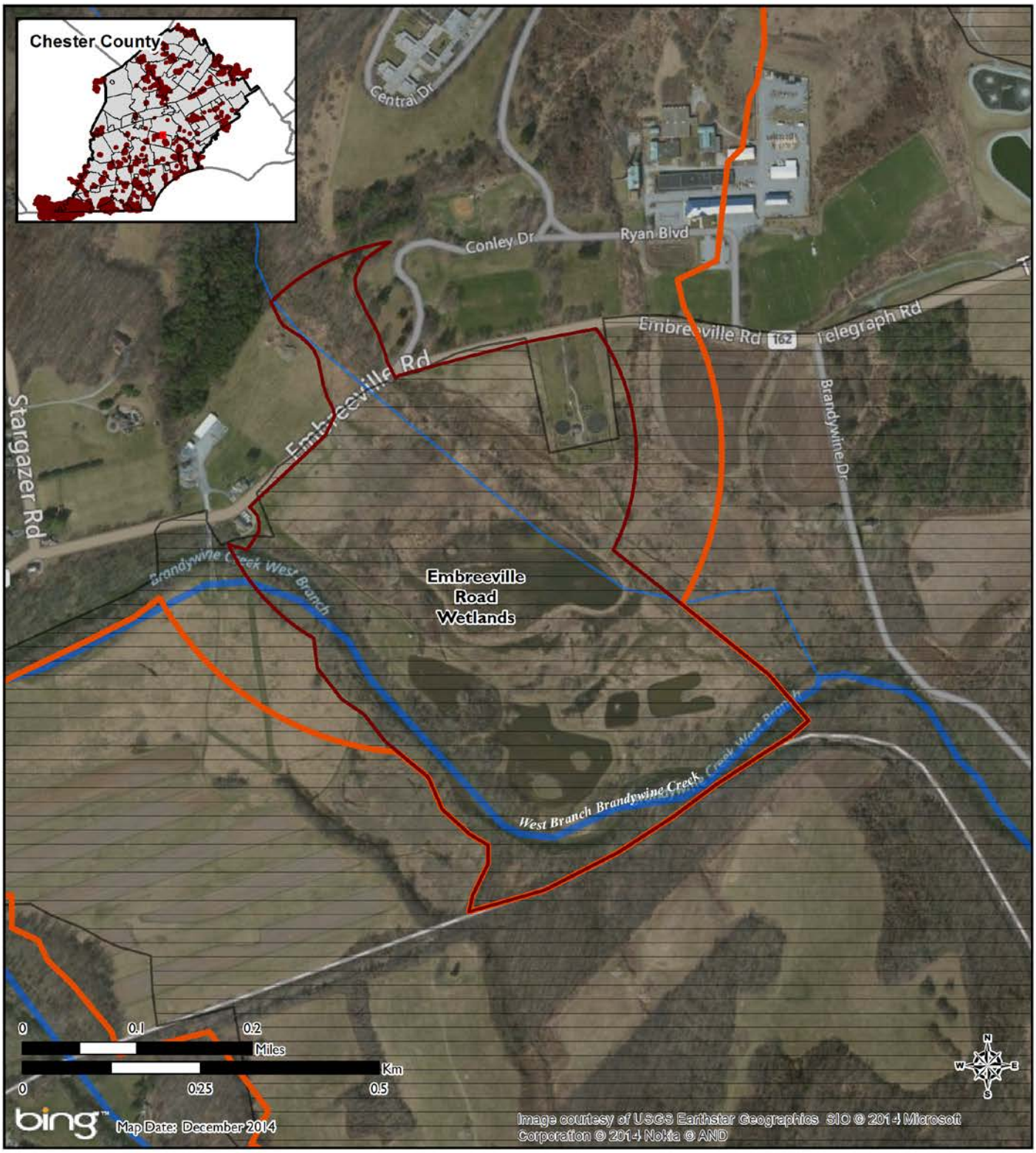
Maintain the existing habitat and hydrology of Embreeville Road West NHA. Create a vegetated buffer along Brandywine Creek and its tributaries and wetlands in order to improve the quality of the habitat.

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

- Maintain the existing hydrology. Any activities that occur along the roads should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.
- Remove woody species and other densely growing species that cover open muddy habitat.
- Widen the native vegetated buffer along the upper end of the stream. A width of 100 meters is ideal, but any increase will benefit the stream and adjacent wetlands.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.

Location

Municipalities: *West Bradford Township, Newlin Township*
USGS quads: *Unionville*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Embreeville County Park*



Embreeville Road Wetlands Natural Heritage Area

Wetlands with shallow pools support a population of tooth-cup, 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***
- ***Conservation Lands***

Embreeville West NHA

PNHP Significance Rank: *State*

Site Description

Embreeville West NHA consists of the forested slope to the south of West Branch Brandywine Creek and the forest hillside along a small tributary. Several rock outcrops occur along the steep hillside in this area that support **lobed spleenwort**, a small fern species of concern. This site is split on the northern end by Brandywine Creek Road. Embreeville West NHA is part of a larger forest block that has been fragmented by roads, residential areas, and agriculture.

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]
Lobed spleenwort (*Asplenium pinnatifidum*)	G4	S3	N (PR)	7/10/2012	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.

Lobed spleenwort is a small fern found from New Jersey west to Wisconsin and south from Georgia to Oklahoma. It is uncommon in most parts of its range and is at the northern edge of its range in Pennsylvania. Populations have been documented in the southern portion of the state but most are small. This species has a specialized habitat on cliffs and rocks outcrops, which limits the ability of existing populations to expand into new habitats.

Denise Watts, PNHP

Lobed spleenwort (*Asplenium pinnatifidum*) grows on rock outcrops.

Threats and Stresses

Invasive species are present throughout this site and may negatively impact the species of concern. The road that bisects this NHA may also degrade the quality of this site by introducing new invasive species and herbicides, as well as increasing erosion along the steep hillsides.

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

- Invasive species may overtake the limited habitat available for lobed spleenwort. Invasive species are already present on the rock outcrops, and may spread to areas inhabited by the species of concern.
- Herbicides sprayed along Brandywine Creek Road through this site may blow or wash off onto areas occupied by lobed spleenwort.
- Logging will further fragment the remaining forest and may open up the shaded habitat needed by the lobed spleenwort. This may also introduce additional invasive species into the area.

Conservation Recommendations

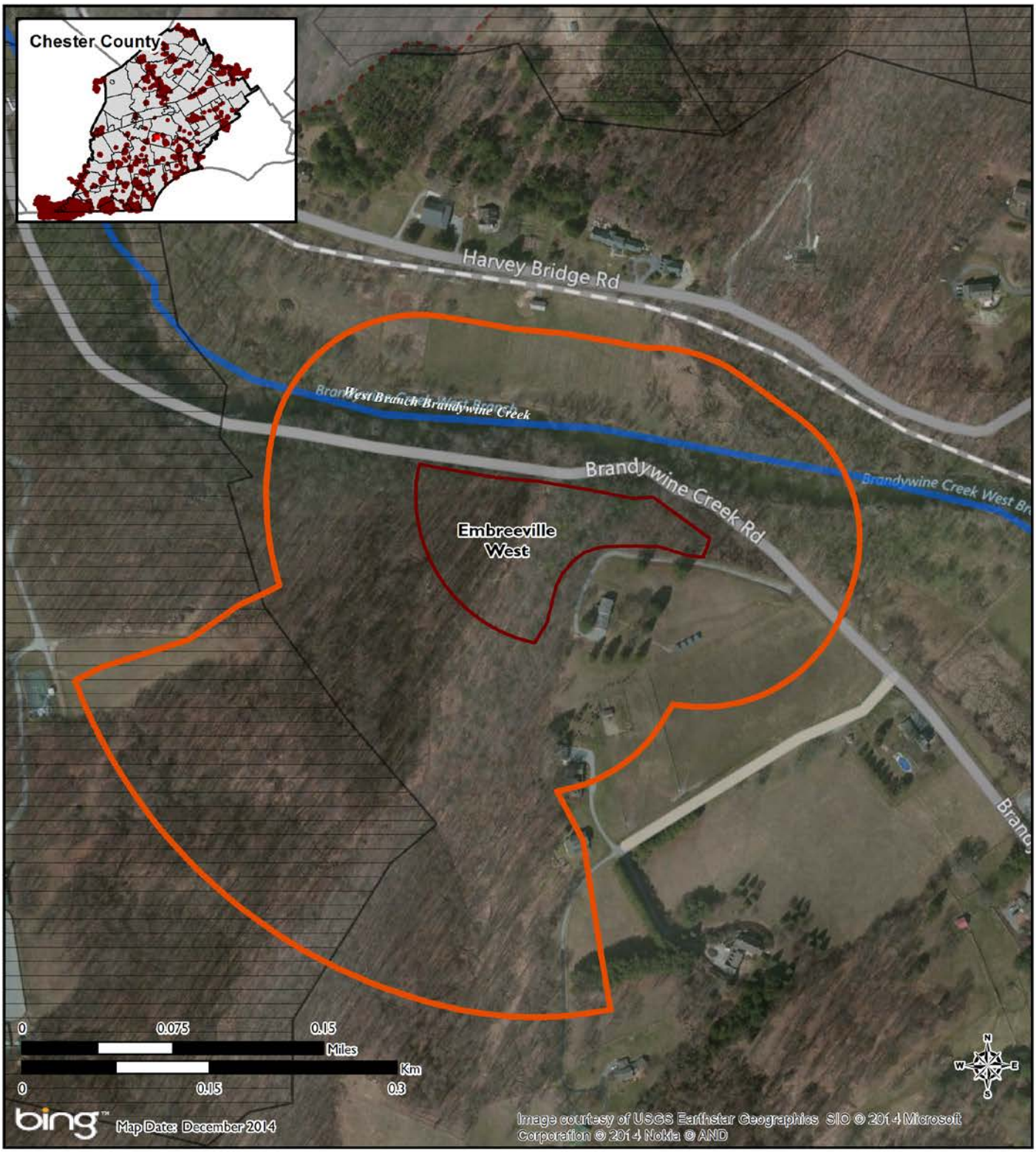
The forested buffer around portions of Embreeville West NHA should be kept intact to maintain the integrity of this site. Further fragmentation should be avoided to reduce impacts to lobed spleenwort and other native species.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Limit herbicides sprayed along the road and maintain the forested habitat adjacent to the road in order to filter sediments and other pollutants in runoff.
- Protect the existing forested areas from logging and other large scale disturbance. Keep the forest as intact as possible to protect the habitat and species within it.

Location

Municipalities: *Newlin Township*
USGS quads: *Unionville*
Previous CNHI reference: *Embreeville West Site*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Embreeville West Natural Heritage Area

Rocky outcrops provide habitat for lobed spleenwort, a plant species of concern in PA.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Ewart Road Meadow NHA

PNHP Significance Rank: *State*

Site Description

Ewart Road Meadow NHA is located north of Route 41 near Kaolin in a landscape dominated by residential development and agricultural fields. The headwaters of a small tributary to Mill Creek begins in this NHA and flows east through a narrow band of maple woods along the stream channel. A wet meadow and pastures are found adjacent to the woods. The open habitat edge supports a population of **eastern coneflower**, a plant 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]
Eastern Coneflower (*Rudbeckia fulgida*)	G5	S3	N (PT)	8/28/1999	CD

[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.

Eastern coneflower is found from Massachusetts west to Wisconsin and south to Florida and Texas. In Pennsylvania, it is most commonly found in the southeastern and south central regions of the state, along with some occurrences in western counties. Eastern coneflower can be found in a variety of habitat types, including woodland openings, wet meadows, and rocky ledges.

Threats and Stresses

Herbicides used to manage the right-of-way can cause mortality and may alter species composition. Succession of woody species can shade out early successional species, but excessive mowing may also have a negative impact on native species.

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

- Invasive species are found in this NHA and may displace native vegetation, including species of concern.
- Growth of woody species in the early successional habitat may cause the area used by eastern coneflower to become overgrown and shaded.
- Herbicides sprayed on the pipeline right-of-way and fields may cause direct mortality to the species of concern and other native species. Fertilizers from surrounding lawns may also wash into the NHA and degrade habitat conditions.
- Changes in hydrology may make the habitat unsuitable to the species of concern found here.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

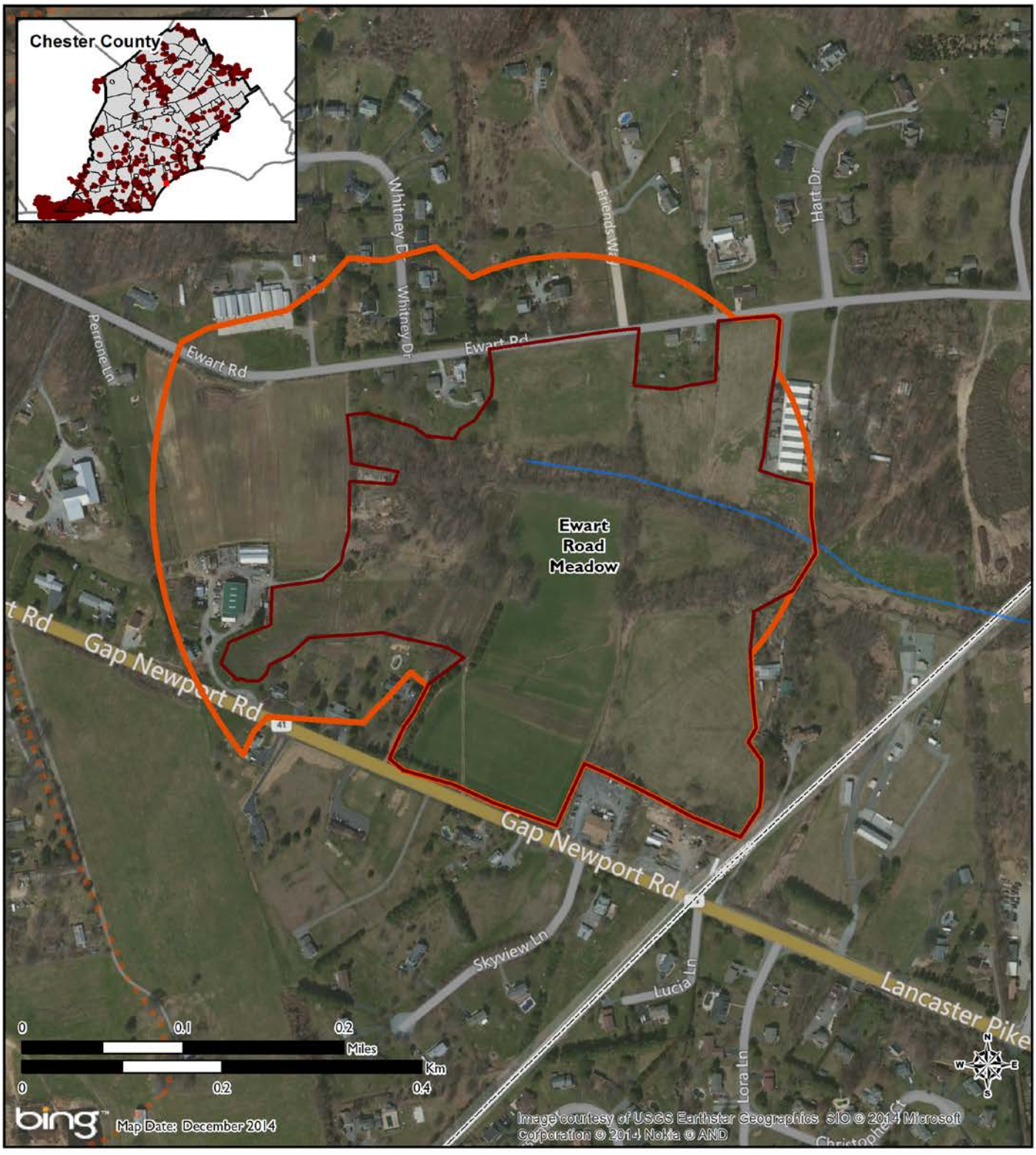
Occasional disturbance will likely be necessary to maintain the habitat conditions and prevent the succession of woody species. Maintenance should be done outside of the growing season with minimal herbicide use to limit impact to native species.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Eastern coneflower requires open habitat that needs to be maintained with mowing or other methods of disturbance. The needs of this species should be considered when planning the timing and frequency of maintenance.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Maintain the existing hydrology. Any activities that occur along the roads and other nearby areas should be conducted with a consideration for the impact to the flow of water into the nearby stream and wetlands.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Kennett Township*
USGS quads: *Kennett Square*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Ewart Road Meadow
Natural Heritage Area

Open, disturbed fields and edge habitat support a population of Eastern coneflower, a vulnerable plant species in Pennsylvania.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

Ewing Road Wetland NHA

PNHP Significance Rank: *State*

Site Description

The Ewing Road Wetland NHA encompasses a landscape composed of mixed forest and wetland habitats interspersed among active agricultural operations that surround a small tributary of East Branch Big Elk Creek. Spring-fed seeps feed wet meadows that provide suitable habitat for a **sensitive species of concern** that is not named 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**	---	---	---	5/25/2000	E
Sensitive species of concern B[3]	**S**	---	---	---	5/25/2000	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.

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

Threats and Stresses

Degradation of water quality and loss of natural habitat are critical threats to this site.

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 storm water runoff from roadways, suburban development and agriculture should be considered a potential source of significant contamination. Runoff from these sources have significantly higher levels of sediment, nutrients, pesticides, herbicides and other pollutants than runoff filtered through a natural habitat.
- Draining or flooding of wet meadow and forested wetland habitats can eliminate suitable habitat for the species of concern.
- Fragmentation due to development or infrastructure activities can result in habitat loss and degradation of the site.
- Exotic invasive plant species threaten to compete with and displace native species.
- Over-browsing by white-tailed deer is a serious threat to the overall plant diversity and forest regeneration.

Conservation Recommendations

This site will be best protected by maintaining the integrity of vegetative buffers and assuring a consistent hydrologic regime to protect wetlands.

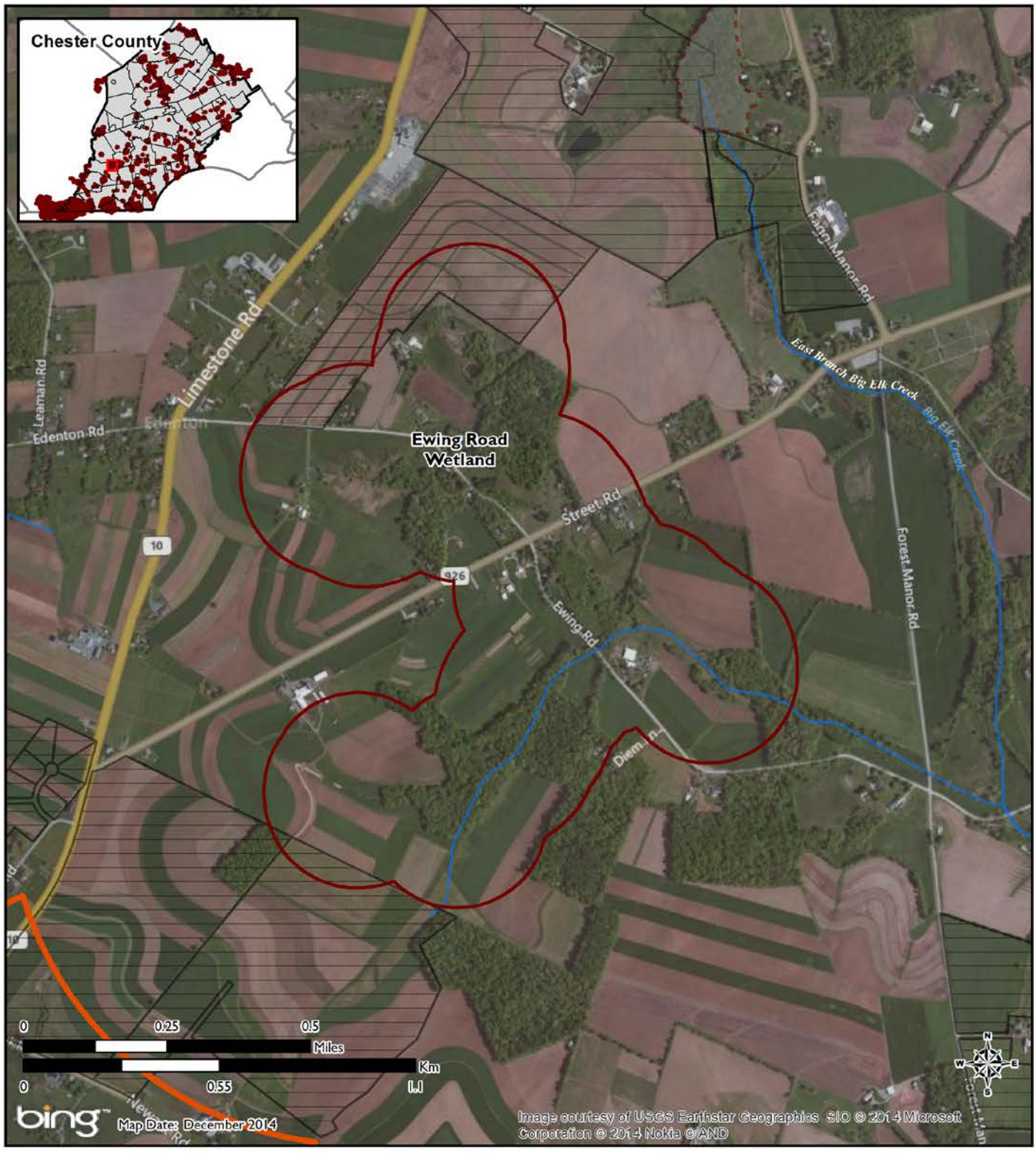
The following steps are recommended to ensure the persistence of these species at this site:

- Avoid disrupting the hydrology of the site by draining or filling the wetlands, or disturbing the surface or groundwater hydrology.

- Protect remaining portions of the forested riparian zone and repair others that have been degraded, by encouraging the growth of native vegetation. Careful determination is needed to avoid planting trees in floodplains that should remain as open canopied herbaceous wetland habitats. These habitats should be maintained in their current open condition, with tree plantings to occur uphill of areas containing hydric soils.
- Stormwater management measures such as the creation of detention basins or vegetated swales should be implemented to decrease the unfiltered flow down the slopes into the creek floodplain.
- 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 population of species of concern, the natural landscape also helps to protect water quality of the streams that drain through this NHA.
- Control invasive species of plants to prevent native species from being crowded out by introduced species.
- Reduce the deer density in the area. Uncommon species of native plants are particularly susceptible to deer herbivory.

Location

Municipalities: *Upper Oxford Township*
USGS quads: *Oxford*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Agricultural Easement*



Ewing Road Wetland
Natural Heritage Area

Wetland habitat 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*
- *Conservation Lands*

Faggs Manor Road Wetland NHA

PNHP Significance Rank: *State*

Site Description

Faggs Manor Road Wetland NHA is a young red maple woods located at the headwater of a tributary to East Branch Big Elk Creek. This NHA is a small forest, approximately 15 acres in size and predominantly surround by agricultural fields. Some residential development occurs in nearby areas. This young wooded area provides habitat for a small population of stiff cowbane, a plant species of concern. The continued shading of this habitat as the forest matures will likely impact the ability of **stiff cowbane** to persist at 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]
Stiff Cowbane (*Oxypolis rigidior*)	G5	S2	TU (PT)	8/28/2005	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.

Stiff cowbane is a plant species in the carrot family. Its range spans from New Jersey west to Minnesota and south to Texas and Florida. It is at the northern edge of its range in Pennsylvania and has mostly been documented in southern counties. Stiff cowbane is found in open, wet habitats.

Stephanie Seymour

Stiff cowbane (*Oxypolis rigidior*)

Threats and Stresses

Due to the small size of this NHA, any disturbances to the surrounding area may have a large effect on the species found here. Fertilizers, herbicides, and sediment from the surrounding fields may wash into the wetland and degrade the water quality. Invasive species may also spread quickly through the habitat. Succession will continue to alter the habitat conditions found within this NHA.

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

- Continued succession of the young woodlot will likely alter the hydrology of the site and shade the remaining early successional habitat.
- Herbicides, fertilizers, and sediment from agricultural fields may wash into the wetland area and degrade the habitat conditions.
- Invasive species are present at this site and may displace native vegetation, including species of concern.
- Changes in hydrology may make the habitat unsuitable to the species of concern found here.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

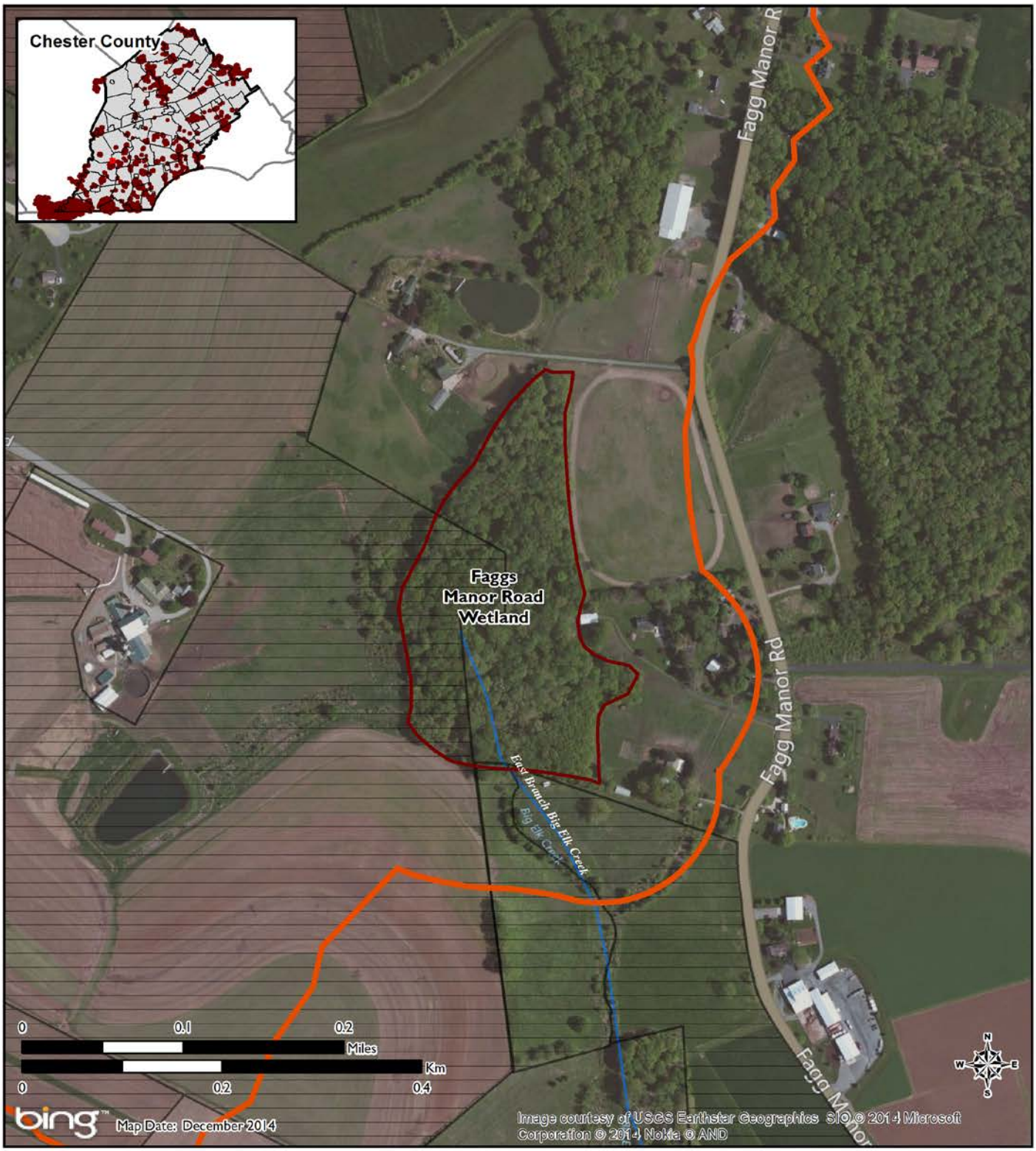
Increase the forested buffer along East Branch Big Elk Creek to protect the water quality of the stream and surrounding wetlands. Limit the use of chemicals on the fields to prevent them from entering into the stream via runoff.

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

- Maintain some areas of early successional and shrubby habitat along the edges of the red maple woods to provide habitat for stiff cowbane.
- Limit herbicide use to situations where it is necessary, such as to control invasive species. Create a sufficient vegetated buffer along the stream in order to filter sediment and chemicals from runoff. A buffer of 100 meter is ideal, but any increase will help to protect the water quality.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Maintain the existing hydrology. Any activities that occur in the fields and along roads should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *West Fallowfield Township, Londonderry Township, Upper Oxford Township*
USGS quads: *Oxford*
Previous CNHI reference: *East Branch Big Elk Creek*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Easement, Agricultural Easement*



Faggs Manor Road Wetland Natural Heritage Area

Wetland habitat supports a population of stiff cowbane, an imperiled 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***
- ***Conservation Lands***

Fairville Road Woods NHA

PNHP Significance Rank: *State*

Site Description

Fairview Road Woods NHA is small patch of wooded habitat that is approximately 40 acres in size. The NHA is one of a number of small, remnant wooded areas in a landscape that has been fragmented by residential development. The habitat within this NHA supports a population of **puttyroot**, a plant 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]
Puttyroot (*Aplectrum hyemale*)	G5	S3	PR (PR)	12/6/1998	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.

In Pennsylvania, puttyroot is most commonly found in the southeastern counties and grows in moist woodlands and on forested slopes and streambanks. Puttyroot produces leaves that are visible through the fall and winter. The leaves wither in late spring and the plant flowers in May and June.

Threats and Stresses

Continued development of this area would cause direct destruction of the wooded habitat and create openings that would allow for the introduction and spread of invasive species. Disturbances around the existing adjacent houses may degrade the habitat, including erosion and chemical runoff.

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

- Invasive species are found at this site and may displace native vegetation, including species of concern.
- Logging, development, or other major activities will further fragment the existing forest and alter the conditions of the habitat needed by the species of concern. Disturbances will also open areas that will be easily colonized by invasive species.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Herbicides and fertilizers used in lawns, fields, and along roads may wash into the forested area and degrade the habitat conditions.

Conservation Recommendations

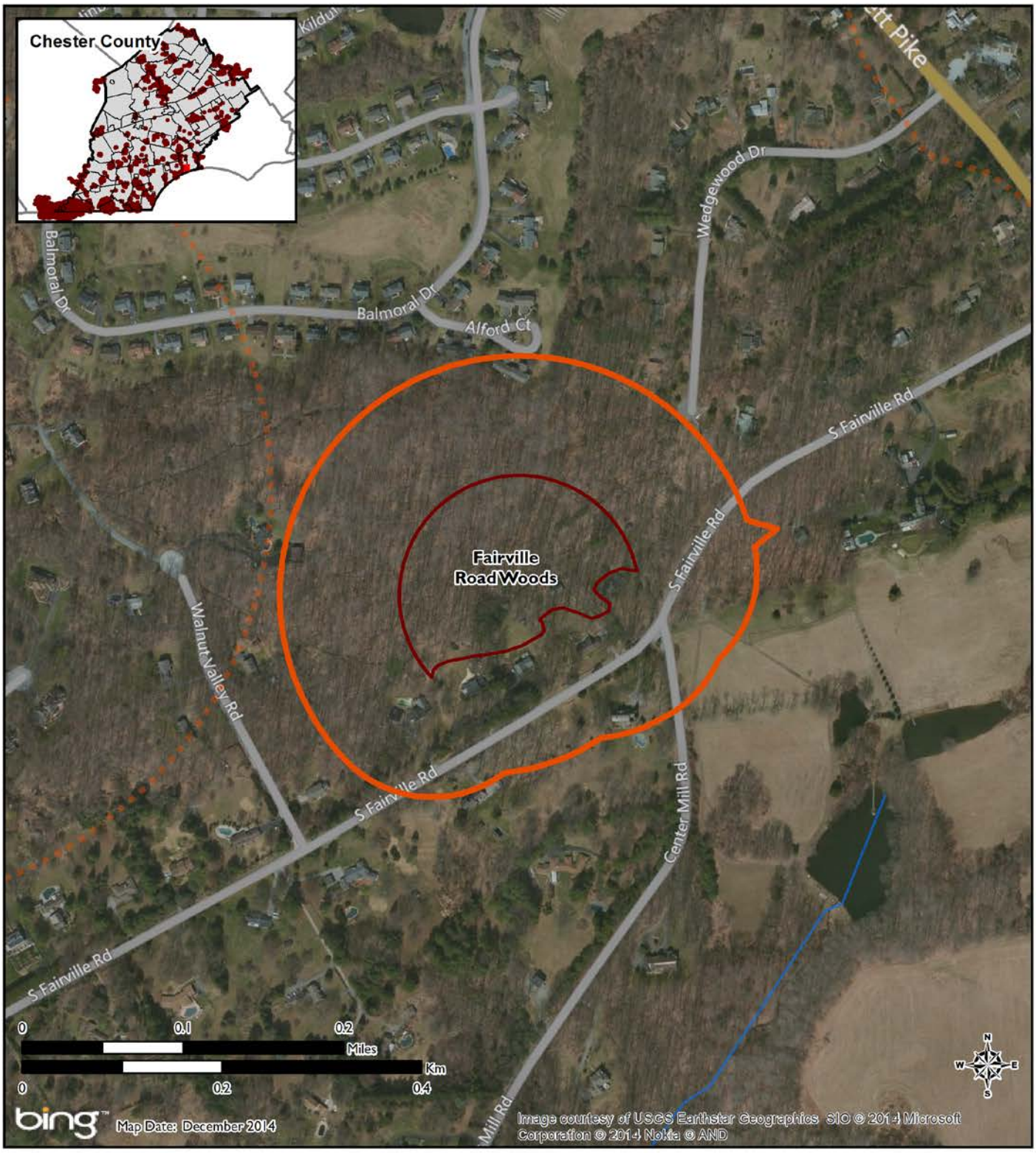
Avoid fragmenting the remaining forested area with logging or infrastructure and attempt to limit development activities around the adjacent houses in order to protect the quality of this habitat.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Protect the existing forested areas from logging and other large scale disturbance. Keep the forest as intact as possible to protect the habitat and species within it.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.

Location

Municipalities: *Kennett Township*
USGS quads: *Kennett Square*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Fairville Road Woods
Natural Heritage Area

This forested site supports a population of puttyroot, a plant species of concern in PA.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

Fern Hill Serpentine Barrens NHA

PNHP Significance Rank: *Regional*

Site Description

This Natural Heritage Area contains a globally rare serpentine habitat in a mosaic of the characteristic serpentine barren plant communities, which include small, open gravel areas, and grassy meadows, within a matrix of conifer and deciduous dominated woodland habitats in various stages of natural succession. The serpentine habitats are often referred to as grasslands, and the scattered herbaceous openings can have a strong representation of warm season grasses and grass-like plants, but they also contain a good diversity of other plant species, many rare at the state and global levels. Fern Hill Serpentine Barrens is currently known to support two butterfly species of concern, and nine plant species of concern. The serpentine community itself is considered globally uncommon due to the limited occurrences of this habitat type around the world.

John Kunsman (PNHP)

Arrow-feathered Three-awn
(*Aristida purpurascens*)

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]
Red-cedar - pine serpentine shrubland	C	GNR	S1	N (N)	2005	C
Serpentine grassland	C	GNR	S1	N (N)	2006	E
Serpentine virginia pine - oak forest	C	GNR	S2	N (N)	2005	E
Dusted Skipper (*Atrytonopsis hianna*)		G4G5	S2	N (N)	5/21/2005	AC
Cobweb Skipper (*Hesperia metea*)		G4	S2	N (N)	5/21/2005	AC
Small White-snakeroot (*Ageratina aromatica*)		G5	S3	N (PR)	8/31/2009	B
Arrow-feathered Three-awn (*Aristida purpurascens*)		G5	S2	PT (PT)	8/31/2009	B
Tall Gramma (*Bouteloua curtipendula*)		G5	S2	PT (PT)	8/31/2009	B
Tufted Hairgrass (*Deschampsia cespitosa*)		G5	S3	N (PT)	8/31/2009	B
Heller's Witchgrass (*Dichanthelium oligosanthes*)		G5	S3	N (PT)	8/31/2009	B
Annual Fimbry (*Fimbristylis annua*)		G5	S2	PT (PT)	8/31/2009	C
Plain Ragwort (*Packera anonyma*)		G5	S2	PR (PR)	8/31/2009	B
Few Flowered Nutrush (*Scleria pauciflora*)		G5	S2	PT (PT)	8/31/2009	B
Serpentine Aster (*Symphyotrichum depauperatum*)		G2	S2	PT (PT)	7/21/1992	C
Sensitive species of concern A[3]	S	---	---	---	8/31/2009	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.

The butterfly (Lepidoptera) species of concern documented at this location are limited in distribution in Pennsylvania to serpentine and other grassland habitats, which are often set in a matrix of open oak and

pine woodlands. Conservation of these species requires protection of the habitat they use during all stages of their life cycles. Maintaining a mosaic of grassland, oak, and pine areas at serpentine barrens sites and the surrounding area will create a diverse and healthy habitat capable of supporting the rare Lepidoptera listed above. Creation of corridors between barrens sites could also encourage movement of species between sites and help create more secure populations. Pesticide application, especially for the control of gypsy moths, can have a devastating effect on populations of Lepidoptera species of concern and should not be used in this area.

The plant species of concern found at this location are, for the most part, strongly associated with the serpentine influenced small herbaceous openings, or within the adjacent thin woodlands. In the past, natural disturbance, such as wild fires, would have helped to keep these areas in an open condition. With the suppression of wildfires, the open areas have gradually closed due to natural succession. A continuous active restoration effort to restore the serpentine openings will be necessary to ensure the persistence of these habitats and the species they support.

Serpentine aster is a species of plant that deserves special mention based on its potential for global extinction due to its extremely limited global population. This species is predominantly known to occur in the eastern serpentine barrens of Pennsylvania and Maryland, with a few far flung outliers in Virginia and North Carolina (Gustafson 2005; Kartesz 2013). This extremely limited distribution has given this species the status of G2 – globally imperiled. Serpentine aster is found in the more open areas of serpentine barrens, suggesting that fire or other active management may be needed to remove woody overgrowth and maintain this preferred habitat.

Rocky Gleason (PNHP)

Serpentine Aster (*Symphyotrichum depauperatum*)

Threats and Stresses

Historically, wildfires likely helped to maintain the open aspect of these habitats. Early accounts record the intentional setting of fire by Native Americans to help open areas for greater potential hunting success. Because of the past prevalence of intentional or accidental wildfires, this habitat was historically less dominated by woody trees and shrubs, but recent fire suppression has favored the expansion of wooded habitats at the expense of herbaceous openings. Invasion of serpentine herbaceous openings by woody trees and shrubs can influence the surrounding habitat. As woody vegetation encroaches on the openings, they tend to trap more organic debris and allow deeper soils to accumulate. As deeper soils occur on the site, they succeed to more common woodland and forest types. Fire disturbances had maintained these herbaceous openings in the past. In the absence of fire, active woody vegetation removal will be necessary to maintain these openings.

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

- The lack of natural fire disturbance poses one of the greatest threats to this habitat. In the absence of natural fire events, most of the open serpentine barrens habitats will gradually succeed to more common woody vegetation such as junipers, pines and oaks.
- Residential development occurs along one edge of the serpentine habitat.
- Invasive species of plants can displace native species of plants.
- Over browsing by white-tailed deer is a serious threat to the overall plant diversity.

Rocky Gleason (PNHP)

Heller's Witchgrass (*Dichanthelium oligosanthes*)

Conservation Recommendations

These serpentine habitats occur in isolated patches as the bedrock material, serpentinite, is exposed at the surface of the ground in a scattered fashion much like an archipelago chain of islands. Each habitat has a slightly different species composition, largely due to the slightly different environmental conditions found at each distinct location. A long range goal for these isolated habitats is to recognize them as a single system and plan for their ecological needs.

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

- The North Hill Civic Association recognizes the importance of the serpentine habitat on its commonly held lands. However, there appears to be no specific management plan for this Natural Heritage Area, and the site would benefit from a thorough review of the site-specific goals and procedures for management here. In the interim, general goals and actions could be gleaned from other serpentine management plans such as the Goat Hill Management Plan (Furedi 2008); Unionville Serpentine Barrens Restoration and Management Plan (Latham 2012); Pink Hill Serpentine Barrens Restoration and Management Plan (Latham 2008).
- The plants that characterize these habitats are adapted to the dry, nutrient poor soils and periodic fire events. A priority for the security of these globally rare habitats should be to establish protection for the core habitats as well as to provide for the landscape context in which natural process can be maintained.
- Active stewardship of these habitats is necessary. In the absence of natural fire disturbance, or active vegetation removal, these habitats will succeed into woodlands and forests, replacing the globally rare habitat with a more common type.
- Habitat restoration activities should strive to establish a mosaic of habitat types to accommodate the variety of organisms and their diverse habitat preferences. While some of these plants will only thrive in the open on thin soils, or even bare bedrock conditions, others need the limited shelter of scattered trees or even the deep shade provided by a mature forest. Some of the insect species require conifers during part of their life cycle while others need deciduous trees or specific shrubs or wildflower host plants. There is no

Rocky Gleason (PNHP)

Active woody plant removal is necessary to maintain herbaceous openings.

"one-size-fits-all" management recommendation for this habitat other than to provide for a mosaic of habitat diversity. "It's essential in restoring and maintaining disturbance-dependent ecosystems to vary the intensity and frequency of the disturbance in patchwork fashion, so that there is always a mosaic of patches of differing disturbance history. …the patchy landscape produced by random variation in disturbance history from one patch to another is essential to sustain the diversity of habitats and organisms that make up the total ecosystem." (Roger Latham, personal communication November 7th, 2014)

- Management activities should be coordinated with long-term habitat monitoring. "Analysis of desired conditions, inventory of existing conditions, and long-term monitoring of an array of key indicators is essential to know whether restoration and management efforts are accomplishing all of the goals or if some of the threatened or endangered species whose recovery is first and foremost among those goals might be inadvertently falling by the wayside." (Roger Latham, personal communication November 7th, 2014)
- Expand herbaceous openings as needed on convex landscapes by removing trees and other woody plants. Focus woody plant removal on areas of pines and junipers, which tend to indicate drier, thinner soils. The establishment of hardwoods should be taken as an indicator of deeper, moister soils. Where deeper soils occur, soil organic matter reduction may be necessary to establish thin soils over serpentine bedrock. "Soil organic matter reduction has proven effective in restoring serpentine grassland vegetation where it has been fully displaced by forest succession, as long as intact grassland adjoins the treated area to serve as a seed source. SOM reduction consists of skimming the surface organic horizons from the soil profile using a backhoe or front-end loader and transporting the material offsite by dump truck. It is particularly effective in restoring serpentine grassland where it has been invaded by a dense thicket of common greenbrier (Smilax rotundifolia)." (Roger Latham, personal communication November 18th, 2014)
- Educate the adjacent landowners on the significance of the globally rare habitat and the need for ongoing management activities.
- Suppress the spread of invasive species of plants to prevent native species from being crowded out of the habitat. Removal of invasive plants in the immediately vicinity of the species of concern can help these populations compete for space against much more aggressive species. Invasive species management should be coordinated by individuals familiar with the rare species as well as the invasive species present. Continual invasive species monitoring and control will be necessary.
- Reduce deer herd density to suitable levels to prevent overbrowsing of sensitive species.

Location

Municipalities: *West Goshen Township*
USGS quads: *West Chester, Unionville*
Previous CNHI reference: *Fern Hill Serpentine Barrens*
Associated NHAs: *None*
Overlapping Protected Lands: *None*

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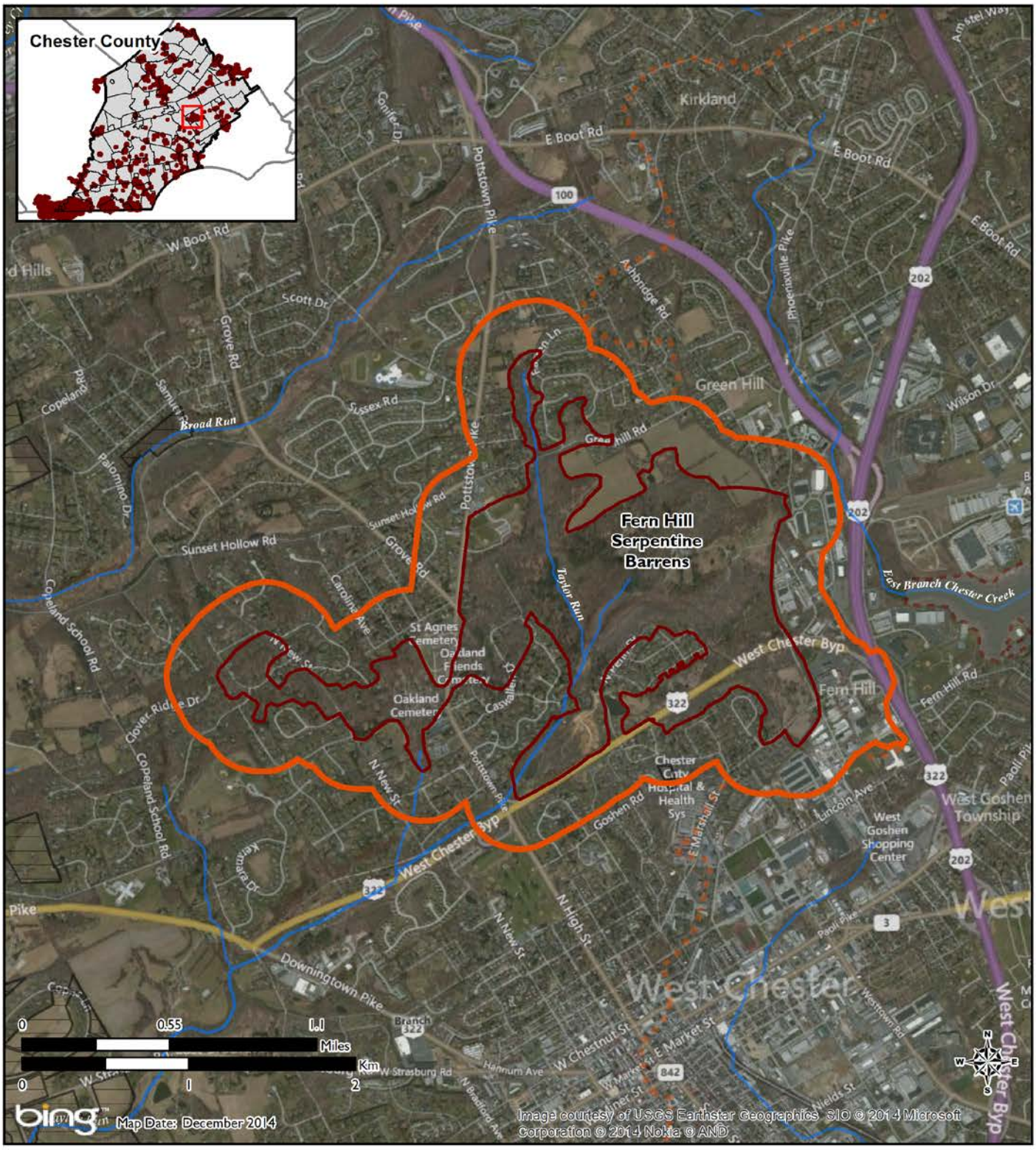


Fern Hill Serpentine Barrens Natural Heritage Area

This site includes three state rare natural communities as part of a small serpentine barren. This unique habitat supports 10 plant species of concern and two butterfly species of concern.

Significance Rank:
GLOBAL

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Franklin School East NHA

PNHP Significance Rank: *State*

Site Description

Franklin School East NHA is a patch of tulip poplar dominated woods near Kemblesville that is approximately 40 acres in size. The area surrounding the NHA is predominately used for agriculture and utility management for the township and private companies. Small patches of wooded habitat are scattered throughout the landscape. Tributaries to West Branch White Clay Creek flow through the wooded area that makes up Franklin School East NHA. This habitat supports a population of a **sensitive species of concern**, not named 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**	---	---	---	2007-07	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.

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

Threats and Stresses

Disturbances of the remaining woodlot will have a negative impact on the habitat conditions. Logging and other fragmentation of the wooded habitat will create opening for invasive species and alter species composition.

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

- Invasive species are present at this site and may displace native vegetation, including species of concern.
- Logging, development, or other major activities will further fragment the existing woodlot and alter the conditions of the habitat needed by the species of concern. Disturbances will also open areas that will be easily colonized by invasive species.
- Herbicides and fertilizers used in lawns, fields, and along roads may wash into the wooded area and degrade the habitat conditions.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

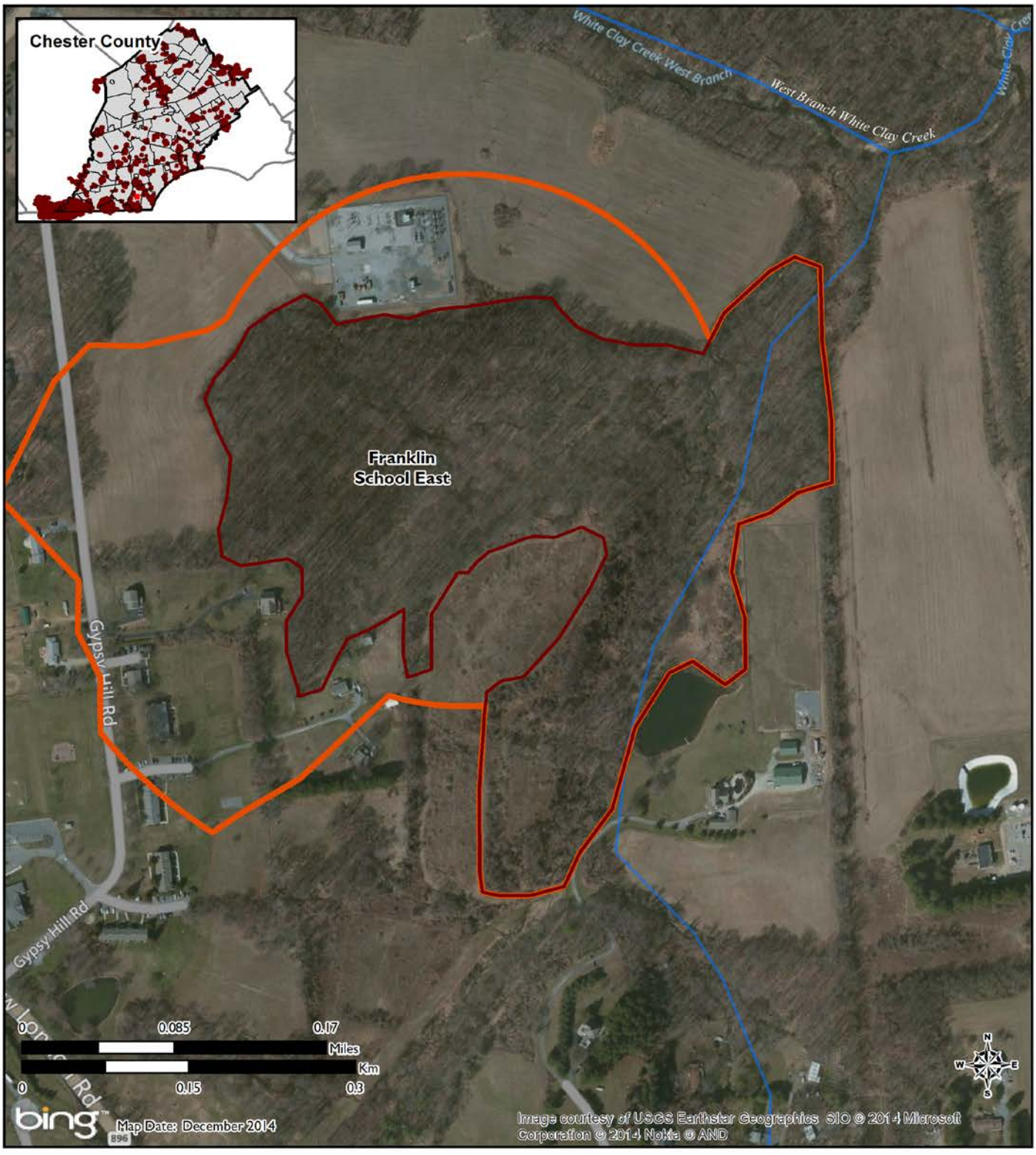
Maintain the integrity of this wooded area by not fragmenting the habitat or performing other large disturbances that may have a negative impact. Preserve the vegetated buffer along the tributaries to protect the water quality of West Branch White Clay Creek and surrounding wetlands.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Protect the existing forested areas from logging and other large scale disturbance. Keep the forest as intact as possible to protect the habitat and species within it.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Franklin Township*
USGS quads: *West Grove*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Franklin School East
Natural Heritage Area

This site supports a sensitive species of concern.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

Franklin School North NHA

PNHP Significance Rank: *State*

Site Description

Franklin School North NHA is a patch of wooded habitat that sits between several housing developments. Several houses are located within the NHA as well. Some agricultural fields also occur along the northern edge of the NHA. Hess Mills Road bisects the site and the headwaters of a small tributary to West Branch White Clay Creek begins in this area and flows through the site. Much of Franklin School North NHA can be classified as a tulip poplar – mixed hardwood forest. This habitat supports a population of a **sensitive species of concern**, not named 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**	---	---	---	2007	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

Disturbances of the remaining forest will have a negative impact on the habitat conditions. Logging and fragmentation of the forest will create opening for invasive species and alter species composition.

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

- Invasive species are present at this site and may displace native vegetation, including species of concern.
- Logging, development, or other major activities will further fragment the existing forest and alter the conditions of the habitat needed by the species of concern. Disturbances will also open areas that will be easily colonized by invasive species.
- Herbicide and fertilizer use in lawns, fields, and along roads may wash into the forested area and degrade the habitat conditions.
- Changes in hydrology may make the habitat unsuitable to the species of concern found here.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

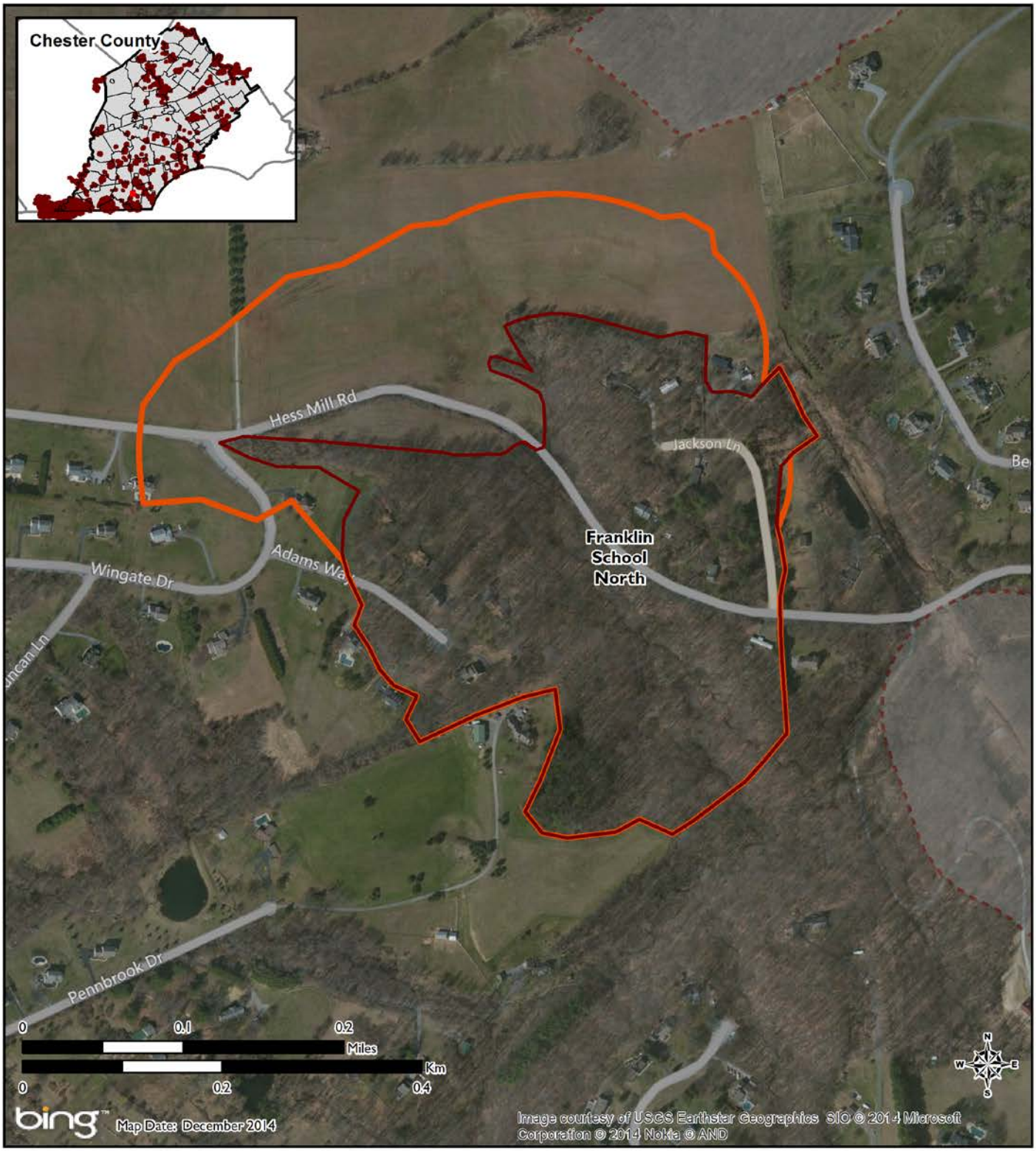
Maintain the integrity of this wooded area by not fragmenting the habitat or performing other large disturbances that may have a negative impact. Preserve the vegetated buffer along the tributaries to protect the water quality of West Branch White Clay Creek and surrounding wetlands.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Protect the existing forested areas from logging and other large scale disturbance. Keep the forest as intact as possible to protect the habitat and species within it.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Maintain the existing hydrology. Any activities that occur along the roads should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Franklin Township*
USGS quads: *West Grove*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Franklin School North Natural Heritage Area

Upland forest is important habitat for 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***

Gap Newport Pike-Street Road NHA

PNHP Significance Rank: *State*

Site Description

Gap Newport Pike-Street Road NHA is a very small grove of white oak and black gum along the outflow to a small man made pond. The surrounding area is primarily agricultural, including an evergreen tree farm to the west of the NHA. A mowed field makes up the majority of the habitat within the NHA and also includes the lawn from the neighboring house. The wet edge habitat along the small stand of trees supports a population of **bushy aster**, a plant 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]
Bushy Aster (*Symphyotrichum dumosum*)	G5	S1	TU (PE)	8/21/2005	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.

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

Bushy aster is located throughout the eastern United States from Maine west to Wisconsin and south to Florida and Texas. It occurs through some parts of Canada as well. Most occurrences in Pennsylvania have been documented in the southeastern counties. It is considered to be critically imperiled in the state due to the small number of occurrences. Bushy aster is most often found in open habitats and along shrubby edge habitat.

Threats and Stresses

The small size and location within a disturbed landscape make this area sensitive to disturbances within and around the NHA. Invasive species are likely to spread quickly along the edge habitat and pesticide use along the road and in fields may wash into the pond and other habitats within the NHA. .

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

- Removal of the small patch of existing trees will alter the habitat currently occupied by the species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Herbicides and fertilizers used in lawns, fields, and along roads may wash into the forested area and degrade the habitat conditions.
- Changes in the currently hydrology could significantly alter the habitat for the plant species of concern by making conditions either too wet or too dry to be able to persist at this site.

Conservation Recommendations

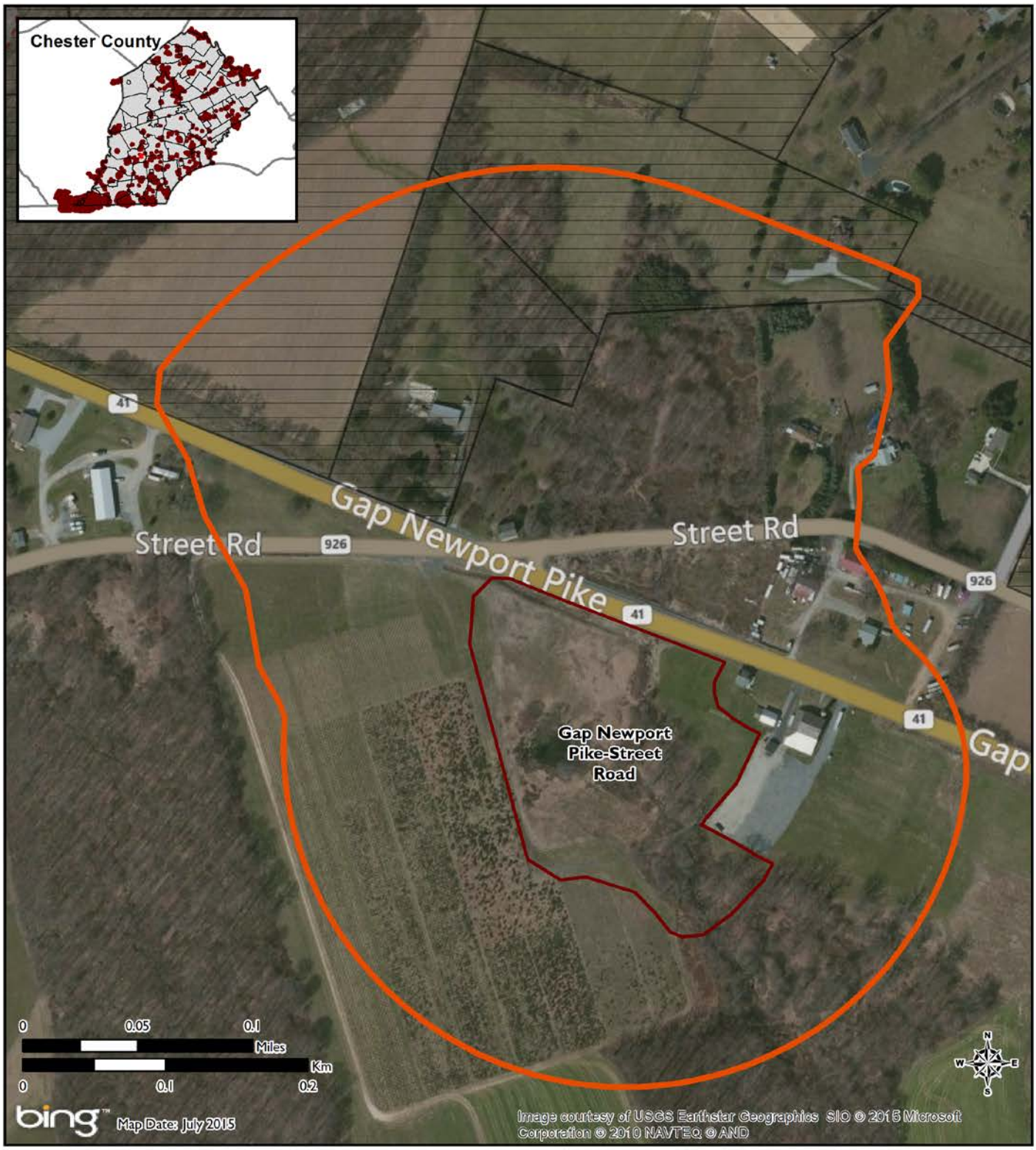
Avoid disturbances to the stand of trees or surrounding area in order to protect the quality if the small patch of habitat. Limit the use of fertilizers and herbicides to prevent runoff into this area that may impact native species.

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

- Avoid logging or other activities that will further disturb the stand of trees and the edge habitat used by the species of concern.
- Maintain the existing hydrology. Any activities that occur along the roads should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.
- Widen the native vegetated buffer along the stream. A width of 100 meters is ideal, but any increase will benefit the stream and adjacent wetlands.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.

Location

Municipalities: *Londonderry Township*
USGS quads: *West Grove*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Gap Newport Pike-Street Road Natural Heritage Area

This NHA provides habitat for bushy aster, a critically imperiled 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***
- ***Conservation Lands***

Glenrose NHA

PNHP Significance Rank: *State*

Site Description

Located in central Chester County, this NHA includes surrounding riparian forest and wetlands in Glenrose along Glenrose Road. Wetland, forest and aquatic habitats support a **sensitive species of concern**. This species cannot be named 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**	---	---	---	2007	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 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 sensitive species of concern at this site relies on good water quality, and is vulnerable to siltation and chemical pollution.

Conservation Recommendations

The entire site is privately owned and landowners in the Core Habitat should be aware that the species is sensitive to disturbance. A portion of this NHA is protected by a conservation easement by the Brandywine Conservancy.

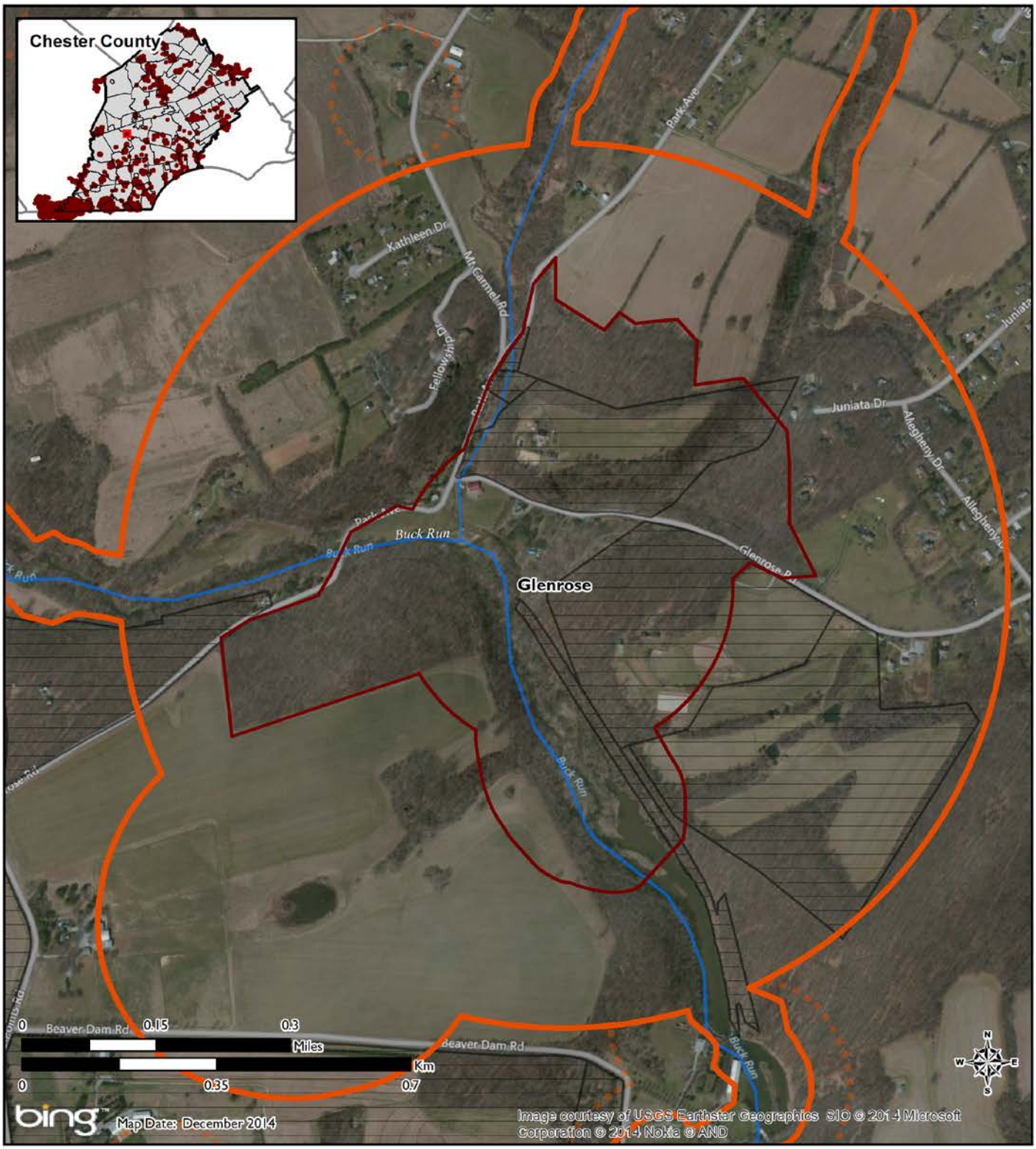
The following steps are recommended to ensure the persistence of these species at this site:

- Avoid disturbance from human activities within the Core Habitat during the breeding season (December – July).
- Additional development within the Core Habitat should be avoided to protect the sensitive species of concern.
- 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.
- 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.

- 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 are. Maintaining high quality aquatic habitat is important to this species.

Location

Municipalities: *East Fallowfield Township, Highland Township*
USGS quads: *Coatesville*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Easement*



Glenrose
Natural Heritage Area

Aquatic and riparian habitats at this site support 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 Supporting Landscape***
- ***Conservation Lands***

Goat Hill Serpentine Barrens NHA

PNHP Significance Rank: *Global*

Site Description


Denise Watts (PNHP)

Maryland Golden-aster (*Chrysopsis mariana*)

This large Natural Heritage Area straddling the Chester and Lancaster County boundary as well as the Pennsylvania and Maryland border contains a globally rare serpentine habitat in a mosaic of the characteristic serpentine barrens plant communities, which include open gravel areas, grassy meadows, and conifer and deciduous dominated woodland habitats. Much of the critical habitat for this area occurs in Chester County, though significant portions of several species of concern core habitat also occur in Lancaster County. Goat Hill is one of several serpentine habitats that make up the State Line Serpentine Barrens, an ecologically unique system occurring in scattered, mostly small patches along this part of the PA/MD border. The serpentine habitats are often referred to as grasslands, and herbaceous openings can have a strong representation of warm season grasses and grass-like plants, but they also contain a good diversity of other plant species, many uncommon at the state and global levels. Goat Hill is known to support 25 plant species of concern, 37 animal species of concern, most of which are butterflies & moths that feed on the unique variety of plants present, and an additional six sensitive species of concern. The serpentine community itself is considered globally uncommon due to the limited occurrences of this habitat type around the world.

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]
Serpentine pitch pine - oak forest	C	GNR	S1	N (N)	8/27/1999	A
Common Roadside Skipper (*Amblyscirtes vialis*)		G4	S2	N (N)	6/2/1995	E
Falcate Orangetip (*Anthocharis midea*)		G4G5	S3	N (N)	5/14/1997	E
Dusted Skipper (*Atrytonopsis hianna*)		G4G5	S2	N (N)	5/14/1997	C
Juniper Hairstreak (*Callophrys gryneus*)		G5	S3	N (N)	5/14/1997	CD
Leonard's Skipper (*Hesperia leonardus*)		G4	S3	N (N)	9/7/2002	B
Cobweb Skipper (*Hesperia metea*)		G4	S2	N (N)	5/14/1997	C
Spiny Oakworm Moth (*Anisota stigma*)		G5	S1S2	N (N)	7/16/2004	C
A Geometrid moth (*Apodrepanulatrix liberaria*)		G3	S1S3	N (N)	10/13/2001	CD
Dot-lined White Moth (*Artace cribraria*)		G5	S1	N (N)	7/3/2004	E
Southern Pine Looper Moth (*Caripeta aretaria*)		G4	S1S2	N (N)	8/26/2000	E
An Underwing Moth (*Catocala umbrosa*)		G5	S1	N (N)	7/23/1998	C
Packard's Lichen Moth (*Cisthene packardii*)		G5	S1S3	N (N)	8/27/2004	C
Lead-colored Lichen Moth (*Cisthene plumbea*)		G5	S1	N (N)	8/27/2004	E
Regal Moth (*Citheronia regalis*)		G4G5	SU	N (N)	7/16/2004	E
Pure Lichen Moth (*Crambidia pura*)		G4	SU	N (N)	8/27/2004	E

Species or Natural Community Name		PNHP Rank[1] Global	PNHP Rank[1] State	PA Legal Status[1]	Last Seen	Quality[2]
A Noctuid Moth (*Elaphria cornutinis*)		G5	SU	N (N)	7/16/2004	E
Broad-lined Erastria Moth (*Erastria coloraria*)		G3G4	S1	N (N)	6/22/2002	CD
Barrens Buckmoth (*Hemileuca maia*)		G5	S1S2	N (N)	5/14/1997	C
Joyful Holomelina Moth (*Holomelina laeta*)		G4	S1S2	N (N)	8/27/2004	C
Esther Moth (*Hypagyrtis esther*)		G5	S2S3	N (N)	8/8/1996	C
An Idaea Moth (*Idaea eremiata*)		G4	S1	N (N)	11/6/1996	C
A Wave Moth (*Idaea violacearia*)		G4	S1	N (N)	10/13/2001	B
Black-waved Flannel Moth (*Lagoa crispata*)		G5	S1	N (N)	6/12/2004	C
Footpath Sallow Moth (*Metaxaglaea semitaria*)		G5	S2	N (N)	9/30/2000	E
A Borer Moth (*Papaipema marginidens*)		G4	SU	N (N)	9/13/1996	E
A Noctuid Moth (*Parahypenodes quadralis*)		G4	SU	N (N)	8/31/1998	E
A Noctuid Moth (*Renia sp. 1 nr. discoloralis*)		G4	S1?	N (N)	8/26/2000	C
A Noctuid Moth (*Richia acclivis*)		G4G5	S1S2	N (N)	8/26/2000	E
A Noctuid Moth (*Sutyna privata teltowa*)		G5T4	S1	N (N)	9/15/2001	C
Tolype Moth (*Tolype notialis*)		G4G5	S1	N (N)	7/16/2004	C
Southern Variable Dart Moth (*Xestia elimata*)		G5	S2S3	N (N)	8/27/2004	C
A Zale Moth (*Zale curema*)		G3G4	S1	N (N)	5/14/1997	C
Oblique Zale Moth (*Zale obliqua*)		G5	S1	N (N)	7/2/1998	C
A Noctuid Moth (*Zale squamularis*)		G4	S2S3	N (N)	7/16/2004	C
A Zale Moth (*Zale submediana*)		G4	S2	N (N)	5/14/1997	C
Pine Barrens Zanclognatha (*Zanclognatha martha*)		G4	S1S2	N (N)	8/27/2004	C
Eastern Lampmussel (*Lampsilis radiata*)		G5	S2	N (CU)	8/3/1995	E
Small White-snakeroot (*Ageratina aromatica*)		G5	S3	N (PR)	9/25/2008	B
Colic-root (*Aletris farinosa*)		G5	S1	TU (PE)	8/8/1995	D
Arrow-feathered Three-awn (*Aristida purpurascens*)		G5	S2	PT (PT)	9/25/2008	B
Richardson's Sedge (*Carex richardsonii*)		G5	S1	N (PE)	6/2/2010	CD
Goat Hill Chickweed (*Cerastium velutinum var. villosissimum*)		G5T1	S1	PE (PE)	5/20/2009	A
Fringe-tree (*Chionanthus virginicus*)		G5	S3	N (PT)	10/7/2008	C
Maryland Golden-aster (*Chrysopsis mariana*)		G5	S1	PT (PE)	9/28/1996	C
Field Dodder (*Cuscuta pentagona*)		G5	S2	N (PT)	9/10/2008	BC
Tufted Hairgrass (*Deschampsia cespitosa*)		G5	S3	N (PT)	6/2/2010	B
Nuttalls' Tick-trefoil (*Desmodium nuttallii*)		G5	S2	TU (PT)	8/21/1991	CD
Serpentine Panic-grass (*Dichanthelium annulum*)		GNR	S2	TU (PT)	9/25/2008	B
Heller's Witchgrass (*Dichanthelium oligosanthes*)		G5	S3	N (PT)	9/25/2008	BC
Elephant's Foot (*Elephantopus carolinianus*)		G5	S4	PE (Watch)	10/21/1991	C
Roundleaf Thoroughwort (*Eupatorium rotundifolium*)		G5	S3	TU (TU)	10/9/2008	B
Glade Spurge (*Euphorbia purpurea*)		G3	S1	PE (PE)	5/12/2010	B
Annual Fimbry (*Fimbristylis annua*)		G5	S2	PT (PT)	10/8/2009	B
St Andrew's-cross (*Hypericum stragulum*)		G4	S2	N (PT)	9/10/2008	D
Sandplain Wild Flax (*Linum intercursum*)		G4	S1	PE (PE)	9/25/2008	B
Plain Ragwort (*Packera anonyma*)		G5	S2	PR (PR)	9/25/2008	B
Virginia Ground-cherry (*Physalis virginiana*)		G5	S1S2	TU (PE)	8/3/1994	BC

Species or Natural Community Name		PNHP Rank[1] Global	State	PA Legal Status[1]	Last Seen	Quality[2]
Southern Red Oak (*Quercus falcata*)		G5	S1	PE (PE)	10/19/2006	C
Few Flowered Nutrush (*Scleria pauciflora*)		G5	S2	PT (PT)	9/25/2008	BC
Prairie Dropseed (*Sporobolus heterolepis*)		G5	S1	PE (PE)	9/25/2008	C
Serpentine Aster (*Symphyotrichum depauperatum*)		G2	S2	PT (PT)	9/25/2008	A
Sensitive species of concern A[3]	S	---	---	---	2013	E
Sensitive species of concern B[3]	S	---	---	---	9/25/2007	E
Sensitive species of concern C[3]	S	---	---	---	4/5/1992	B
Sensitive species of concern D[3]	S	---	---	---	5/14/1997	D
Sensitive species of concern E[3]	S	---	---	---	6/13/2011	A
Sensitive species of concern F[3]	S	---	---	---	9/25/2008	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.

Many of the butterfly and moth species (Lepidoptera) documented at this location are limited in distribution in Pennsylvania to serpentine and other grassland habitats, which are often set in a matrix of open oak and pine woodlands. Conservation of these species requires protection of the habitat they use during all stages of their life cycles. Maintaining a mosaic of grassland, oak, and pine areas at serpentine barrens sites and the surrounding area will create a diverse and healthy habitat capable of supporting the rare Lepidoptera listed above. Creation of corridors between barrens sites could also encourage movement of species between sites and help create more secure populations. Pesticide application, especially for the control of gypsy moths, can have a devastating effect on populations of Lepidoptera species of concern and should not be used in this area.

Rocky Gleason (PNHP)

St Andrew's-cross (*Hypericum stragulum*)

Most of the plant species of concern found within this Natural Heritage Area are found primarily within the strongly serpentine influenced small herbaceous openings or within the adjacent thin woodlands. Among these include arrow-feathered three-awn, Richardson's sedge, serpentine chickweed, Maryland golden-aster, tufted hairgrass, elephant's foot, sandplain wild flax, serpentine panic-grass, Heller's witchgrass, Virginia ground-cherry, few-flowered nutrush, serpentine aster, plain ragwort, prairie dropseed and a sensitive species of concern. In the past, natural disturbance, such as wildfires, would have helped to keep these areas in an open condition. With the relatively recent suppression of fire, the open areas have gradually closed due to natural succession. An active restoration effort to restore the serpentine openings will be necessary to ensure the continued existence of these habitats and the species they contain. Other plants within this area are not specifically adapted to the open habitats, but are more closely associated with wooded and forested habitats. These include fringe-tree, Nuttalls' tick-trefoil, glade spurge, southern red oak & cranefly orchid. Efforts to restore serpentine openings should take into account the presence of these species and avoid disturbing the habitat where they occur.

Several of the plants noted above deserve special mention based on their potential for global extinction due to their extremely limited global populations.

- The serpentine chickweed at this location may be a taxonomically distinct variety of this species and this location is currently the only known location for the plant in the world. The utmost care should be exercised to preserve the known and potential habitat for this species until its taxonomic identity is more clearly understood.
- Serpentine aster is a species of plant that deserves special mention based on its potential for global extinction due to its extremely limited global population. This species is predominantly known to occur in the eastern serpentine barrens of Pennsylvania and Maryland, with a few far flung outliers in Virginia and North Carolina (Gustafson 2005; Kartesz 2013). This extremely limited distribution has given this species the status of G2 – globally imperiled. Serpentine aster is found in the more open areas of serpentine barrens, suggesting that fire or other active management may be needed to remove woody overgrowth and maintain this preferred habitat.

John Kunsman (PNHP)

Goat Hill Chickweed
(*Cerastium velutinum var. villosissimum*)

- Glade spurge has a relatively small global range, extending from New Jersey into Ohio, and south into North Carolina. Currently, around 50 populations are known to exist worldwide. Fewer than 10 populations, most of them with only a few individuals, are currently known from Pennsylvania. At this location, glade spurge is growing in the moist seepages of tributaries to the Octoraro Creek. The viability of the known populations of glade spurge and its habitat may be enhanced by establishing buffers around wetlands, controlling invasive species, and protecting the natural hydrology surrounding wetlands. Logging of the adjacent slopes is a potential concern. This species may be impacted by excessive browsing by deer in some locations.

<u>Threats and Stresses</u>

Historically, wildfires likely helped to maintain the open aspect of these habitats. Early accounts record the intentional setting of fire by Native Americans to help open areas for greater potential hunting success. Because of the past prevalence of intentional or accidental wildfires, this habitat was historically less dominated by woody trees and shrubs, but recent fire suppression has favored the expansion of wooded habitats at the expense of herbaceous openings. Invasion of serpentine herbaceous openings by woody trees and shrubs can influence the surrounding habitat. As woody vegetation encroaches on the openings, they tend to trap more organic debris and allow deeper soils to accumulate. As deeper soils occur on the site, they succeed to more common woodland and forest types. Fire disturbances had maintained these herbaceous openings in the past. In the absence of fire, active woody vegetation removal will be necessary to maintain these openings.

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

- The lack of natural fire disturbance poses one of the greatest threats to this habitat. In the absence of natural fire events, most of the open serpentine barrens habitats will gradually succeed to more common woody vegetation such as junipers, pines and oaks.
- Some residential development has been occurring at the periphery of the serpentine habitat.
- An extensive quarry operates on the western shore of the Octoraro Creek. This quarry has greatly altered the globally significant serpentine habitat at this location. The former hill and its unique plant and animal community have been reduced to crushed stone material. There is virtually no buffer between the quarry operation and the Octoraro Creek and sediment from the operation appears to flow freely into the creek.

- The state boundary between Pennsylvania and Maryland can be clearly seen in current aerial photos based on the differences in land use between the two states. While the serpentine habitat in Pennsylvania is mostly in natural woody or open habitats, parcels on the Maryland side of the border are in active agriculture or residential development.
- Similarly, the Chester County side of the Octoraro Creek is mostly in natural habitats, while the Lancaster side is dominated by agricultural activities.

Conservation Recommendations

A large portion of the most significant habitat is under the jurisdiction of the PA Bureau of Forestry and managed as a Wild Plant Sanctuary. An additional portion of primary serpentine habitat is owned and actively managed by The Nature Conservancy. The Boy Scouts of America own an ecologically significant area overlooking the Octoraro Creek.

Henry Whitesel – Friends of the State Line Serpentine Barrens

Active vegetation management is necessary to maintain herbaceous openings at most serpentine habitats.

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

- A management plan specifically for Goat Hill was recently developed by the PA Natural Heritage Program with input and participation from other serpentine habitat experts and organizations (Furedi 2008). Consult that plan for fine details about management. Coordinate the conservation of this habitat between Lancaster and Chester Counties and the state of Maryland. These serpentine habitats occur in isolated patches as the bedrock material, serpentinite, is exposed at the surface of the ground in a scattered fashion much like an archipelago chain of islands. Each habitat has a slightly different species composition, largely due to the slightly different environmental conditions found at each distinct location. A long range goal for these isolated habitats is to recognize them as a single system and plan for their ecological needs. The area between and around these habitats should be maintained to provide the necessary buffer to allow prescribed burns to maintain the mosaic of open habitat once a network of the woody species have been removed.
- The plants that characterize these habitats are adapted to the dry, nutrient poor soils and periodic fire events. A priority for the security of these globally rare habitats should be to establish protection for the core habitats as well as to provide for the landscape context in which natural process can be maintained.
- Active stewardship of these habitats is necessary. In the absence of natural fire disturbance, or active vegetation removal, these habitats will succeed into woodlands and forests, replacing the globally rare habitat with a more common type.


Rocky Gleason (PNHP)

Fringe-tree (*Chionanthus virginicus*)

- Habitat restoration activities should strive to establish a mosaic of habitat types to accommodate the variety of organisms and their diverse habitat preferences. While some of these plants will only thrive in the open on thin soils, or even bare bedrock conditions, others need the limited shelter of scattered trees or even the deep shade provided by a mature forest. Some of the insect species require conifers during part of their life cycle while others need deciduous trees or specific shrubs or wildflower host plants. There is no "one-size-fits-all" management recommendation for this habitat other than to provide for a mosaic of habitat diversity. "It's essential in restoring and maintaining disturbance-dependent ecosystems to vary the intensity and frequency of the disturbance in patchwork fashion, so that there is always a mosaic of patches of differing disturbance history. …the patchy landscape produced by random variation in disturbance history from one patch to another is essential to sustain the diversity of habitats and organisms that make up the total ecosystem." (Roger Latham, personal communication November 7th, 2014)
- Management activities should be coordinated with long-term habitat monitoring. "Analysis of desired conditions, inventory of existing conditions, and long-term monitoring of an array of key indicators is essential to know whether restoration and management efforts are accomplishing all of the goals or if some of the threatened or endangered species whose recovery is first and foremost among those goals might be inadvertently falling by the wayside." (Roger Latham, personal communication November 7th, 2014)
- Expand herbaceous openings as needed on convex landscapes by removing trees and other woody plants. Focus woody plant removal on areas of pines and junipers, which tend to indicate drier, thinner soils. The establishment of hardwoods should be taken as an indicator of deeper, moister soils. Where deeper soils occur, soil organic matter reduction may be necessary to establish thin soils over serpentine bedrock. "Soil organic matter reduction has proven effective in restoring serpentine grassland vegetation where it has been fully displaced by forest succession, as long as intact grassland adjoins the treated area to serve as a seed source. SOM reduction consists of skimming the surface organic horizons from the soil profile using a backhoe or front-end loader and transporting the material offsite by dump truck. It is particularly effective in restoring serpentine grassland where it has been invaded by a dense thicket of common greenbrier (*Smilax rotundifolia*)." (Roger Latham, personal communication November 18th, 2014)
- Locate, preserve and expand nectar plants for specialized Lepidoptera species, in particular, wild indigo (*Baptisia tinctoria*) and New Jersey tea (*Ceanothus americanus*). These species are the preferred larval host for two Lepidoptera species of concern. Deer exclosures may be necessary to protect these host plant populations.
- In the past, naturally occurring fires helped maintain the open aspect characteristic of the serpentine barren habitat. Today, active vegetation management, primarily in the form of volunteer work crews of the "Friends of the State Line Serpentine Barrens", helps to remove trees and shrubs that in the past would have been cleared by fire events, or active large mammal grazing. These work crews have made great progress over the years to create the mosaic of patchy openings resembling in places, a grass land, in others, an oak savannah, or pitch pine woodland, or juniper–catbrier shrubland, or mixed oak forest, or bare soil gravel bed. All these, as well as other small patch natural communities, play an important role in sustaining the diversity of plants and animals in these important ecosystems.

- These systems may be best maintained in an agricultural or rural setting. Residential development near or between these barrens should be strongly discouraged. A priority for the security of these globally rare habitats should be to establish protection for the core habitats as well as to provide for the landscape context in which natural process can be maintained. Adjacent residential development can conflict with or greatly reduce the options for management using prescribed fire.
- While much of the core serpentine habitat at this location is protected by the PA Bureau of Forestry and The Nature Conservancy, much more known and potential habitat for species of concern occurs outside of the protected areas. Focus conservation efforts on acquisition of the largest parcels within the lower loops of the Octoraro Creek. Transfer of development rights, conservation easements and fee simple acquisition are all appropriate tools for securing the conservation status of the parcels of varying ecological significance.
- Educate the adjacent landowners on the significance of the globally rare habitat and the need for ongoing management activities.
- Suppress the spread of invasive species of plants to prevent native species from being crowded out of the habitat. Removal of invasive plants in the immediately vicinity of the species of concern can help these populations compete for space against much more aggressive species. Invasive species management should be coordinated by individuals familiar with the rare species as well as the invasive species present. Continual invasive species monitoring and control will be necessary.
- Reduce deer herd density to suitable levels to prevent overbrowsing of sensitive species.

Location

Municipalities: *West Nottingham Township, Fulton Township, Little Britain Township*
USGS quads: *Kirkwood, Rising Sun, Conowingo Dam*
Previous CNHI reference: *Goat Hill Serpentine Barrens*
Overlapping Protected Lands: *Goat Hill Serpentine Barrens, Valley Forge State Forest, Nottingham Serpentine Barrens, Octoraro Creek Greenway, Brandywine Conservancy Easement, Agricultural Easement*

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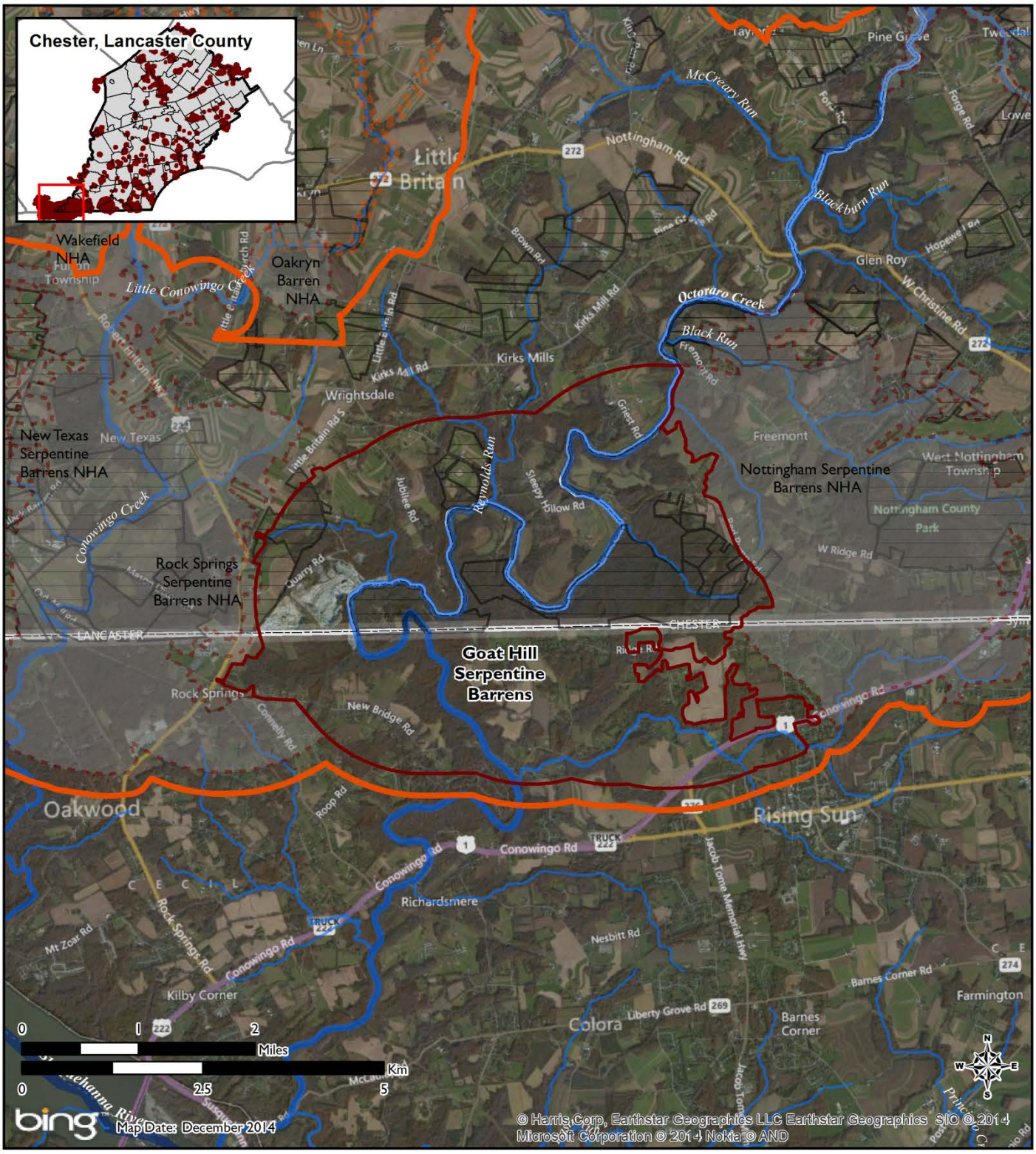


Goat Hill Serpentine Barrens Natural Heritage Area

This diverse site contains a globally rare Serpentine Pitch Pine-Oak Forest community and supports populations of more than 65 species of concern - including many moths and butterflies, numerous plants, and some vertebrates.

Significance Rank:
GLOBAL

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Goshen Road Woods NHA

PNHP Significance Rank: *State*

Site Description

Located in eastern Chester County, this site contains a small patch of forest and adjacent fields bordered by Goshen, Delchester, and Plumsock Roads. Okehocking Run also passes through the site. This riparian forest and adjacent agricultural 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**	---	---	---	7/4/2007	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 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 of concern at this site rely on good water quality, and are vulnerable to siltation and chemical pollution.

Conservation Recommendations

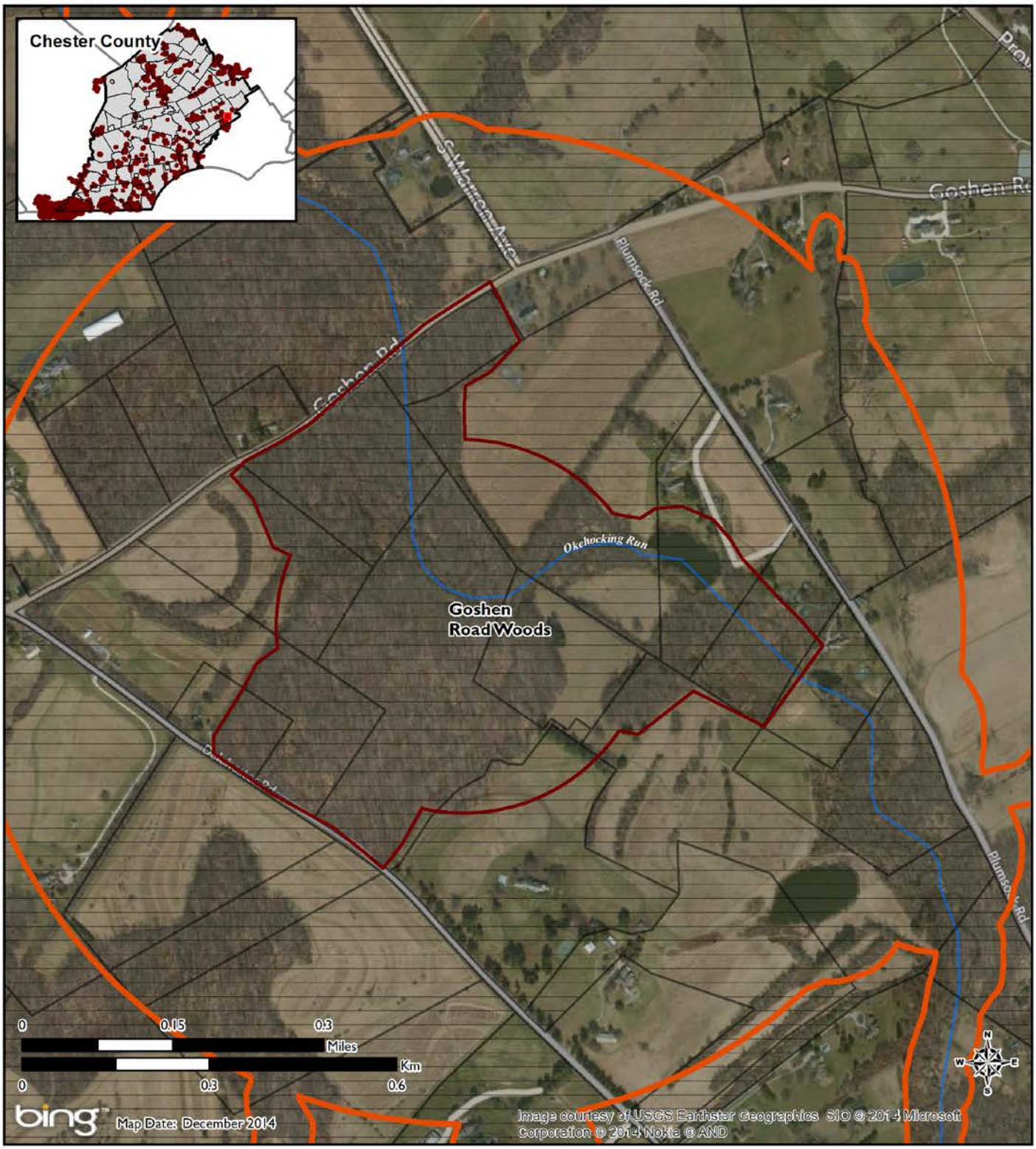
Additional development within the Core Habitat should be avoided to protect the sensitive species of concern. Disturbance within the Core Habitat should not be a problem for this species if it occurs during non-breeding season (August – May).

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 June through July breeding season.
- Maintain at least a 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: *Willistown Township*
USGS quads: *Media*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Easement*



Goshen Road Woods
Natural Heritage Area

Aquatic and forested wetland habitats support 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 Supporting Landscape***
- ***Conservation Lands***

Great Marsh NHA

PNHP Significance Rank: *State*

Site Description

Great Marsh NHA is a large wetland complex along Marsh Creek that provides a unique habitat that supports a number of wetland species. Great Marsh is situated between Route 401 and the Pennsylvania Turnpike above Marsh Creek Lake. The wetland habitat is several hundred acres in size and consists of a number of graminoid, shrub, and forested wetland types. Two habitats of note are natural communities of concern, **bluejoint – reed canary grass marsh** and **circumneutral shrub swamp**. These communities provide habitat for several species of concern. **Black dash** and **mulberry wing** are two butterfly species of concern that use sedges as a host plant, which are common in the graminoid wetlands. **Marsh wren** is a bird species of concern that nests in early successional wetlands, such as those found at Great Marsh. This site also provides habitat for **three sensitive species of concern**, not named at the request of the jurisdictional agencies overseeing their 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]
Black Dash (*Euphyes conspicuus*)		G4	S3	N (N)	7/15/1988	B
Mulberry Wing (*Poanes massasoit*)		G4	S2	N (N)	7/15/1988	B
Marsh Wren (*Cistothorus palustris*)		G5	S2S3B	N (CA)	6/1990	B
Bluejoint - reed canary grass marsh	C	GNR	S5	N (N)	2005	BC
Circumneutral shrub swamp	C	GNR	S3	N (N)	2005	B
Sensitive species of concern A[3]	S	---	---	---	6/29/2008	E
Sensitive species of concern B[3]	S	---	---	---	1/29/2015	E
Sensitive species of concern C[3]	S	---	---	---	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.

Black dash and mulberry wing are two butterfly species of concern found in marshes, swamps, and other open wetland habitats. Both species use sedges as a host plant, most likely tussock sedge (*Carex stricta*). They are both found in the upper Midwest, Northeast, and Atlantic Coast, as well as in parts of southern Canada.

Marsh wrens are found throughout most of the United States and southern Canada. This species is found most commonly along the coasts as a year round resident. The interior portions of the range, including Pennsylvania, have more scattered breeding occurrences that migrate during the nonbreeding season. Marsh wrens nest in herbaceous fresh water and coastal wetlands. Loss of this type of habitat is a significant threat to this species.

Threats and Stresses

Changes in hydrology would have the potential to significantly alter the wetland system. Chemical and sediment runoff from surrounding areas may also have a negative impact on the quality of the stream and wetland.

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

- Changes in the currently hydrology could significantly alter the habitat for the species of concern by making conditions either too wet or too dry to be able to persist at this site.
- Degradation of water quality or quantity can have a negative impact on the habitat supporting the species of concern found at this location. Runoff from industrial and residential development, agricultural fields, and roads have significantly higher levels of sediment, nutrients, pesticides, herbicides and other pollutants than runoff filtered through a natural habitat.
- Logging in the wooded areas along the wetlands will reduce the natural buffer that protects the quality of the wetlands and create openings that will increase erosion and allow for the establishment of invasive species.
- Invasive species are found in many areas of this site and may displace native vegetation, including species of concern.
- Herbicides and pesticides sprayed along roads, fields, and on the utility right-of-way may cause direct mortality to the species of concern and other native species.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

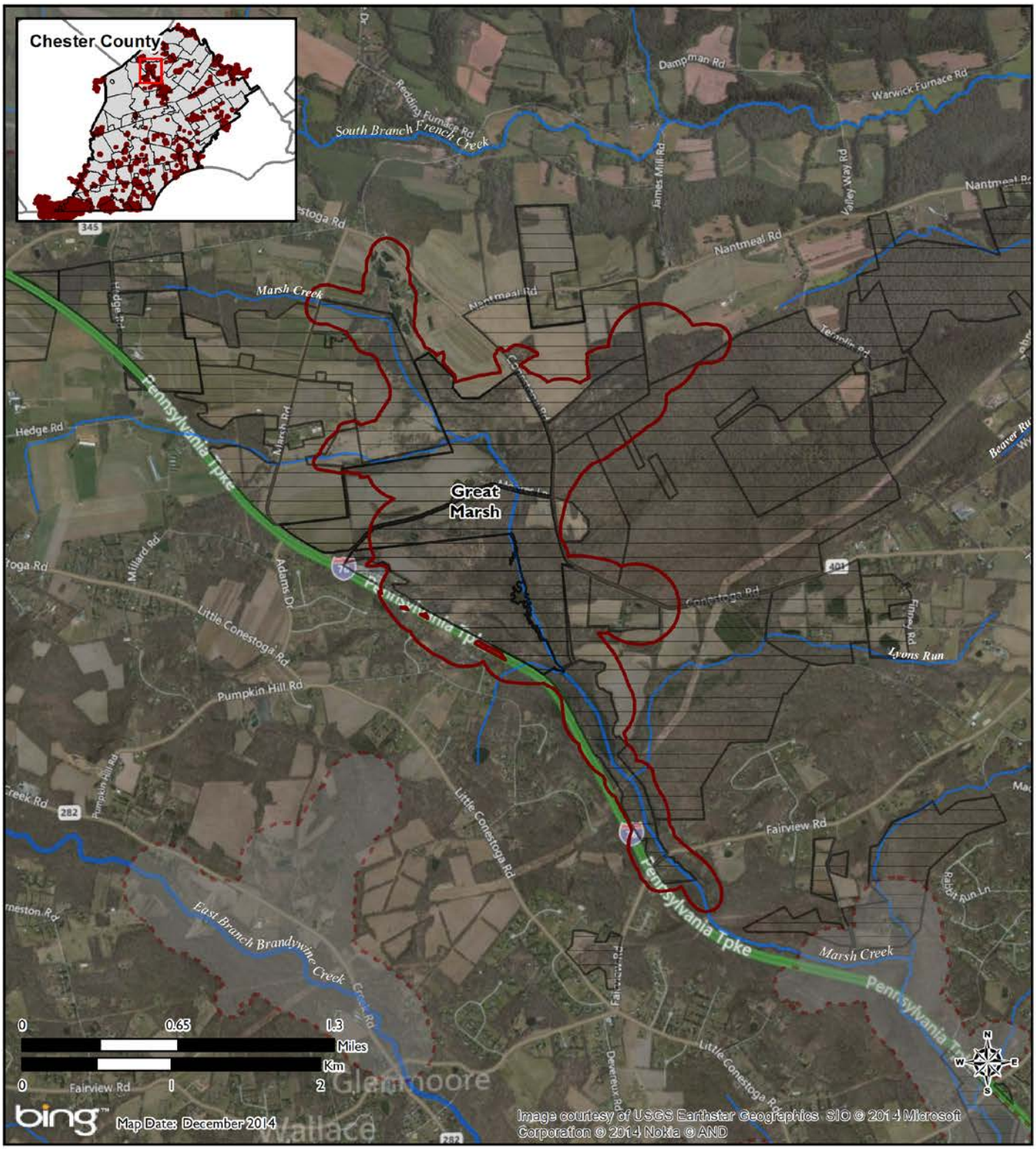
Conservation Recommendations

Almost all of Great Marsh NHA has some form of permanent protection in place. The Nature Conservancy owns a portion of this site and most privately owned properties are held under a conservation easement. This effort to conserve Great Marsh and the species it supports should help to keep this area from being lost to habitat destruction. Native vegetated buffers should be maintained and improved around the stream and wetlands in order to protect the habitat from impacts related to the surrounding land use.

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

- Maintain the existing hydrology. Any activities that occur near the NHA should be conducted with a consideration for the impact to the flow of water into the wetlands below.
- Protect the riparian zone and repair others that have been degraded by encouraging the growth of native vegetation. Careful determination is needed to avoid planting trees in floodplains that should remain as open canopied herbaceous wetland habitats. These habitats should be maintained in their current open condition, with tree plantings to occur uphill of areas containing hydric soils.
- Avoid fragmenting the existing forests and wetlands 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.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location
Municipalities: *East Nantmeal Township, Wallace Township*
USGS quads: *Pottstown, Elverson, Downingtown, Wagontown*
Previous CNHI reference: *Great Marsh*
Associated NHAs: *None*
Overlapping Protected Lands: *Great Marsh, Agricultural Easement*



Great Marsh
Natural Heritage Area

Extensive wetlands at this site support two state rare natural communities and 7 species of concern. Included among these is state imperiled marsh wren, two state rare butterflies - black dash and mulberry wing, and a state imperiled upland plant, Nuttall

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Green Lane Woods NHA

PNHP Significance Rank: *State*

Site Description

Green Lane Woods NHA is wooded riparian habitat along Ashbridge Run, a tributary to Ridley Creek near Dutton Mill. Residential development, agricultural fields, and wooded habitat surround the NHA. Red maple dominated wetlands are found in some areas along the stream in Green Lane Woods NHA. This habitat supports a population of **log fern**, a plant 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]
Log Fern (*Dryopteris celsa*)	G4	S1	N (PE)	6/26/1994	CD

[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.

Log fern has been documented in several southeastern counties in Pennsylvania. It is uncommon in many parts of its range, which spans from New York west to Michigan and south to Georgia and Texas. Log fern is a hybrid species that is a cross between southern wood fern (*Dryopteris ludoviciana*) and Goldie's woodfern (*Dryopteris goldiana*) that is found in moist woods.

Threats and Stresses

Disturbances to the forest, such as logging and development, would destroy the existing habitat. Invasive species would also likely colonize any newly disturbed areas. The limited wooded buffer along Ashbridge Run may not effectively filter chemicals and sediment from the surrounding fields and other disturbed areas.

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

- Further fragmentation of the existing forest may alter the structure of the habitat and allow an increase in invasive species.
- Changes in the currently hydrology could significantly alter the habitat for the plant species of concern by making conditions either too wet or too dry to be able to persist at this site.
- Herbicide and fertilizer used along roads, lawns, and fields may wash into the forested area and degrade the habitat or cause direct mortality.
- Invasive species are present at this site and may displace native vegetation, including species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

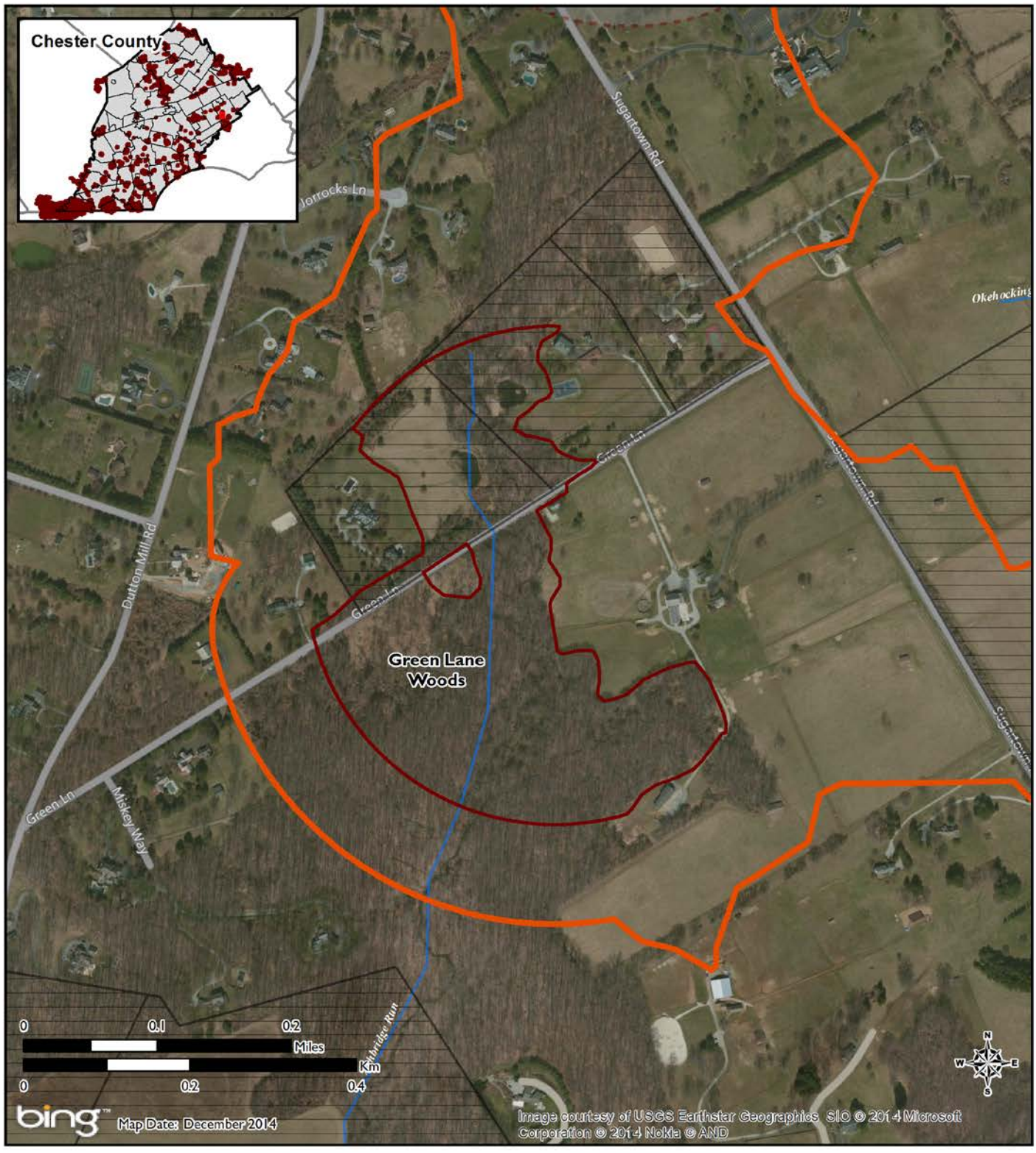
The upper portion of this NHA above Green Lane is covered under a conservation easement. This will help to protect some of this site from major disturbances. Do not further fragment the wooded habitat and expand it where possible to provide a buffer along the stream and wetlands.

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

- Protect the existing forested areas from logging and other large scale disturbance. Keep the forest as intact as possible to protect the habitat and species within it.
- Widen the native vegetated buffer along stream, especially above the NHA. A width of 100 meters is ideal, but any increase will benefit the stream and adjacent wetlands.
- Maintain the existing hydrology. Any activities that occur along the roads and other areas surrounding the NHA should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Willistown Township*
USGS quads: *West Chester*
Previous CNHI reference: *Dutton Mill Woods*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Easement*



Green Lane Woods Natural Heritage Area

Forested wetland supports a population of log fern, a critically imperiled 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***
- ***Conservation Lands***

Green Lawn Southwest NHA

PNHP Significance Rank: *State*

Site Description

Green Lawn Southwest NHA is part of a dry meadow that is managed as a hayfield. The surrounding area is in an area heavily dominated by agricultural fields with scattered woodlots. This NHA provides habitat for **Elliot's beardgrass**, a plant 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]
Elliott's Beardgrass (*Andropogon gyrans*) 	G5	S3	N (PR)	10/2/2005	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.

Elliot's beardgrass is at the northern edge of its range in Pennsylvania and has only been documented in a few southeastern counties. It spans from New Jersey to Illinois, south from Texas to Florida. This species needs open, early successional habitat in order to persist.

Threats and Stresses

Without proper management, succession will cause the area to become overgrown with woody species. Mistimed management can also negatively impact the habitat by affecting the growth of native species.

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

- Succession that is not controlled by mowing or other methods of disturbance will likely cause the habitat to become unsuitable for the species of concern to be able to persist at this site.
- Further development of the habitat currently occupied by Elliot's beardgrass will likely eliminate it from this area.
- Herbicide and fertilizer use in fields and along roads may wash into the field and degrade the habitat conditions.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Invasive species can take over portions of the habitat currently used by the species of concern and other native species.

Conservation Recommendations

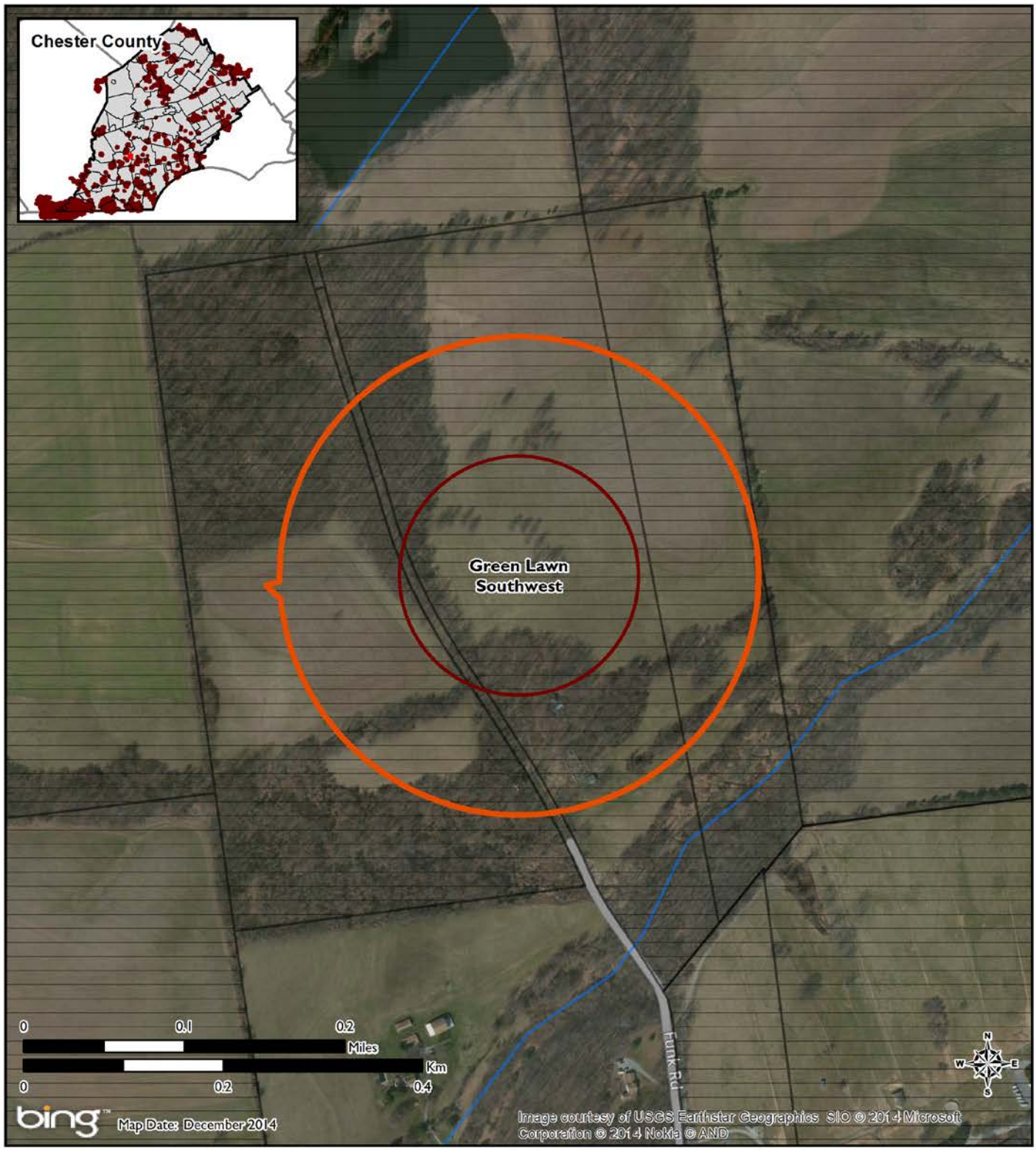
All of Green Lawn Southwest NHA is covered by a conservation easement. This will help to protect the area from development and other large disturbances. Periodic maintenance, such as mowing, is needed to preserve the existing habitat conditions. Maintenance should be done outside of the growing season to allow native species to complete their life cycle.

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

- Elliot's beardgrass requires open habitat that needs to be maintained. The needs of this species should be considered when planning the timing and frequency of maintenance.
- Avoid building additional houses or infrastructure in the area where Elliot's beardgrass is known to occur.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.

Location

Municipalities: *Londonderry Township*
USGS quads: *Coatesville*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Easement*



Green Lawn Southwest Natural Heritage Area

This site provides habitat for a population of Elliott's beardgrass, a vulnerable 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***
- ***Conservation Lands***

Greenwood Elementary School NHA

PNHP Significance Rank: *State*

Site Description

Greenwood Elementary School NHA is located south of Longwood partially on the school grounds and Longwood Gardens. The headwaters of a small stream begins in a man made pond at Longwood Gardens and flows through the NHA. The wooded habitat within the NHA is dominated by maple and has mowed trails cut through the area. The open woods provide habitat for **grass-leaved rush** and **stiff cowbane**, two plant 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]
Grass-leaved Rush (*Juncus biflorus*)		G5	S2	TU (PT)	7/10/1999	D
Stiff Cowbane (*Oxypolis rigidior*)		G5	S2	TU (PT)	7/10/1999	CD

[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.

Grass-leaved rush has been documented from Massachusetts west to Michigan and south to Florida and Arizona. This species is found in open, wet habitats throughout the state, but most populations occur in the southeastern counties.

Stiff cowbane is a plant species in the carrot family. Its range spans from New Jersey west to Minnesota and south to Texas and Florida. It is at the northern edge of its range in Pennsylvania and has mostly been documented in southern counties. Stiff cowbane is found in open, wet habitats.

Threats and Stresses

Disturbances to the forest, such as logging and development, can negatively impact the existing habitat. Invasive species would also likely colonize any newly disturbed areas. Use of parts of this NHA for recreation may also create disturbances within the wooded habitat.

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

- Logging, development, or other major activities will further fragment the existing forest and alter the conditions of the habitat needed by the species of concern. Disturbances may also open areas that can be easily colonized by invasive species.
- Runoff and other sources of water pollution from the surrounding area threaten to degrade the water quality of streams and surrounding wetlands.
- Invasive species are common throughout much of this site and may displace native vegetation, including species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Herbicides sprayed on the agricultural fields and edges may cause direct mortality to the species of concern and other native species.

- Changes to the currently hydrology could significantly alter the habitat for the plant species of concern by making conditions either too wet or too dry to be able to persist at this site.

Conservation Recommendations

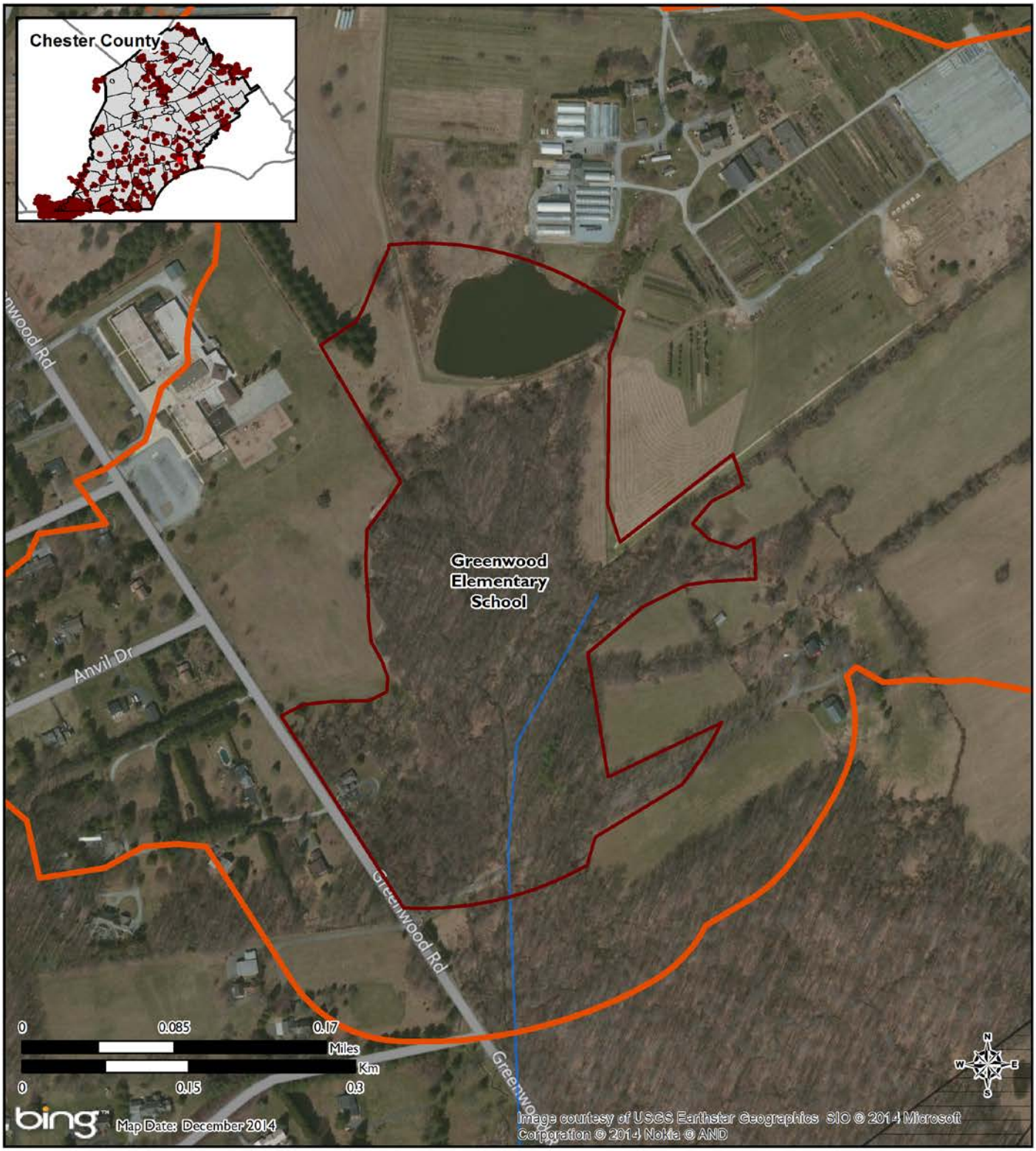
Greenwood Elementary School NHA is partially owned by the school district and Longwood Gardens, as well as private ownership. Limited disturbance to the wooded area will help to maintain the habitat conditions. Some small disturbances may be needed along the trail to maintain the habitat used by the species of concern.

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

- Protect the existing forested areas from logging and other large scale disturbance. Keep the forest as intact as possible to protect the habitat and species within it.
- Widen the native vegetated buffer along the stream. A width of 100 meters is ideal, but any increase will benefit the stream and adjacent wetlands.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Maintain the existing hydrology. Any activities that occur in adjacent areas should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.

Location

Municipalities: *Kennett Township, East Marlborough Township*
USGS quads: *Kennett Square*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Greenwood Elementary School Natural Heritage Area

Forested habitat on the grounds of Greenwood Elementary School support populations of two plant species of concern: grass-leaved rush and stiff cowbane.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Greenwood Road East Woods NHA

PNHP Significance Rank: *State*

Site Description

Greenwood Road East Woods is a portion of a patch of wooded habitat that is approximately 95 acres in size near Rosedale. The habitat within the NHA is dominated by tulip poplar and white oak. A number of residential developments are located in the areas surrounding this site and several houses are located in the wooded habitat surrounding the NHA. The habitat within the NHA supports a population of **puttyroot**, a plant 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]
Puttyroot (*Aplectrum hyemale*) 	G5	S3	PR (PR)	12/11/1994	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.

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

In Pennsylvania, puttyroot is most commonly found in the southeastern counties and grows in moist woodlands and on forested slopes and streambanks. Puttyroot produces leaves that are visible through the fall and winter. The leaves wither in late spring and the plant flowers in May and June.

Threats and Stresses

Continued development or other fragmentation of this area would cause direct destruction of the wooded habitat. Invasive species are found throughout this NHA and may alter the structure of the habitat.

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

- Invasive species are common in many areas of this site and may displace native vegetation, including species of concern.
- Logging, development, or other major activities will further fragment the existing forest and alter the conditions of the habitat needed by the species of concern. Disturbances will also open areas that will be easily colonized by invasive species.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Herbicides and fertilizers used in lawns, fields, and along roads may wash into the wooded area and degrade the habitat conditions.

Conservation Recommendations

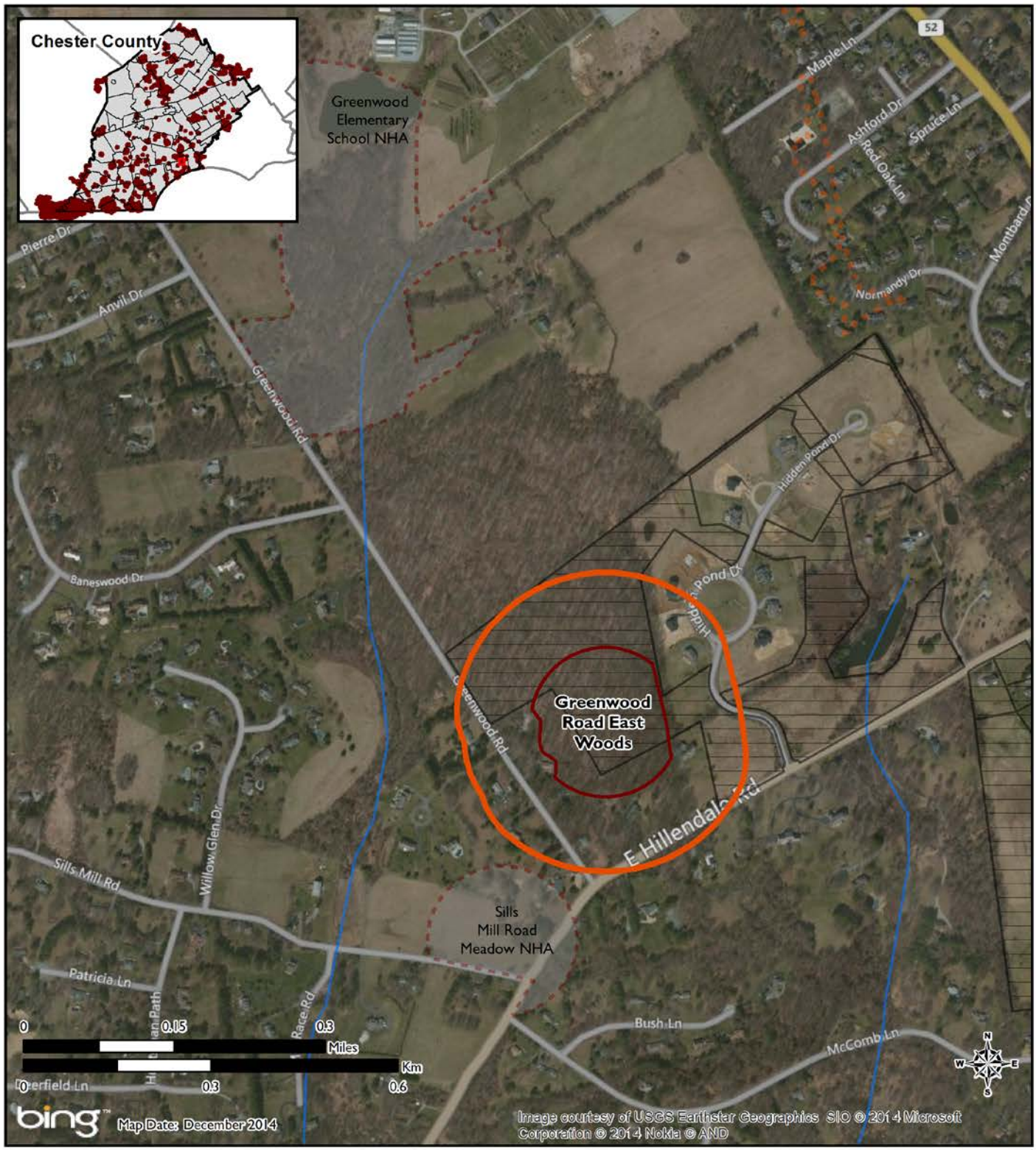
Avoid fragmenting the existing wooded area with logging or infrastructure. Attempt to control invasive species with mechanical removal, using herbicides only if necessary.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Protect the existing forested areas from logging and other large scale disturbance. Keep the forest as intact as possible to protect the habitat and species within it.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.

Location

Municipalities: *Kennett Township*
USGS quads: *Kennett Square*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Easement*



Greenwood Road East Woods Natural Heritage Area

This forested site supports a population of the state rare plant, puttyroot.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Grist Mill Woods NHA

PNHP Significance Rank: *State*

Site Description

Grist Mill Woods NHA consists of the riparian area along a section Big Elk Creek. Much of this site is wooded, but there are some open wetlands along the creek that also provide habitat for several species of concern – **a sedge, bushy aster, downy lobelia, slender blue iris**, and **stiff cowbane**. This site is surrounded by residential development and agriculture, making the habitat susceptible to impacts from adjacent disturbance. Much of the riparian area surrounding Big Elk Creek upstream of Grist Mill Woods NHA has been cleared, which could have serious negative impacts to Big Elk Creek and the surrounding wetlands.

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]
A Sedge (*Carex tetanica*)		G4G5	S2	PT (PT)	9/21/2008	BC
Slender Blue Iris (*Iris prismatica*)		G4G5	S1	PE (PE)	9/19/2004	D
Downy Lobelia (*Lobelia puberula*)		G5	S1	PE (PE)	10/3/1999	CD
Stiff Cowbane (*Oxypolis rigidior*)		G5	S2	TU (PT)	9/19/2004	D
Bushy Aster (*Symphyotrichum dumosum*)		G5	S1	TU (PE)	10/3/1999	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.

A sedge (*Carex tetanica*) is most often found in open, wet habitats and has been documented throughout the state. In the United State, this species if found from Maine west to North Dakota and south to North Carolina and Nebraska. It is found in portions of southern Canada as well.

Bushy aster is located throughout the eastern United States from Maine west to Wisconsin and south to Florida and Texas. It occurs through some parts of Canada as well. Most occurrences in Pennsylvania have been documented in the southeastern counties. It is considered to be critically imperiled in the state due to the small number of occurrences. Bushy aster is most often found in open habitats and along shrubby edge habitat.

The state endangered slender blue iris is uncommon throughout much of its range, which stretches along the Atlantic Coast from Maine to Georgia, as well as in parts of the southern Appalachians. In Pennsylvania, most documented populations of this species are found in the southeast, with a few locations known in the western part of the state. Slender blue iris grows in open, wet habitats.

Downy lobelia is a state endangered species that ranges from New Jersey to Illinois and south into Florida and Texas. In Pennsylvania, it is considered a southerly species and has been documented historically in the southeastern counties. It grows in moist clearings and openings, grasslands, woods borders, and right-of-ways.

Stiff cowbane is a plant species in the carrot family. Its range spans from New Jersey west to Minnesota and south to Texas and Florida. It is at the northern edge of its range in Pennsylvania and has mostly been documented in southern counties. Stiff cowbane is found in open, wet habitats.


Denise Watts, PNHP

Stiff cowbane (*Oxypolis rigidor*)

Threats and Stresses

Invasive species are prevalent through much of this site. Japanese stiltgrass (*Microstegium vimineum*) is especially problematic in many areas. The large amount of disturbance adjacent to the site also threatens to degrade the quality of the habitat due to sedimentation and runoff from agricultural and residential areas.

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

- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Succession that is not controlled by mowing or other methods of disturbance will likely cause the habitat to become unsuitable for many of the species of concern to be able to persist at this site. Red maple is colonizing the open habitat, and some herbaceous species, such as goldenrod, may compete for habitat currently used by species of concern.
- Runoff and sedimentation from the surrounding agricultural and residential areas may degrade the water quality of Big Elk Creek and the surrounding natural areas, especially given the limited riparian areas upstream of this site.
- Logging will further fragment the existing forest and alter the conditions of the habitat needed by the species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

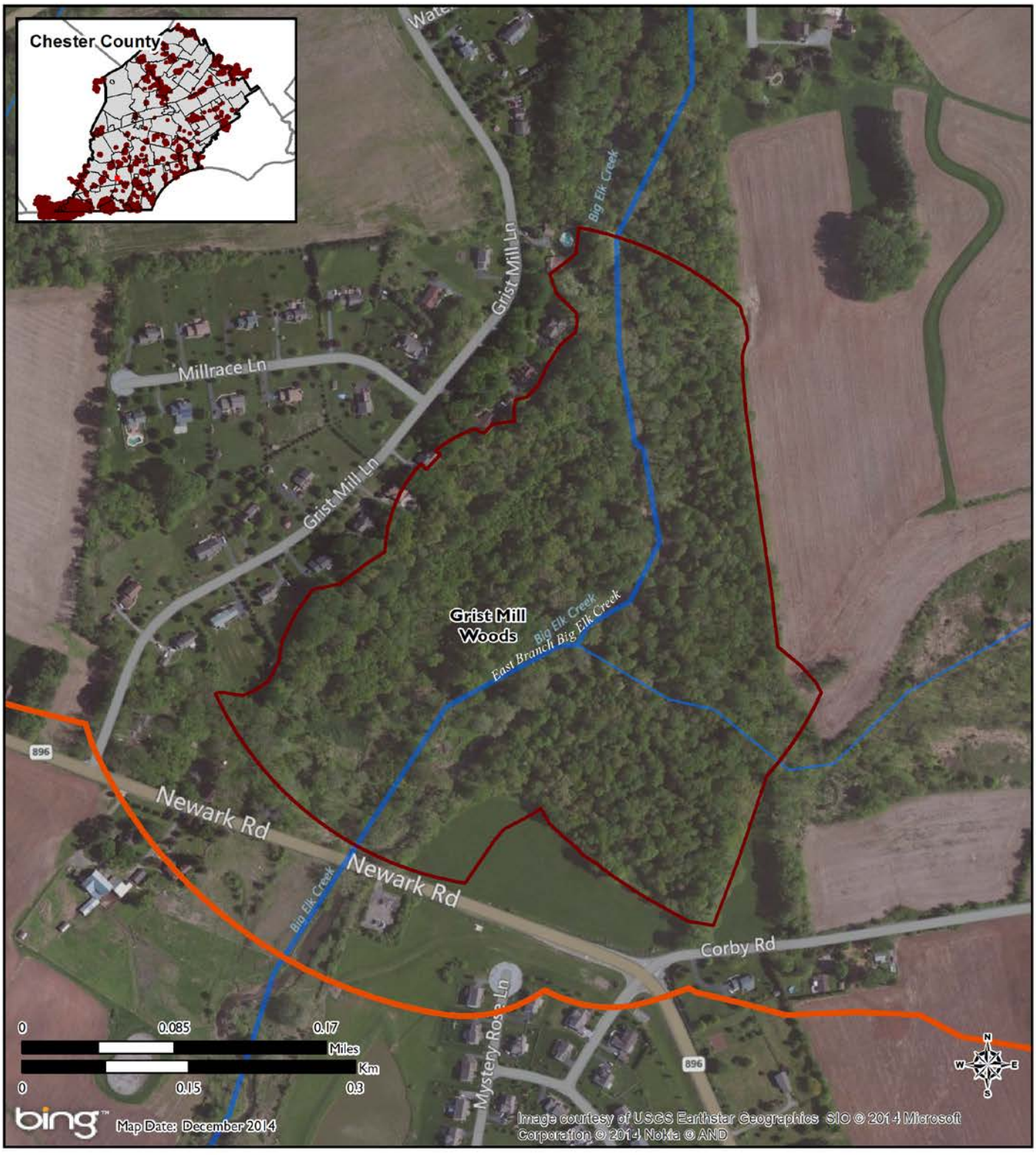
Grist Mill Woods NHA is part of the greenspace for the adjacent housing development. Further fragmentation of the natural area surrounding Big Elk Creek should be avoided in order to maintain the function of the habitat for the species of concern. Some maintenance will be needed to keep early successional habitats from becoming overrun with woody species.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Use disturbance, such as mowing, to slow succession and preserve habitat for species of concern. The needs of the species of concern found at this site should be considered when planning the timing and frequency of maintenance.
- Maintain the existing forested buffer along Big Elk Creek and improve it wherever possible. A riparian buffer of 100 meters is ideal, but lesser amounts provide benefits as well.
- Protect the existing forested areas from logging. Do not further fragment the habitat with roads, house, or other disturbances in order to preserve habitat for as many species as possible.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Penn Township, Upper Oxford Township*
USGS quads: *Oxford*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Grist Mill Woods
Natural Heritage Area

Upland forest and forested wetlands along the East Branch of Big Elk Creek support populations of 5 plant species of concern

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

Gum Tree Road NHA

PNHP Significance Rank: *State*

Site Description

This NHA contains a small riparian wetland and adjacent forest and agricultural lands located just south of Gum Tree Road in central Chester County. Wetland habitat at this site supports 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**	---	---	---	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.

Threats and Stresses

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

- 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 of concern at this site rely on good water quality, and are vulnerable to siltation and chemical pollution.

Conservation Recommendations

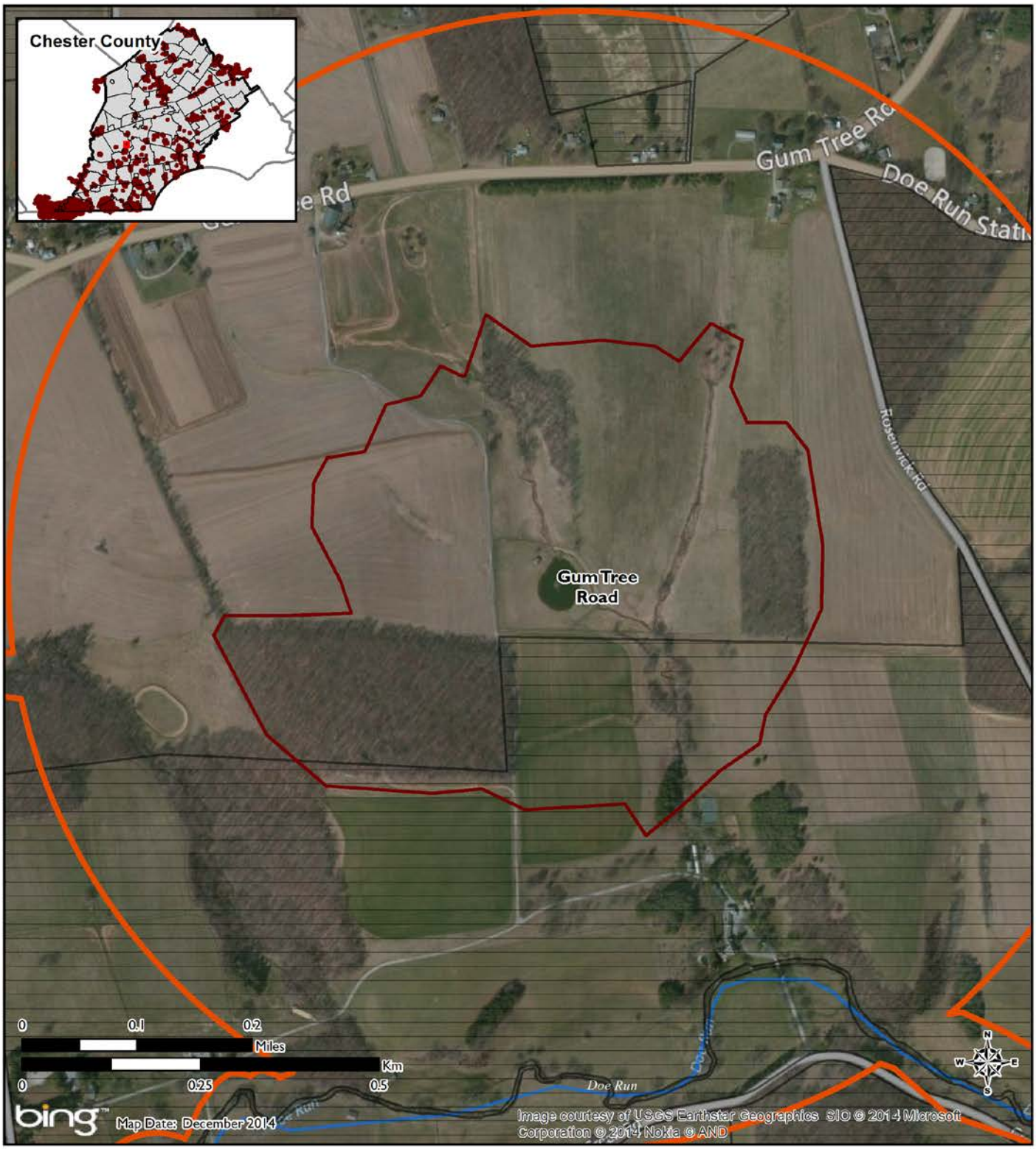
Additional development within the Core Habitat should be avoided to protect the sensitive species of concern. Disturbance within the Core Habitat should not be a problem for this species if it occurs during non-breeding season (August – May).

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 June through July breeding season.
- Maintain at least a 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: *Highland Township*
USGS quads: *Coatesville*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Easement*



Gum Tree Road
Natural Heritage Area

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 Supporting Landscape***
- ***Conservation Lands***

Hamorton Woods NHA

PNHP Significance Rank: *State*

Site Description

Hamorton Woods NHA is located in a portion of greenspace within a housing development. Ring Run begins as the outflow of a small pond in the development and flows through the narrow wooded riparian area. This wooded streamside provides habitat for **autumn bluegrass**, a state endangered plant 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]
Autumn Bluegrass (*Poa autumnalis*)	G5	S1	PE (PE)	6/202012	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.

In Pennsylvania, autumn bluegrass has been documented in several southwestern counties and is typically found along stream banks and in moist woods. It is more common in the southern portions of its range, which spans from New Jersey west into Michigan and south to Florida and Texas. Autumn bluegrass is considered critically imperiled in Pennsylvania due to the small number of known populations in a small geographical area.

Threats and Stresses

Invasive species are found commonly throughout this site. A trail is cut through the wooded area that may disturb the habitat used by the species of concern.

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

- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Further fragmentation of the small patch of existing woodlot may alter the structure of the habitat and allow an increase in invasive species.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Recreation at this site may cause erosion along existing trails and provide areas of disturbance that may be colonized by new populations of invasive species.

Conservation Recommendations

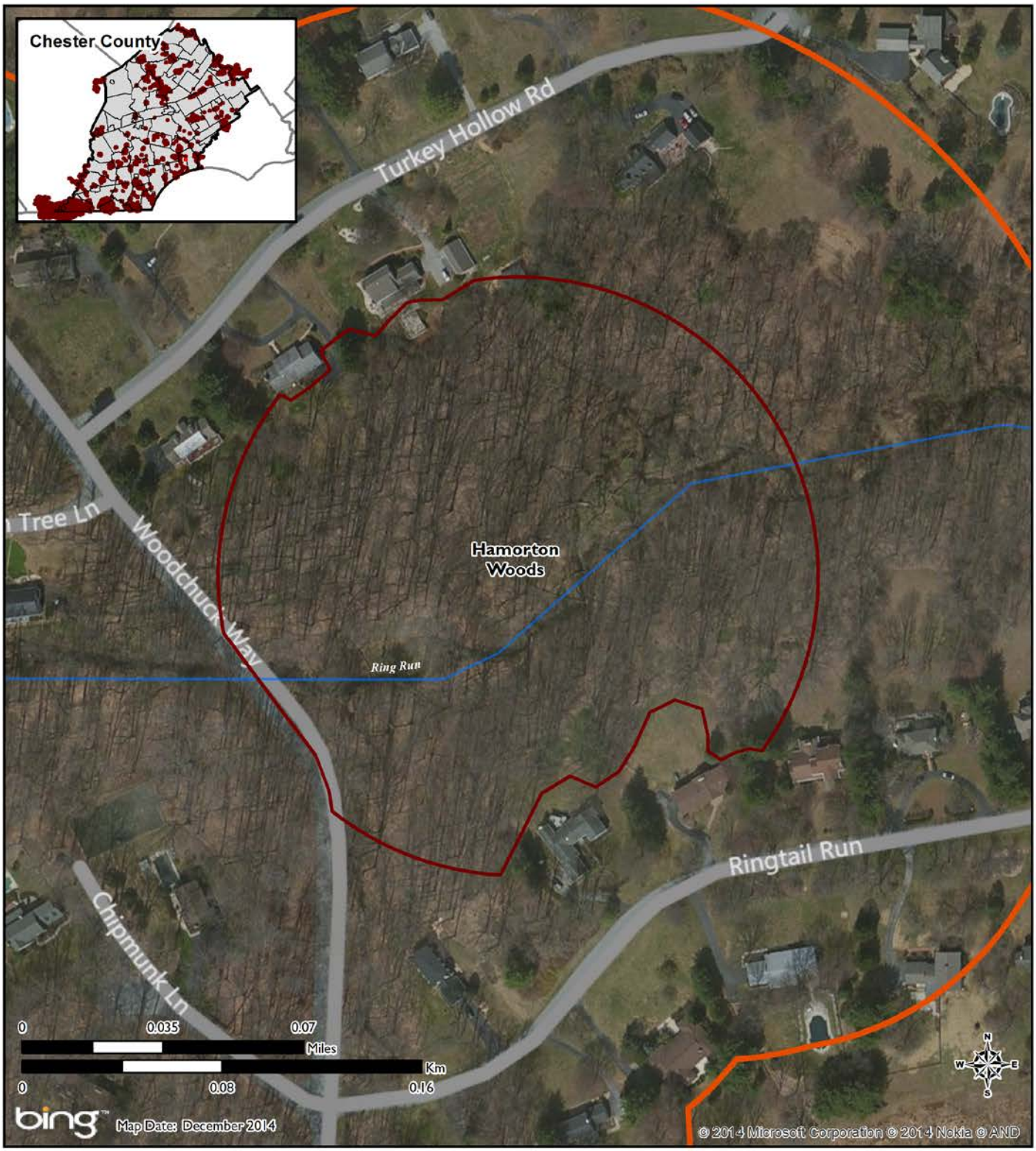
Proximity to Ring Run should protect this site from further development. Limiting further disturbance from activities such as logging and recreation will help to preserve the habitat in its current state. Controlling invasive species should be a priority for management.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations. Further disturbance within this habitat will create additional opening for the establishment and spread of invasive species.
- Protect the existing forested areas from logging and disturbance along the forest edge. Maintaining as many intact habitats as possible, given the location within a residential area, will help to preserve habitat for the native species found at this site.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Limit modifications of the existing trails to prevent erosion and the introduction of additional invasive species. Maintain the current level of activity and do not allow higher impact recreational activities that may increase the amount of disturbance.

Location

Municipalities: *Kennett Township*
USGS quads: *Kennett Square*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Hamorton Woods
Natural Heritage Area

Forested habitat supports a population of Autumn bluegrass, an endangered plant species in PA.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

Hartsfeld Woods NHA

PNHP Significance Rank: *State*

Site Description

Hartsfeld Woods NHA is a patch of wooded habitat that is located within a residential development near Kaolin. Numerous small, scattered woodlots occur throughout the developed landscape. Tulip poplar dominates the canopy of the wooded habitat within this NHA. A small tributary of Bucktoe Creek flows through the wooded area. This habitat found within Hartsfeld Woods NHA supports a population of a **sensitive species of concern**, not named 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**	---	---	---	7/11/2002	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.

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

Threats and Stresses

Fragmentation of the wooded habitat will alter the existing conditions and would likely increase the abundance of invasive species by creating openings for them to become established. Fertilizers and herbicides used along roads and on lawns and the adjacent golf course may wash into the wooded habitat and degrade the water quality of the stream.

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

- Invasive species are present in many areas of this site and may displace native vegetation and alter the habitat required by the species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Logging may disturb the small amount of remaining habitat, as well as cause changes in hydrology and allow for the introduction of additional invasive species.
- Runoff and other sources of water pollution from the surrounding area threaten to degrade the water quality of streams.

Conservation Recommendations

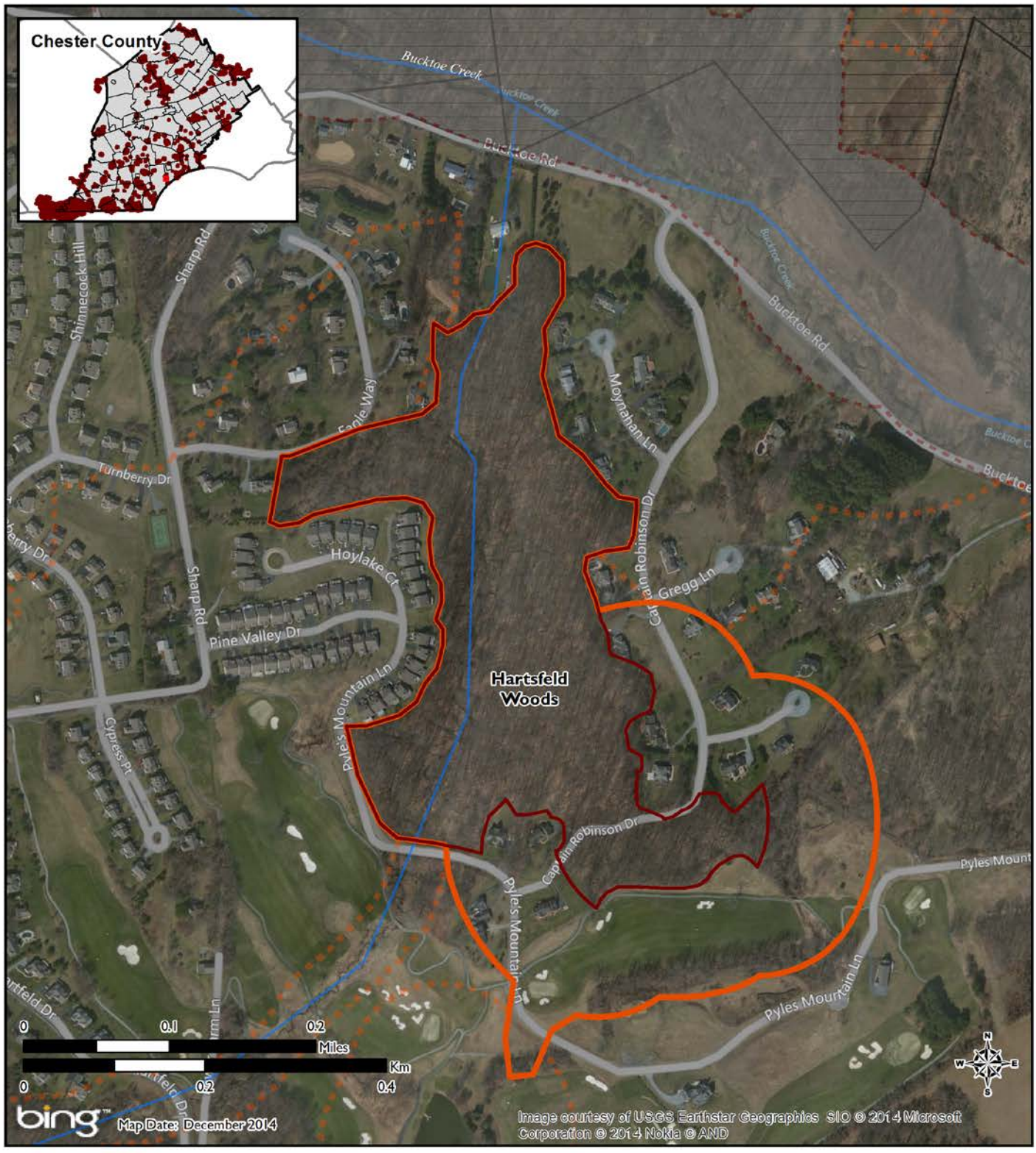
This area has been set aside as green space within a residential development. Proximity to the stream may prevent further development within this area. Avoid fragmenting the remaining habitat in order to protect the existing habitat conditions. Limit the use of chemical fertilizers and pesticides on the adjacent lawns and golf course.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Protect the existing forested areas from logging and other large scale disturbance. Keep the forest as intact as possible to protect the habitat and species within it.
- Maintain a vegetated buffer along the roads and limit the use of pesticides and herbicides along the road and fields to protect the water quality.

Location

Municipalities: *Kennett Township, New Garden Township*
USGS quads: *Kennett Square*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Hartsfeld Woods
Natural Heritage Area

Upland forest at this site provides habitat for 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*
- *Conservation Lands*

Harvey's Bridge North NHA

PNHP Significance Rank: *State*

Site Description

Harvey's Bridge North NHA is a portion of a patch of wooded habitat approximately 130 acres in size. Along with the wooded habitat, this NHA also includes a small amount of early successional habitat in an old field. This site sits to the north of West Branch Brandywine Creek. The surrounding area is a mix of agricultural fields and woodlots with some residential areas. The wooded habitat within Harvey's Bridge North NHA is dominated by tulip poplar and American beech. This habitat supports a population of **puttyroot**, a plant species of concern. **Elliot's beardgrass** is another plant species of concern found at this site, which was documented in the early successional old field.

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]
Elliott's Beardgrass (*Andropogon gyrans*)		G5	S3	N (PR)	10/21/2007	C
Puttyroot (*Aplectrum hyemale*)		G5	S3	PR (PR)	10/21/2007	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.

Elliot's beardgrass is at the northern edge of its range in Pennsylvania and has only been documented in a few southeastern counties. It spans from New Jersey to Illinois, south from Texas to Florida. This species needs open, early successional habitat in order to persist.

In Pennsylvania, puttyroot is most commonly found in the southeastern counties and grows in moist woodlands and on forested slopes and streambanks. Puttyroot produces leaves that are visible through the fall and winter. The leaves wither in late spring and the plant flowers in May and June.

Threats and Stresses

Invasive species are found throughout this site and can alter habitat conditions and species composition. Fragmentation of the wooded area will negatively impact the habitat, while succession is a major threat to the old field portion of this NHA.

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

- Logging, development, or other major activities can further fragment the existing habitat and alter the conditions needed by the species of concern. Disturbances may also open areas that can be easily colonized by invasive species.
- Succession that is not controlled by mowing or other methods of disturbance will likely cause the early successional habitat to become unsuitable for Elliot's beardgrass to be able to persist at this site.
- Invasive species can take over portions of the habitat currently used by the species of concern and other native species.
- Herbicides and fertilizers used in fields and along roads may wash into the field and degrade the habitat conditions and cause direct mortality.

- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

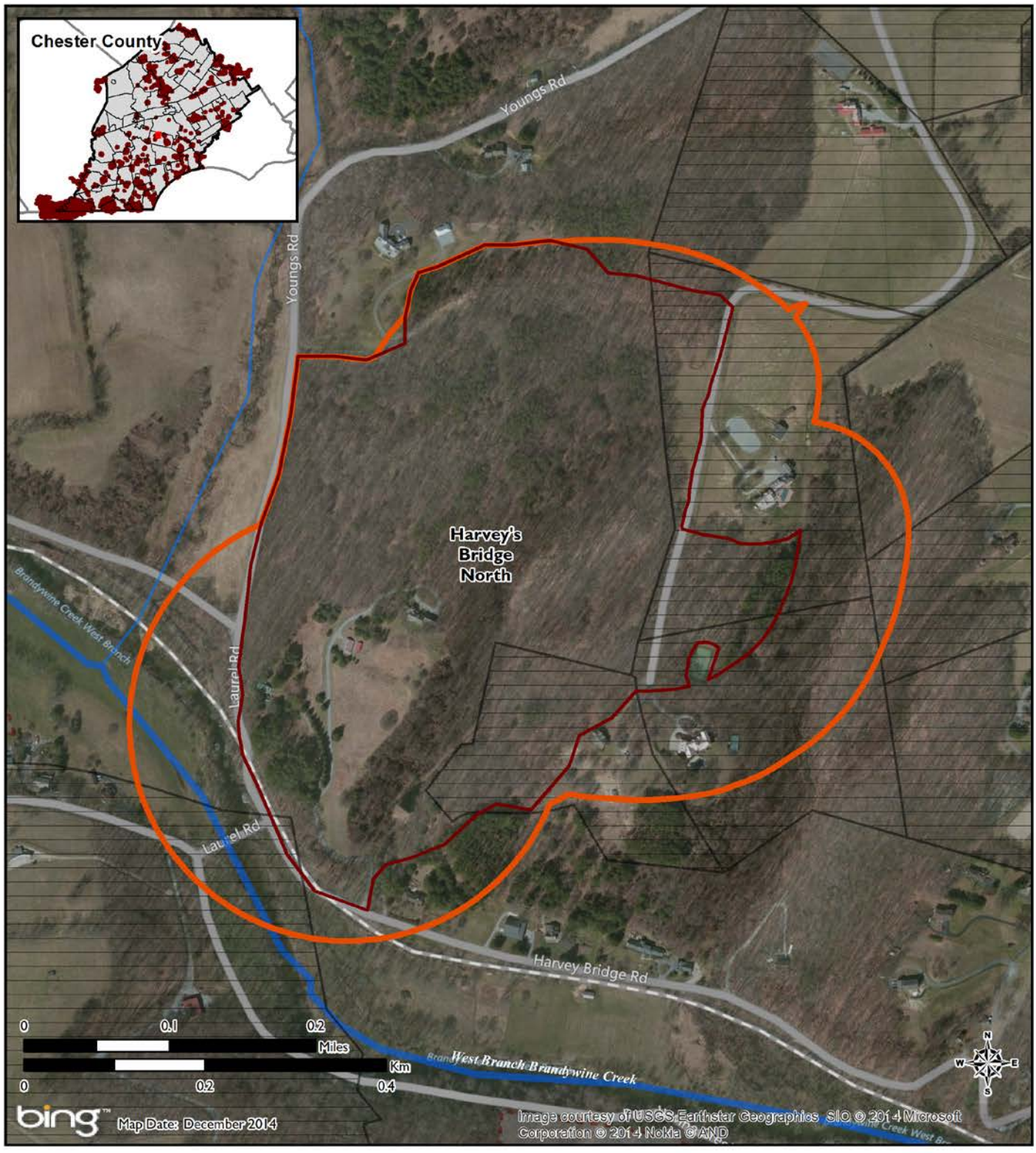
A small amount of this NHA is covered by a conservation easement, but the majority of the site has no formal protection. Remove invasive species where possible. Multiflora rose is common throughout much of the wooded area and may have significant impacts to the natural habitat conditions. Maintain existing habitat conditions by minimizing activities in the wooded habitat and using mowing or other disturbance in the early successional habitat.

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

- Protect the existing forested areas from logging and other large scale disturbance. Keep the forest as intact as possible to protect the habitat and species within it.
- Elliot's beardgrass requires open habitat that needs to be maintained. The needs of this species should be considered when planning the timing and frequency of maintenance.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Newlin Township*
USGS quads: *Unionville, Coatesville*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Easement*



Harvey's Bridge North Natural Heritage Area

Upland habitats support two plant species of concern: Elliott's beardgrass and puttyroot.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Hayesville Powerline Seep NHA

PNHP Significance Rank: *State*

Site Description

The headwaters of a small tributary to West Branch Big Elk Creek begin in the northwestern end of Hayesville Powerline Seeps NHA and flow southeast through a patch of red maple woods. The southeastern end of the site is a power line right-of-way. Wet seep habitat occurs adjacent to the stream throughout the red maple woods. This area provides habitat for **stiff cowbane**, a plant 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]
Stiff Cowbane (*Oxypolis rigidior*)	G5	S2	TU (PT)	5/24/1995	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.

Stiff cowbane is a plant species in the carrot family. Its range spans from New Jersey west to Minnesota and south to Texas and Florida. It is at the northern edge of its range in Pennsylvania and has mostly been documented in southern counties. Stiff cowbane is found in open, wet habitats.

Threats and Stresses

Disturbed habitats surround much of the NHA. Activities done on adjacent agricultural fields, residential developments, and powerline cuts may negatively impact the condition of the habitat within the NHA. Livestock may have access to the area, which could disturb the habitat by grazing, trampling, or spreading invasive species.

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

- Logging, development, or other major activities can further fragment the existing habitat and alter the conditions needed by the species of concern. Disturbances may also open areas that can be easily colonized by invasive species.
- Runoff and other sources of water pollution from the surrounding area threaten to degrade the water quality of streams and surrounding wetlands.
- Changes in the currently hydrology could significantly alter the habitat for the plant species of concern by making conditions either too wet or too dry to be able to persist at this site.
- Invasive species can take over portions of the habitat currently used by the species of concern and other native species.
- Herbicides and fertilizers used in fields, the powerline right-of-way, and along roads may wash into the wooded habitat and degrade the habitat conditions and cause direct mortality.
- Over-browsing by white-tailed deer and livestock impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

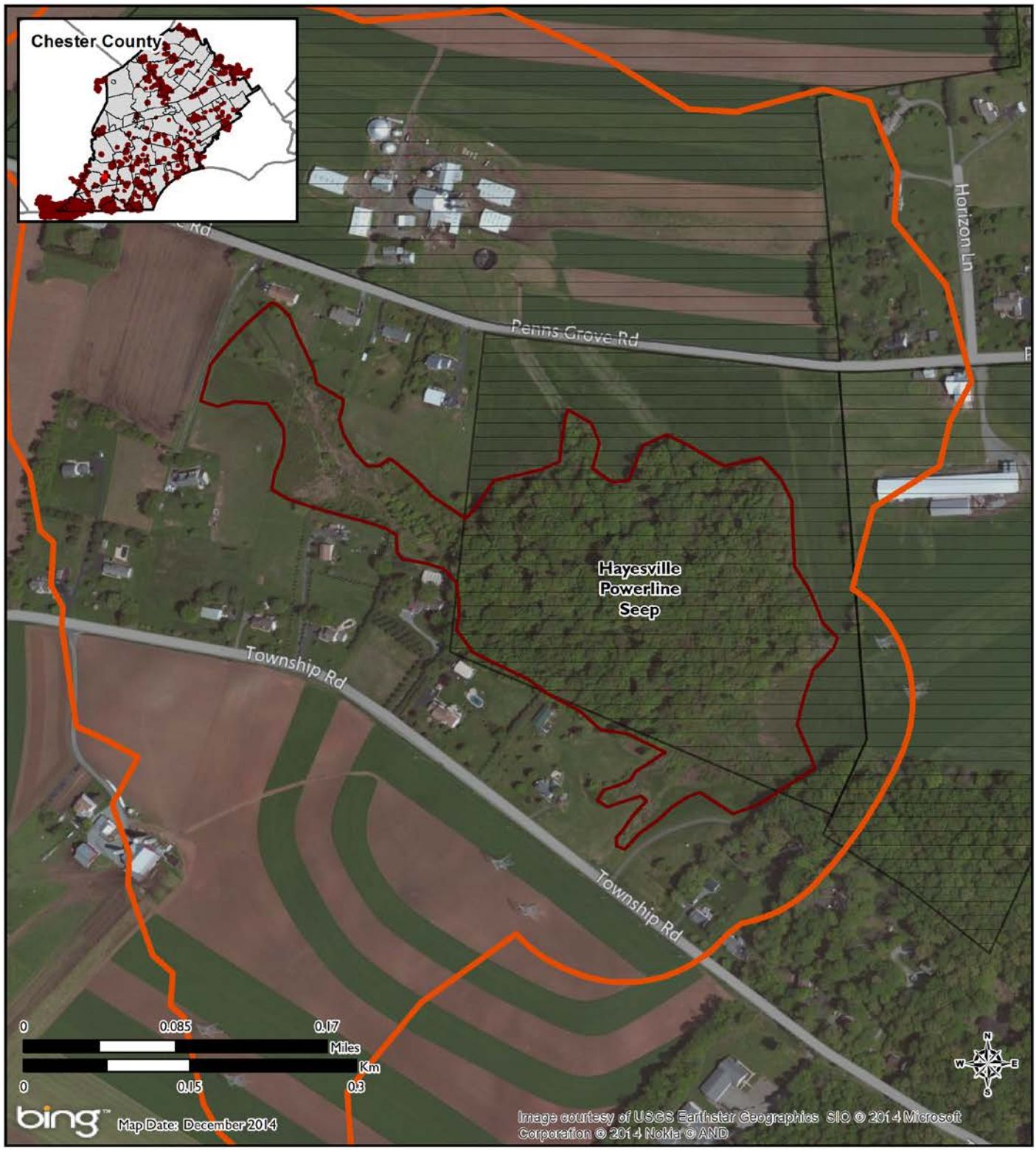
The eastern end of the NHA is covered under a conservation easement, which should help to protect the habitat from major disturbances. Limit application of herbicides and fertilizers on adjacent agricultural fields, lawns, and right-of-ways along the roads and powerline. Increase the vegetated riparian buffer along the stream and wetlands, especially in the western end of the NHA.

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

- Protect the existing forested areas from logging and other large scale disturbance. Keep the forest as intact as possible to protect the habitat and species within it.
- Widen the native vegetated buffer along the upper end of the stream. A width of 100 meters is ideal, but any increase will benefit the stream and adjacent wetlands.
- Maintain the existing hydrology. Any activities that occur along the roads should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape. Keep livestock out of the wooded habitat.

Location

Municipalities: *Lower Oxford Township*
USGS quads: *Oxford*
Previous CNHI reference: *None*
Associated NHAs: None
Overlapping Protected Lands: *Brandywine Conservancy Easement*



Hayesville Powerline Seep Natural Heritage Area

Wetland habitat at this site supports a population of a Pennsylvania imperiled plant, stiff cowbane.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Helm Way Pipeline NHA

PNHP Significance Rank: *State*

Site Description

Helm Way Pipeline NHA is located at the edge of a residential development north of Downingtown. Housing developments and wooded habitat surround the NHA. Much of the habitat within the NHA is wooded, but early successional habitat has been created in the pipeline right-of-way. Grasses, ferns, and other herbaceous species dominate this area. This open habitat supports a small population of **tawny ironweed**, a plant 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]
Tawny Ironweed (*Vernonia glauca*)	G5	S1	PE (PE)	7/2/2001	CD

[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.

Tawny ironweed is a perennial herb that flowers in the late summer and fall. It often grows in open habitats and upland forests. This species is endangered in Pennsylvania due to the small number of populations in a limited area of the state. Tawny ironweed is found from Pennsylvania and New Jersey south to Florida and Mississippi. In Pennsylvania, it is at the northern edge of its range and found in a few southern counties. Habitat loss and succession are the major threats to this species.

Threats and Stresses

Herbicides used to manage the right-of-way can cause mortality and may alter species composition. Succession of woody species can shade out early successional species, but excessive mowing may also have a negative impact on native species. Invasive species are found throughout this site and may spread to crowd out native species that currently exist in this NHA.

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

- Invasive species are common throughout this NHA and may displace native vegetation, including species of concern.
- Growth of woody species in the early successional habitat may cause the area used by tawny ironweed to become overgrown and shaded.
- Herbicides sprayed on the pipeline right-of-way may cause direct mortality to the species of concern and other native species. Fertilizers from surrounding lawns can also wash into the NHA and degrade habitat conditions.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

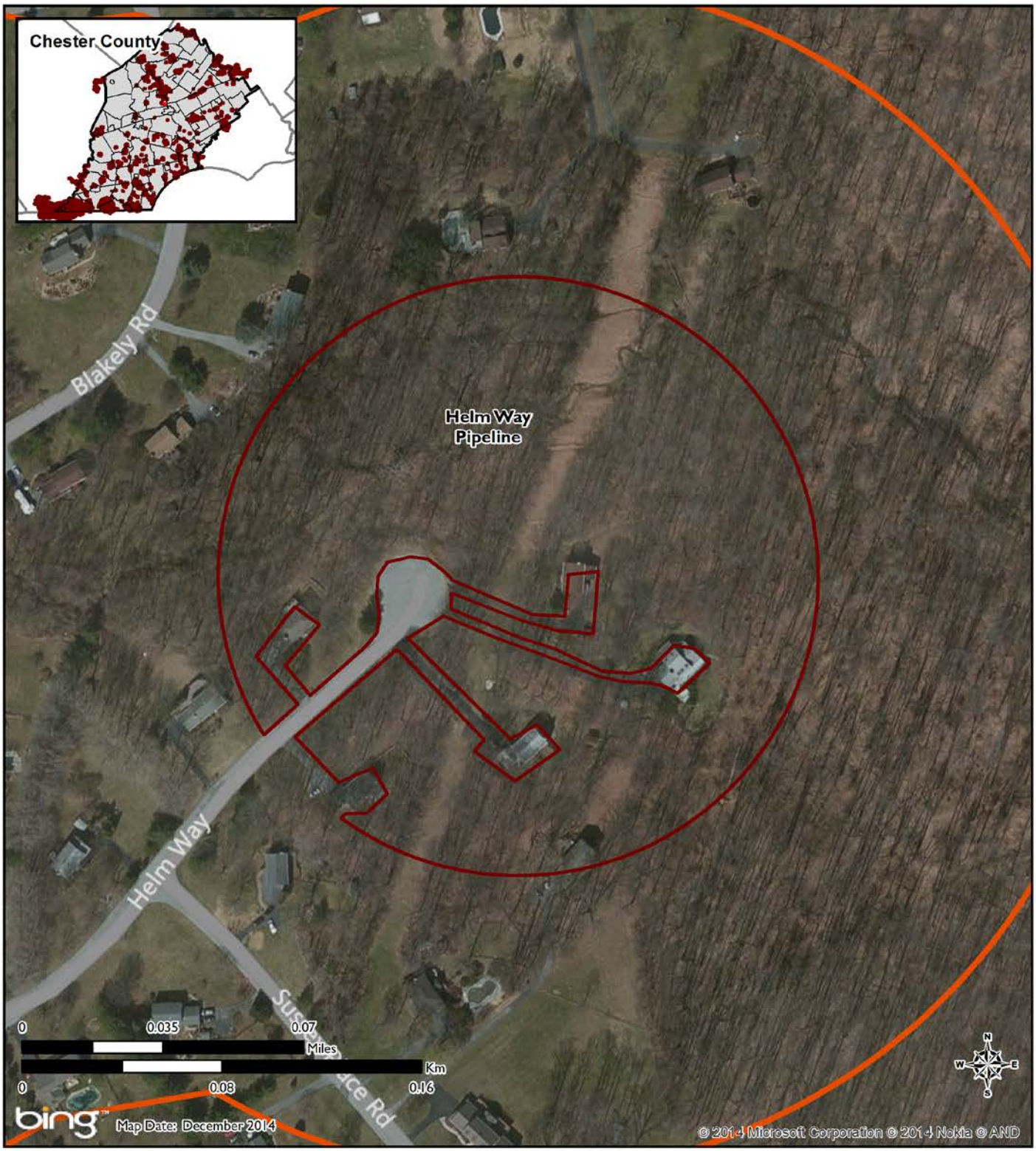
Occasional disturbance will likely be necessary to maintain the habitat conditions and prevent the succession of woody species. Maintenance should be done outside of the growing season with minimal herbicide use to limit impact to native species.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Tawny ironweed requires open habitat that needs to be maintained with mowing or other methods of disturbance. The needs of this species should be considered when planning the timing and frequency of maintenance.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *East Brandywine Township*
USGS quads: *Downingtown*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Helm Way Pipeline
Natural Heritage Area

An open, disturbed pipeline corridor supports a population of tawny ironweed, 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***

Hershey Mill Barrens Southeast NHA

PNHP Significance Rank: *State*

Site Description

A small, remnant serpentine influenced habitat occurs in a residential context. Part of the habitat has been converted to a golf course and the whole site is surrounded by homes and the golf course.

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]
Annual Fimbry (*Fimbristylis annua*)		G5	S2	PT (PT)	9/17/1982	E
Serpentine Aster (*Symphyotrichum depauperatum*)		G2	S2	PT (PT)	10/5/1992	C
Sensitive species of concern A[3]	S	---	---	---	2008	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.

All three of the species of concern occurring at this site are typical of the Eastern Serpentine Barrens communities and outcrops of PA. This habitat is too small for natural community status and does not have the variety of habitats that are found on the large barrens; however the plant species of concern occurring here have fairly sizeable populations. In the past, natural disturbance, such as wildfires, would have helped to keep this area in an open condition. Without active management, the open grassy area will gradually close due to natural succession. In this residential setting, typical regular lawn mowing likely has helped to preserve some of the open aspect preferred by the species of concern.

Serpentine aster is a species of plant that deserves special mention based on its potential for global extinction due to its extremely limited global population. This species is predominantly known to occur in the eastern serpentine barrens of Pennsylvania and Maryland, with a few far flung outliers in Virginia and North Carolina (Gustafson 2005; Kartesz 2013). This extremely limited distribution has given this species the status of G2 – globally imperiled. Serpentine aster is found in the more open areas of serpentine barrens, suggesting that fire or other active management may be needed to remove woody overgrowth and maintain this preferred habitat.

Rocky Gleason (PNHP)

Serpentine Aster (*Symphyotrichum depauperatum*)

Threats and Stresses

Reviews of aerial photos taken in 1937 show this area as dominated by active agriculture with scattered woodlots. This specific location does not appear to have been in cultivation, likely due to the thin stony serpentine influenced soils present, but was likely used as pasture, which would have been a suitable habitat for the plant species of concern. The farms in the area have since been replaced by residential

development and their associated infrastructure. Part of the site is a golf course and parts of the dry, grassy areas and adjacent thin woods appear to have offered the plant species of concern some refuge.

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

- The lack of natural fire disturbance poses one of the greatest threats to this habitat. In the absence of natural fire events or active woody vegetation management, most of the open serpentine barrens habitats will gradually succeed to more common woody vegetation such as junipers, pines and oaks.
- This site occurs within a residential context with a lot of associated edge habitat.
- Invasive species of plants can displace native species of plants.
- Over browsing by white-tailed deer is a serious threat to the overall plant diversity.

Conservation Recommendations

These serpentine habitats occur in isolated patches as the bedrock material, serpentinite, is exposed at the surface of the ground in a scattered fashion much like an archipelago chain of islands. Each habitat has a slightly different species composition, largely due to the slightly different environmental conditions found at each distinct location. A long range goal for these isolated habitats is to recognize them as a single system and plan for their ecological needs.

Henry Whitesel – Friends of the State Line Serpentine Barrens

Active vegetation management is required to maintain herbaceous openings at serpentine habitats.

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

- Two of the species of concern known from this location have not been documented in many years and should be surveyed for again to determine the status of the population and the condition of its surrounding habitat.
- There is no specific management plan for this Natural Heritage Area, and the site would benefit from a thorough review of the site-specific goals and procedures for management here. In the interim, general goals and actions could be gleaned from other serpentine management plans such as the Goat Hill Management Plan (Furedi 2008); Unionville Serpentine Barrens Restoration and Management Plan (Latham 2012); Pink Hill Serpentine Barrens Restoration and Management Plan (Latham 2008).
- Active stewardship of these habitats is necessary. In the absence of natural fire disturbance, or active vegetation removal, these habitats will succeed into woodlands and forests, replacing the globally rare habitat with a more common type.
- Educate the adjacent landowners on the significance of the globally rare habitat and the need for ongoing management activities. The serpentine influenced plant species are considered quite rare in the state and could be cultivated at this location as part of the residential landscape. Maintain the dry, herbaceous openings, fostering the populations of serpentine influenced plants by removing their more common competitors. This is a relatively unique

- assortment of plants and there will be very few other landscapes with this assortment of species.
- Suppress the spread of invasive species of plants to prevent native species from being crowded out of the habitat. Removal of invasive plants in the immediately vicinity of the species of concern can help these populations compete for space against much more aggressive species. Invasive species management should be coordinated by individuals familiar with the rare species as well as the invasive species present. Continual invasive species monitoring and control will be necessary.
- Reduce deer herd density to suitable levels to prevent overbrowsing of sensitive species.

John Kunsman (PNHP)

Annual Fimbry (*Fimbristylis annua*)

Location

Municipalities: *East Goshen Township*
USGS quads: *Malvern*
Previous CNHI reference: *Hershey Mill Barrens Southeast*
Associated NHAs: *None*
Overlapping Protected Lands: *None*

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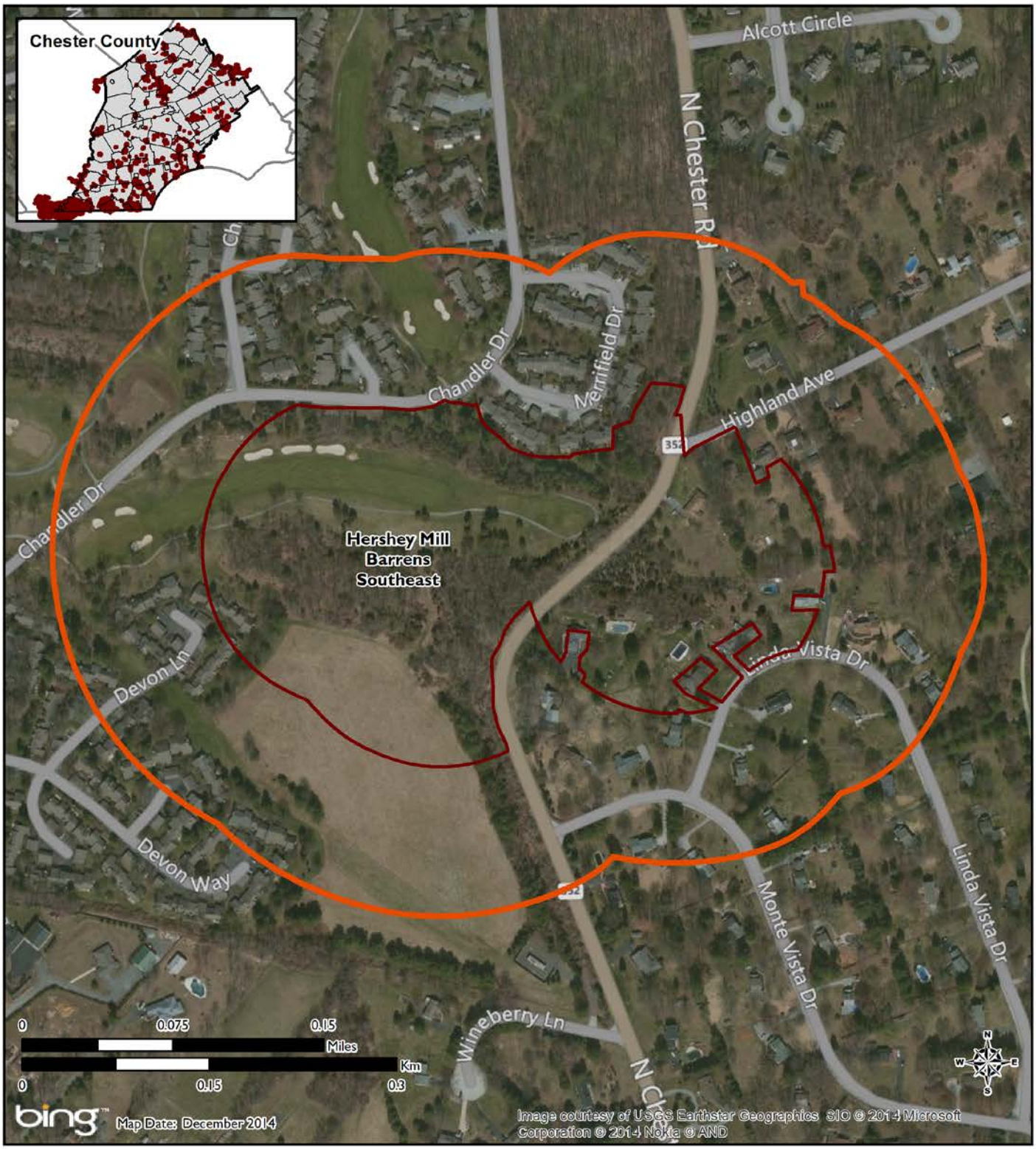

Hershey Mill Barrens Southeast Natural Heritage Area

Serpentine rock outcrops and small barrens patches provide habitat for two Pennsylvania threatened plants, annual fimbry and serpentine aster, and another sensitive species of concern.

Significance Rank:
GLOBAL

PNHP
Pennsylvania Natural Heritage Program

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

Hershey Mill Barrens Southwest NHA

PNHP Significance Rank: *Global*

Site Description

A small, remnant serpentine influenced habitat occurs in a residential context. The plant community exists as a small herbaceous opening hemmed in by roads, buildings, and a golf course.

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]
Annual Fimbry (*Fimbristylis annua*)		G5	S2	PT (PT)	10/5/1992	B
Serpentine Aster (*Symphyotrichum depauperatum*)		G2	S2	PT (PT)	10/5/1992	B
Sensitive species of concern A[3]	S	---	---	---	1992	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.

All three of the species of concern occurring at this site are typical of the Eastern Serpentine Barrens communities and outcrops of PA. This habitat is too small for natural community status and does not have the variety of habitats that are found on the large barrens; however the plant species of concern occurring here have fairly sizeable populations.

Serpentine aster is a species of plant that deserves special mention based on its potential for global extinction due to its extremely limited global population. This species is predominantly known to occur in the eastern serpentine barrens of Pennsylvania and Maryland, with a few far flung outliers in Virginia and North Carolina (Gustafson 2005; Kartesz 2013). This extremely limited distribution has given this species the status of G2 – globally imperiled. Serpentine aster is found in the more open areas of serpentine barrens, suggesting that fire or other active management may be needed to remove woody overgrowth and maintain this preferred habitat.

Rocky Gleason (PNHP)

Serpentine Aster (*Symphyotrichum depauperatum*)

Threats and Stresses

Reviews of aerial photos taken in 1937 show this area as dominated by active agriculture with scattered woodlots. This specific location does not appear to have been in cultivation, likely due to the thin stony serpentine influenced soils present, but was likely used as pasture, which would have been a suitable habitat for the plant species of concern. The farms in the area have since been replaced by residential development and their associated infrastructure. Part of the site is a golf course and parts of the dry, grassy areas and adjacent thin woods appear to have offered the plant species of concern some refuge.

In the past, natural disturbance, such as wildfires, would have helped to keep this area in an open condition. Without active management, the open grassy area will gradually close due to natural succession. In this residential setting, typical regular lawn mowing likely has helped to preserve some of the open aspect preferred by the species of concern.

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

- The small size and developed context of this remnant serpentine habitat reduces the possibility of natural processes such as prescribed fire to help maintain the suitable characteristics of this habitat. In the absence of natural fire events or active woody vegetation management, most of the open serpentine barrens habitats will gradually succeed to more common woody vegetation such as junipers, pines and oaks.
- This site occurs within a developed context and may be pressured towards conversion to other uses.
- Invasive species and general landscaping plants can displace native species of plants.
- Over browsing by white-tailed deer is a serious threat to the overall plant diversity.

John Kunsman (PNHP)

Annual Fimbry (*Fimbristylis annua*)

Conservation Recommendations

These serpentine habitats occur in isolated as the bedrock material, serpentinite, is exposed at the surface of the ground in a scattered fashion much like an archipelago chain of islands. Each habitat has a slightly different species composition, largely due to the slightly different environmental conditions found at each distinct location. A long range goal for these isolated habitats is to recognize them as a single system and plan for their ecological needs.

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

- All three of the species of concern known from this location have not been documented in many years and should be surveyed for again to determine the status of the population and the condition of its surrounding habitat.
- There is no specific management plan for this Natural Heritage Area, and the site would benefit from a thorough review of the site-specific goals and procedures for management here. In the interim, general goals and actions could be gleaned from other serpentine management plans such as the Goat Hill Management Plan (Furedi 2008); Unionville Serpentine Barrens Restoration and Management Plan (Latham 2012); Pink Hill Serpentine Barrens Restoration and Management Plan (Latham 2008).
- Active stewardship of these habitats is necessary. In the absence of natural fire disturbance, or active vegetation removal, these habitats will succeed into woodlands and forests, replacing the globally rare habitat with a more common type.
- Management activities should be coordinated with long-term habitat monitoring. "Analysis of desired conditions, inventory of existing conditions, and long-term monitoring of an array of key indicators is essential to know whether restoration and management efforts are accomplishing all of the goals or if some of the threatened or endangered species whose recovery is first and foremost among those goals might be inadvertently falling by the wayside." (Roger Latham, personal communication November 7th, 2014)

- Expand herbaceous openings as needed on convex landscapes by removing trees and other woody plants. Focus woody plant removal on areas of pines and junipers, which tend to indicate drier, thinner soils. The establishment of hardwoods should be taken as an indicator of deeper, moister soils. Where deeper soils occur, soil organic matter reduction may be necessary to establish thin soils over serpentine bedrock. "Soil organic matter reduction has proven effective in restoring serpentine grassland vegetation where it has been fully displaced by forest succession, as long as intact grassland adjoins the treated area to serve as a seed source. SOM reduction consists of skimming the surface organic horizons from the soil profile using a backhoe or front-end loader and transporting the material offsite by dump truck. It is particularly effective in restoring serpentine grassland where it has been invaded by a dense thicket of common greenbrier (*Smilax rotundifolia*)." (Roger Latham, personal communication November 18th, 2014)
- Educate the adjacent landowners on the significance of the globally rare habitat and the need for ongoing management activities. The serpentine influenced plant species are considered quite rare in the state and could be cultivated at this location as part of the residential landscape. Maintain the dry, herbaceous openings, fostering the populations of serpentine influenced plants by removing their more common competitors. This is a relatively unique assortment of plants and there will be very few other landscapes with this assortment of species.
- Suppress the spread of invasive species of plants to prevent native species from being crowded out of the habitat. Removal of invasive plants in the immediately vicinity of the species of concern can help these populations compete for space against much more aggressive species. Invasive species management should be coordinated by individuals familiar with the rare species as well as the invasive species present. Continual invasive species monitoring and control will be necessary.
- Reduce deer herd density to suitable levels to prevent overbrowsing of sensitive species.

Location

Municipalities: *East Goshen Township*
USGS quads: *Malvern, West Chester*
Previous CNHI reference: *Hershey Mill Barrens Southwest*
Associated NHAs: *None*
Overlapping Protected Lands: *None*

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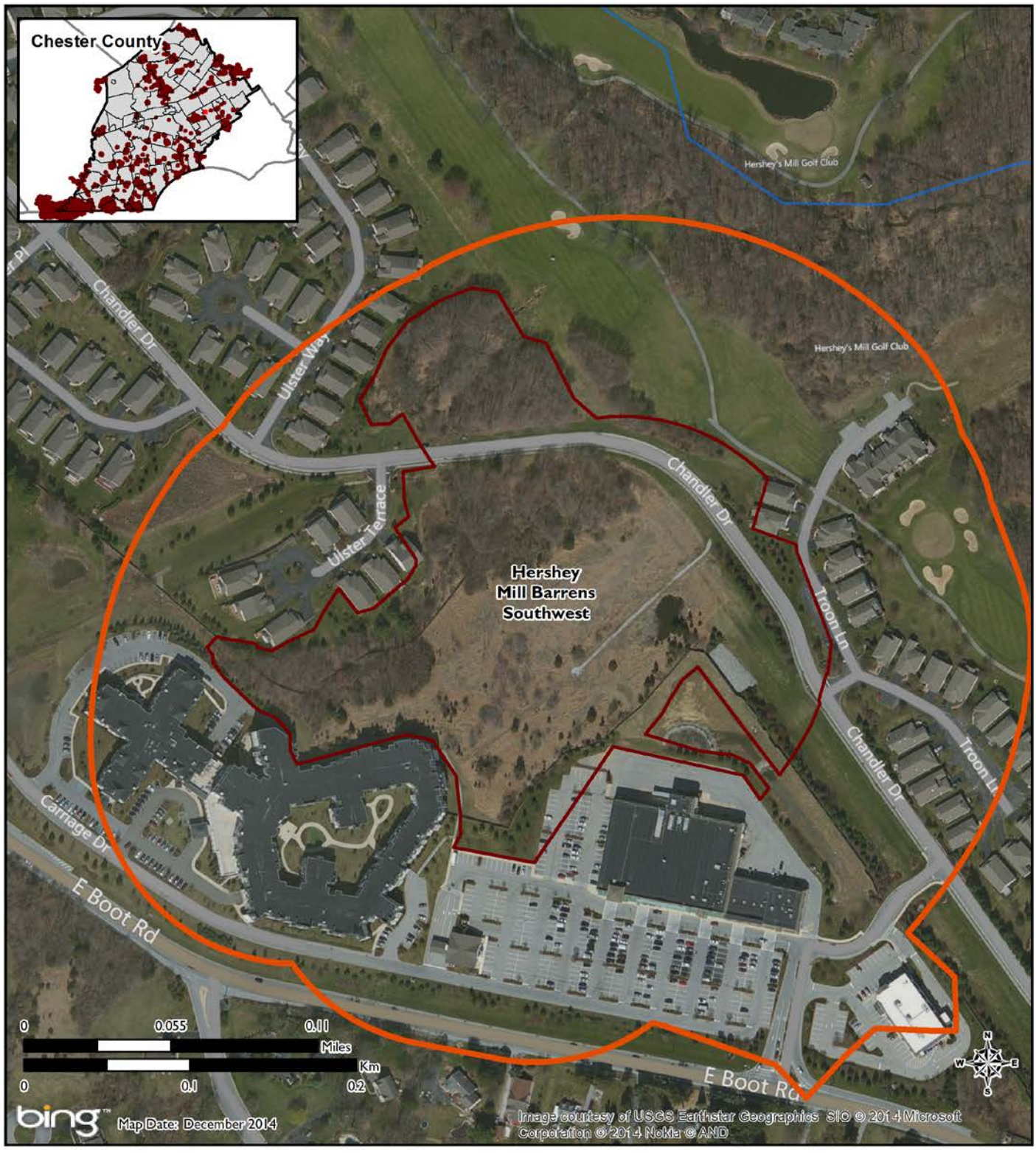


Hershey Mill Barrens Southwest Natural Heritage Area

Prairie outcrop barrens supports populations of serpentine aster, a globally imperiled plant species, and annual fimbry, a plant species imperiled in Pennsylvania.

Significance Rank:
GLOBAL

PNHP
Pennsylvania Natural Heritage Program

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

Hill Crest Drive NHA

PNHP Significance Rank: *State*

Site Description

Hill Crest Drive NHA is located along a stretch of wooded riparian habitat surrounding West Branch White Clay Creek. The wooded habitat at this site is dominated by a number of tree species, including tulip poplar, American beech, red oak, and red maple. The NHA is surrounded by agricultural fields and residential developments. The steep, wooded stream valley provides habitat for a small population of **fringe-tree**, a plant 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]
Fringe-tree (*Chionanthus virginicus*) 	G5	S3	N (PT)	8/11/2007	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.

Fringe-tree is a shrub or small tree found from New York and Massachusetts south to Florida and Texas. It is near the northern end of its range in Pennsylvania and has mostly been documented in the southern counties. Most current records are in the southeastern part of the state. Fringe-tree is found in moist woods and along streams. It is threatened by habitat loss, invasive species, and excessive deer browse.

Threats and Stresses

Changes in hydrology along West Branch White Clay Creek may alter the flow of water into the surrounding forested habitat. Logging and other large scale disturbances will fragment the wooded habitat and provide openings for the establishment of invasive species.

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

- Logging, development, or other major activities will further fragment the existing forest and alter the conditions of the habitat needed by the species of concern. Disturbances will also open areas that will be easily colonized by invasive species.
- Changes in hydrology may make the habitat unsuitable to the species of concern found here.
- Invasive species are present in this site and may displace native vegetation, including species of concern.
- Herbicide and fertilizer use in fields and lawns may wash into the forested area and degrade the habitat conditions.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

This area is privately owned, but the proximity to West Branch White Clay Creek and the steepness of the slope should help protect the immediate area from development. Do not conduct other activities

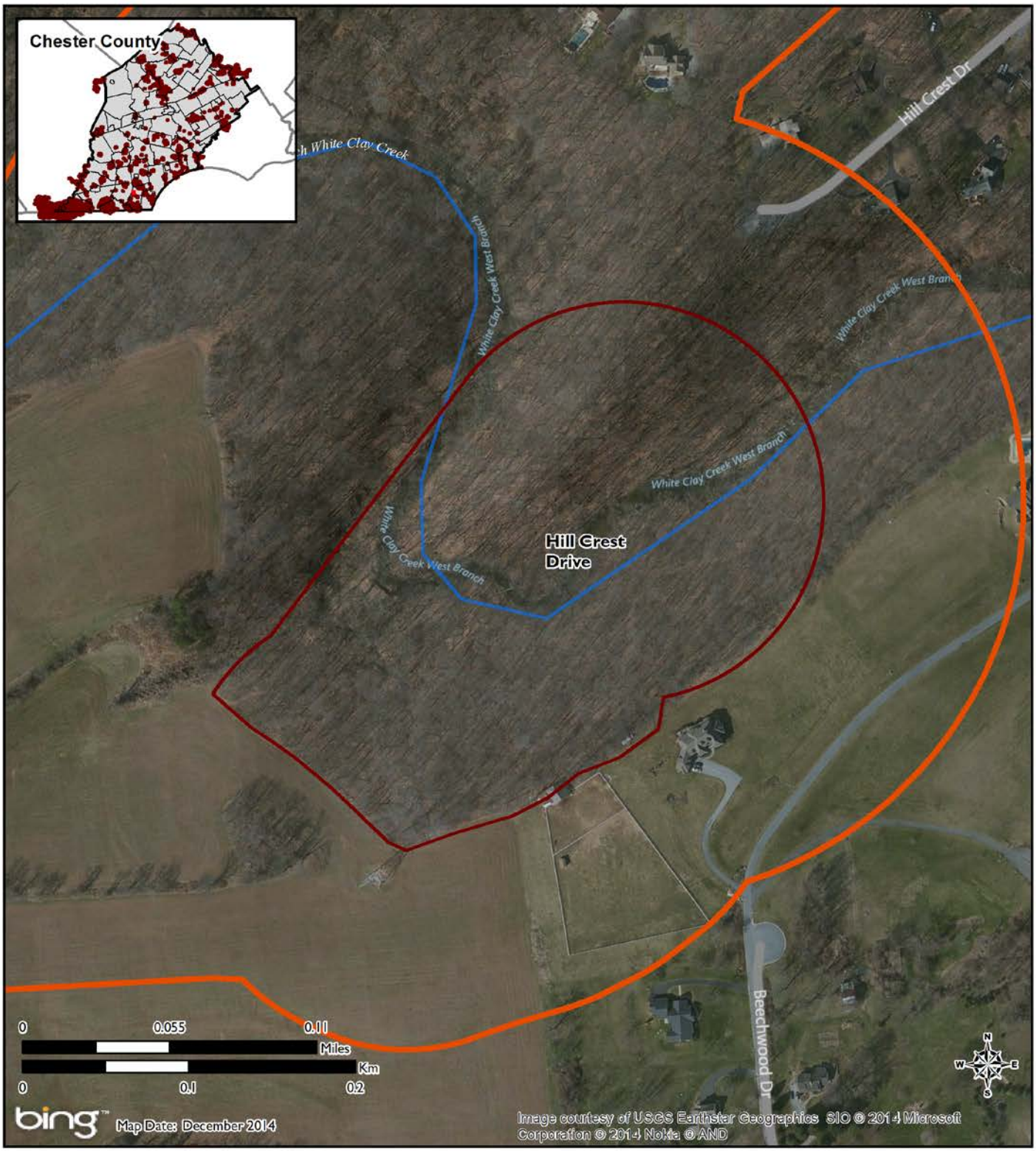
that will fragment the habitat or create other large disturbances. Maintain the existing hydrology of the stream and associated wetlands.

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

- Protect the existing forested areas from logging and other large scale disturbance. Keep the forest as intact as possible to protect the habitat and species within it.
- Maintain the existing hydrology. Any activities that occur near the NHA should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Franklin Township*
USGS quads: *West Grove*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Hill Crest Drive
Natural Heritage Area

Moist upland forest slopes support a population of fringe-tree, a vulnerable 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***

Hilltop View Woods NHA

PNHP Significance Rank: *State*

Site Description

Hilltop View Woods NHA is part of a block of wooded habitat greater than 450 acres in size, which is one of the largest such areas in a landscape dominated by agriculture. A small tributary to Buck Run begins near this NHA and flows through the eastern end. The habitat found within Hilltop View Woods NHA supports a population of a **sensitive species of concern**, not named 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**	---	---	---	7/11/1999	CD

[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

Fragmentation of the wooded habitat will alter the existing conditions and would likely increase the abundance of invasive species by creating openings for them to become established. Fertilizers and herbicides used on the agricultural fields may wash into the wooded habitat and degrade the water quality of the stream.

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

- Invasive species are present in many areas of this site and may displace native vegetation and alter the habitat required by the species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Logging may disturb the remaining wooded habitat, as well as cause changes in hydrology and allow for the introduction of additional invasive species.
- Runoff and other sources of water pollution from the surrounding area threaten to degrade the water quality of stream.

Conservation Recommendations

Conservation easements cover this NHA and many of the other properties in this area, which should help to protect this habitat. Avoid fragmenting the remaining wooded habitat in order to maintain the existing habitat conditions. Limit the use of fertilizers and pesticides on the agricultural fields to prevent runoff of excess chemicals into surround habitat.

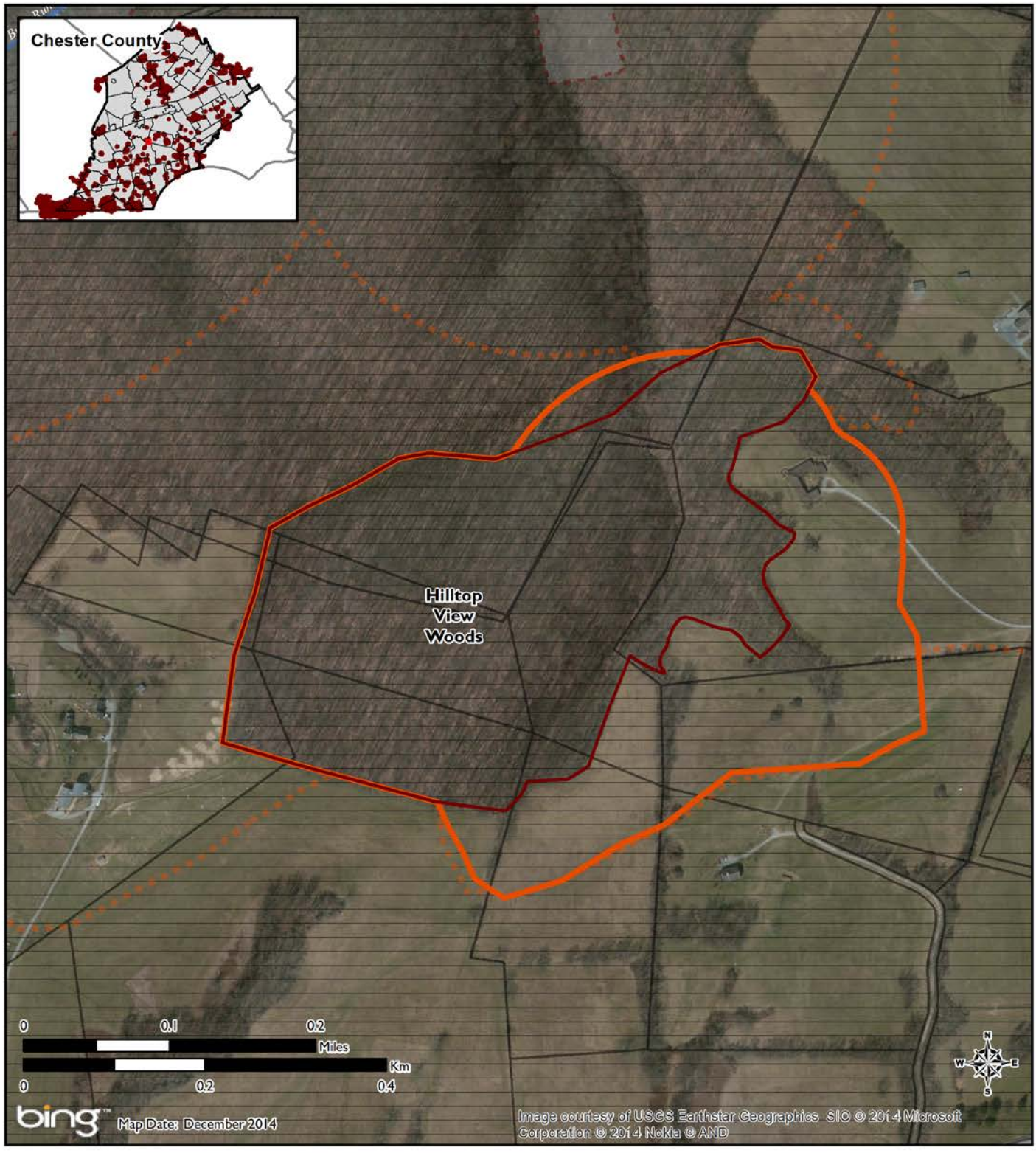
The following steps are recommended to ensure the persistence of these species at this site:

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.

- Monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Protect the existing forested areas from logging and other large scale disturbance. Keep the forest as intact as possible to protect the habitat and species within it.
- Maintain a vegetated buffer along the streams and limit the use of pesticides and herbicides in the fields to protect the water quality.

Location

Municipalities: *East Fallowfield Township, West Marlborough Township, Newlin Township*
USGS quads: *Coatesville*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Easement*



Hilltop View Woods
Natural Heritage Area

Upland forest at this site provides habitat for 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*
- *Conservation Lands*

Hodgson Circle NHA

PNHP Significance Rank: *State*

Site Description

Hodgson Circle NHA is a shrubby, wet field situated between a housing development and agricultural fields where the headwaters of a tributary to Big Elk Creek begin. The southern section of this NHA is a stand of logged woods. The wet field provides habitat for a small population of **grass-leaved rush**, a plant 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]
Grass-leaved Rush (*Juncus biflorus*)	G5	S2	TU (PT)	11/14/1999	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.

Grass-leaved rush has been documented from Massachusetts west to Michigan and south to Florida and Arizona. This species is found in open wet habitats throughout the state, but most populations occur in the southeastern counties.

Threats and Stresses

Disturbance from the surrounding fields and development may degrade the small patch of habitat. Chemicals from fields and lawns may wash into the NHA. Activities conducted near the site may impact the flow of water and alter the hydrology of the habitat.

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

- Further succession of the shrubby field may cause the habitat used by grass-leaved rush to become overgrown and shaded by woody species.
- Additional development will fragment the remaining habitat and create disturbances that may allow invasive species to be introduced to the area.
- Herbicides sprayed on the agricultural fields and edges may cause direct mortality to grass-leaved rush and other native species. Nutrients and chemicals used on lawns may wash into the wet meadow and degrade the habitat.
- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Changes in the currently hydrology could significantly alter the habitat for the plant species of concern by making conditions either too wet or too dry to be able to persist at this site.

Conservation Recommendations

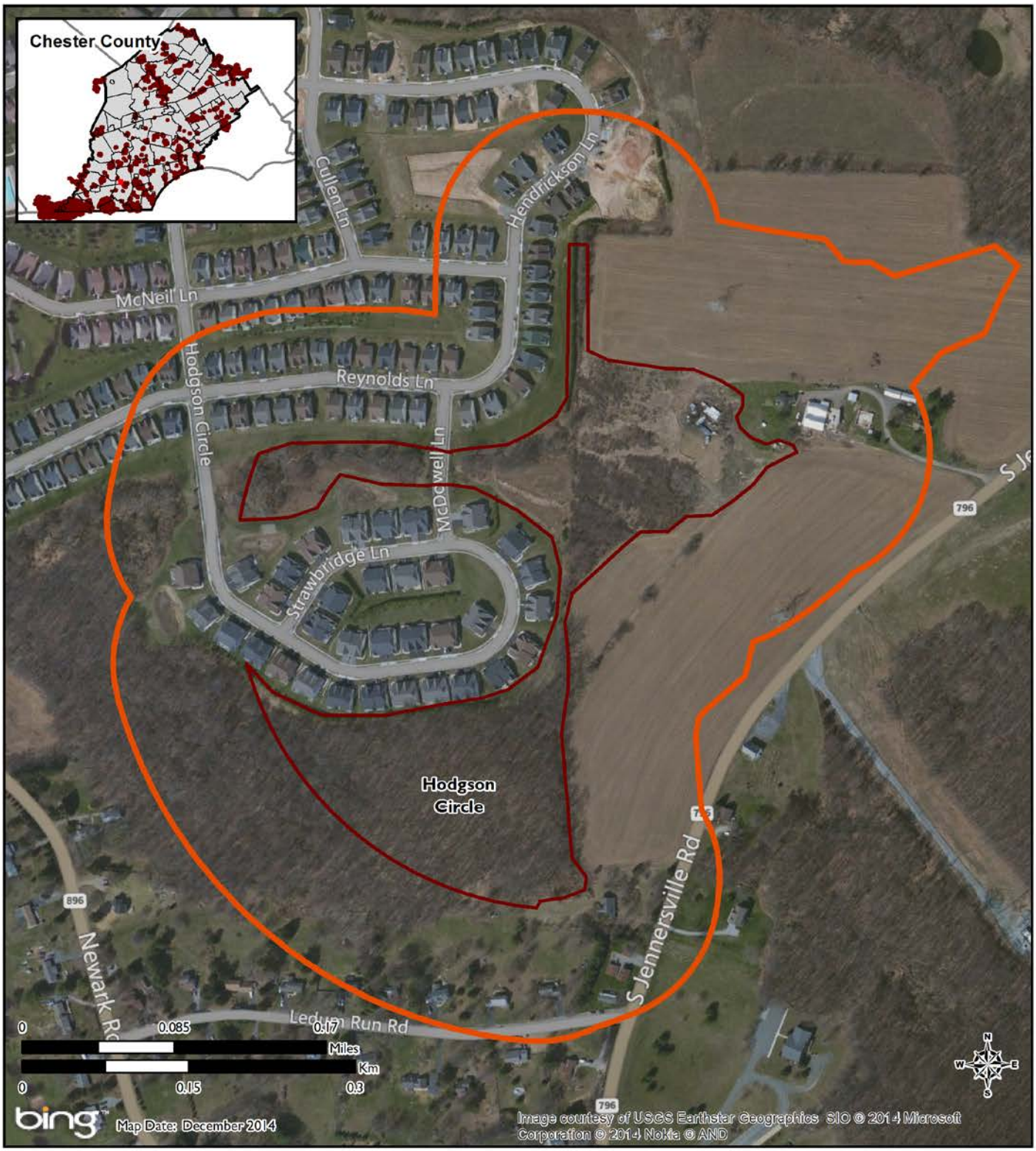
Avoid further fragmentation of this small patch of habitat. Limit chemical application and other activities within adjacent habitats that may have a negative impact on the NHA. Avoid altering the flow of surface or ground water in order to maintain the existing hydrology of the site.

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

- Grass-leaved rush requires open habitat that needs to be maintained with mowing or other methods of disturbance. The needs of this species should be considered when planning the timing and frequency of maintenance.
- Avoid fragmenting the habitat with development, roads or other infrastructure or large disturbance.
- Limit herbicide use to situations where it is necessary, such as to control invasive species. Minimize the use of fertilizers and chemicals on lawns or along roads, to prevent it from washing into other areas and degrading the habitat.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Maintain the existing hydrology. Any activities that occur along the roads should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.

Location

Municipalities: *Penn Township*
USGS quads: *Oxford*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Hodgson Circle
Natural Heritage Area

Wet shrubland provides habitat for grass-leaved rush, an imperiled plant species in Pennsylvania.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

Hopewell Floodplain NHA

PNHP Significance Rank: *State*

Site Description

Hopewell Floodplain NHA is a small patch of wooded habitat that has remained in a predominately agricultural landscape. It is part of a wooded area along a small tributary to Octoraro Creek that is just over 50 acres in size adjacent to Route 1. Wetland openings are found along the stream and are dominated by young red maple and shrub. A powerline right-of-way cuts through the southeastern end of the NHA. The wetland opening provides habitat for **downy lobelia** and **forked rush**, two endangered plant 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]
Forked Rush (*Juncus dichotomus*)		G5	S1	PE (PE)	10/11/1989	D
Downy Lobelia (*Lobelia puberula*)		G5	S1	PE (PE)	10/11/1989	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.

Downy lobelia is a state endangered species that ranges from New Jersey to Illinois and south into Florida and Texas. In Pennsylvania, it is considered a southerly species and has been documented historically in the southeastern counties. It grows in moist clearings and openings, grasslands, woods borders, and right-of-ways.

Forked rush has a range mostly near the Atlantic coast from Maine south into Florida and west into the southwestern states. In Pennsylvania, it has been documented historically in some southern, particularly southeastern, counties. Forked rush is classified as endangered due to the small number of know populations. It grows in moist to damp old fields, openings, clearings, and open woods.

Threats and Stresses

Excessive mowing and herbicide use in the agricultural fields and right-of-way may impact the quality of the wetland habitat and native species found here. Chemicals and sediment washing into the stream and wetlands from surrounding areas will impact the quality of the habitat.


Denise Watts, PNHP
Downy lobelia (*Lobelia dortmana*)

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

- Runoff and sedimentation from the surrounding agricultural and residential areas may degrade the water quality of stream and surrounding wetlands, especially given the limited riparian areas upstream of this site.
- Succession that is not controlled by mowing or other methods of disturbance will likely cause the habitat to become unsuitable for the species of concern to be able to persist at this site.

- Invasive species are found at this site and may displace native vegetation, including species of concern.
- Further development or other major activities can further fragment the habitat and alter the conditions needed by the species of concern. Disturbances may also open areas that can be easily colonized by invasive species.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

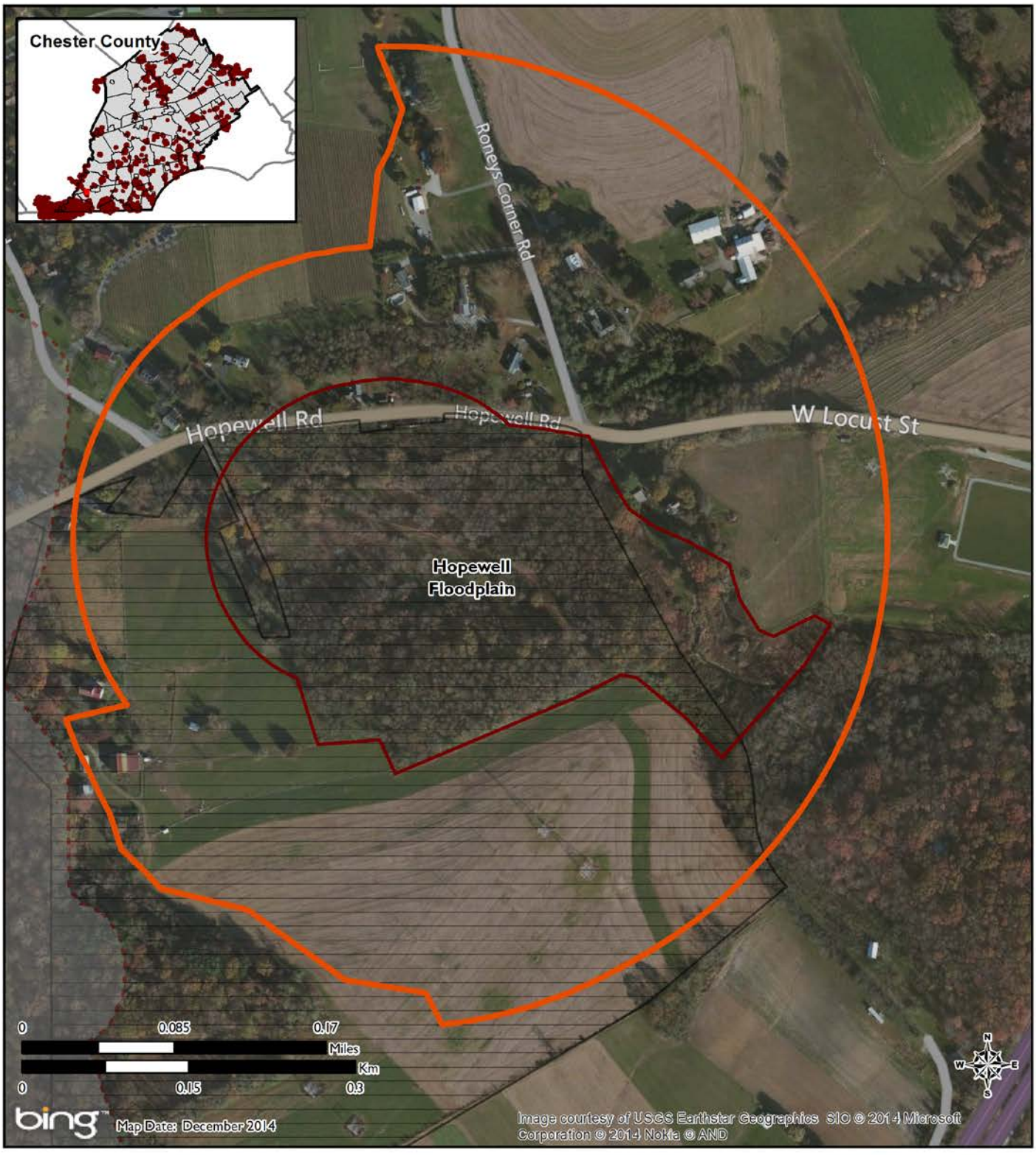
Much of this NHA is covered under an agricultural easement. This may not protect the habitat within this NHA, but should help to limit development. Mowing is currently done along the right-of-way and occasionally other portions of the NHA. Limit mowing to outside of the growing season to protect native species.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Protect the existing habitats from development and other large scale disturbance. Keep the NHA as intact as possible to protect the habitat and species within it.
- Avoid altering the current hydrology of the site, including draining or filling the wetlands and altering the flow of surface water. Consider potential changes to the flow of water when doing any activities within and around this NHA.
- Widen the unmowed vegetated buffer along the stream. A width of 100 meters is ideal, but any increase will benefit the stream and adjacent wetlands.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- The species of concern require open habitat that needs to be maintained. The needs of these species should be considered when planning the timing and frequency of maintenance in the open habitat.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *East Nottingham Township*
USGS quads: *Kirkwood*
Previous CNHI reference: *Hopewell Floodplain*
Associated NHAs: *None*
Overlapping Protected Lands: *Agricultural Easement*



Hopewell Floodplain Natural Heritage Area

Open, disturbed habitat at this site supports two critically imperiled plants in Pennsylvania: forked rush and downy lobelia.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Hopewell Lake NHA

PNHP Significance Rank: *Global*

Site Description

Straddling the Berks – Chester county boundary, this NHA includes a variety of habitats across both private and public lands including parts of French Creek State Park, Hopewell Village National Historic Site, and State Game Lands #43. Comprising just a small part of the Hopewell – Big Woods forested landscape, this NHA is focused primarily on the floodplains and riparian corridors of French Creek, Pine Creek, Scotts Run, and their tributaries. The area includes two reservoirs formed by damming portions of French Creek and Scotts Run. Numerous species of concern are scattered over this area, mostly associated with various wetlands, shrub swamps, wet meadows, forested wetlands and riparian areas, with a concentration around Pine Swamp, a partially open herbaceous wetland increasingly dominated by woody species. Geologic diversity in this area also helps add to the high variety of habitat niches.

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]
Red maple - black ash palustrine forest	C	GNR	S2S3	---	6/12/2000	AB
Red maple - black-gum palustrine forest	C	GNR	S3S4	---	6/3/1987	B
Northern Myotis (*Myotis septentrionalis*)		G4	S2	PT (PT)	7/2/1993	D
Brown Spiketail (*Cordulegaster bilineata*)		G5	S1S2	---	6/23/2007	E
Sable Clubtail (*Gomphus rogersi*)		G4	S2	---	5/30/2003	E
Bushy Bluestem (*Andropogon glomeratus*)		G5	S3	TU (PR)	10/7/1999	AB
Screw-stem (*Bartonia paniculata*)		G5	S3	N (PR)	10/8/2007	BC
Brown Sedge (*Carex buxbaumii*)		G5	S3	TU (PR)	7/18/1992	BC
Short Hair Sedge (*Carex crinita var. brevicrinis*)		G5T5	S1	PE (PE)	9/5/2007	BC
Shining Panic-grass (*Dichanthelium lucidum*)		GNR	S1	TU (PE)	7/18/1992	BC
Rough-leaved Aster (*Eurybia radula*)		G5	S2	N (PT)	9/5/2007	C
Grass-leaved Rush (*Juncus biflorus*)		G5	S2	TU (PT)	7/3/2007	C
Sweet Bay Magnolia (*Magnolia virginiana*)		G5	S2	PT (PT)	10/7/1994	C
Bog Bluegrass (*Poa paludigena*)		G3	S3	PT (PR)	5/30/2012	AB
Cross-leaved Milkwort (*Polygala cruciata*)		G5	S1	PE (PE)	9/20/1999	C
Reticulated Nutrush (*Scleria muehlenbergii*)		G5	S1	PE (PE)	9/21/1987	B
Bushy Aster (*Symphyotrichum dumosum*)		G5	S1	TU (PE)	10/7/1999	D
New York Aster (*Symphyotrichum novi-belgii*)		G5	S2	PT (PT)	10/7/1999	C
Possum-haw (*Viburnum nudum*)		G5	S1	PE (PE)	10/7/1994	CD
Sensitive species of concern A[3]	S	---	---	---	8/23/2009	BC
Sensitive species of concern B[3]	S	---	---	---	9/8/2006	E
Sensitive species of concern C[3]	S	---	---	---	5/26/2009	E
Sensitive species of concern D[3]	S	---	---	---	4/21/2009	E
Sensitive species of concern E[3]	S	---	---	---	4/21/2009	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.

The variety of species of concern occurring in this NHA can be grouped based on their habitat preferences. The largest group is those species preferring the open wet meadow, wet swale, and old field conditions and include **bushy bluestem**, **brown sedge**, **short hair sedge**, **shining panic-grass**,

rough-leaved aster, **grass-leaved rush**, **crossleaf milkwort**, **Muehlenberg's nutrush**, **bushy aster**, and several of the sensitive species of concern.

The shaded, saturated conditions of the **Red maple - black ash palustrine forest**, and **Red maple - black-gum palustrine forest** natural communities support **screw-stem**, **bog bluegrass**, **sweet bay magnolia**, and **possum-haw**, as well as being considered natural communities of concern themselves.

R. Harrison Wiegand

Sweetbay magnolia (*Magnolia virginiana*)

The two dragonfly species of concern, **brown spiketail** and **sable clubtail**, and the **Northern Myotis** bat were found associated with the forested tributaries of French Creek. The bat uses the forested streams and wetland edges to forage for flying insects and frequently roosts during the summer in the loose bark of trees or other tree cavities.

Several of the sensitive species of concern (which are not named in this report at the request of the jurisdictional agencies overseeing their protection) use the various habitats of the floodplain throughout their lifecycle, requiring open canopied wetlands, forested wetlands and adjacent upland habitats during different aspects of their lifecycle.

Threats and Stresses

The past use of this area for agriculture and industry, especially the historic iron furnace, which required large volumes of wood for fuel, resulted in large scale deforestation of the surrounding area. Locally, much of the floodplain of French Creek and the flat portions of its tributaries were cleared and used for agricultural purposes. The floodplain wetlands, which in the past were likely a mosaic of beaver modified habitats in various stages of succession, were cleared, dammed for farm ponds, or drained and used for crops and pasture.

The remaining wet pasture conditions maintained by light grazing or haying of wetlands likely helped to preserve parts of the open, wet conditions favorable for many of the species of concern currently and formerly known from this area. As active agriculture of the area has diminished, natural succession to shrub and ultimately tree dominated habitats represents the primary threat to the habitat supporting many of these species. Active management of some of these areas will likely be necessary to maintain the preferred habitat conditions of these species.

John Kunsman, PNHP

New York Aster
(*Symphyotrichum novi-belgii*)

The construction of a dam to create the Hopewell Lake reservoir flooded a large, shallow wetland, reducing the available suitable habitat for many native species, including species of concern. Similarly, a dam constructed on Scotts Run flooded the narrow forested headwaters of that stream to create Scotts Run Lake.

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

- Natural succession can eliminate suitable open canopied habitats supporting species of concern.
- Degradation of the water quality or quantity can have a severe impact on the habitat for the species of concern. Draining or flooding of wet meadow and forested wetland habitats can eliminate the suitable habitat for many species of concern.
- Exotic invasive plant species threaten to compete with and displace native species.
- Over-browsing by white-tailed deer is a serious threat to the overall plant diversity and forest regeneration.

Conservation Recommendations

The Morris Arboretum of the University of Pennsylvania developed a thorough resource inventory and management plan for French Creek State Park, which includes much of the area depicted in this Natural Heritage Area. That report should be considered a primary source for management options tailored specifically for this area.

As part of the French Creek State Park system, the area is not likely to be subject to large scale development, but improvements to park infrastructure, utility ROWs and changes in site hydrology could pose challenges for the species of concern at this location in the future. Conservation and reestablishment of the open wet meadows along French Creek and its tributaries will help to provide the necessary habitat for the continued survival of many of the species of concern that occur at this location. Woody vegetation removal is necessary to maintain the wetland openings preferred by these species. Upland areas should be allowed to approach and maintain old growth conditions.

Rocky Gleason, PNHP

Brown Sedge (*Carex buxbaumii*)

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

- Long term goals of this Natural Heritage Area should be to reestablish the slow moving marsh systems that dominated this area before modern agricultural practices worked to minimize the areas of lands considered un-cultivatable. Outside of wetland areas, conservation efforts should focus on protection of interior forest conditions, and preservation of forested riparian corridors of tributary streams.
- The open wetland natural community that supports many of the species of concern here requires special consideration to maintain its unique attributes. Existing wet meadows should not be modified (i.e. dammed, drained, planted in trees or cultivated), as this will deprive the open wetland adapted species of suitable habitat. Active management to remove woody vegetation from formerly open-canopy wet meadows will help to restore the habitat conditions favorable for many of the species of concern. Mowing or burning a third of the area each year can help to maintain wet meadow conditions. Remove red maple from tussock sedge marshes and alder thickets to suppress succession to closed canopy conditions. Light grazing with pastoral animals can be an effective tool to maintain these soggy meadows in their preferred condition.

John Kunsman, PNHP

Rough-leaved Aster (*Eurybia radula*)

- Because most of the species of concern noted from this site rely on open canopied habitats, programs that support establishment of riparian buffers with trees, such as CREP, should be avoided in areas of hydric soils. Instead, these programs may be better suited beyond the historic floodplain of the drainages.
- Avoid fragmenting the existing forested areas with additional buildings or infrastructure, and where necessary, should be conducted with the continuity of the wetland systems in mind. This may require that road crossings involve bridge systems that would preserve the wide sluggish waters associated with marshes and slow flowing waterways.
- The forest cover should be allowed to achieve and maintain old-growth characteristics. Avoid logging in this area except as it relates to invasive species removal and management of wet meadow habitats.

- Avoid the removal of native trees with naturally exfoliating bark such as shagbark hickory, and when not a threat to park visitors, allow snags or dying trees to persist upon the landscape as these provide suitable summer roost areas for bats and other animal species.
- 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, 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 and repair a heavily infested habitat. Invasive species management should be coordinated by individuals familiar with the rare species as well as the invasive species present. Continual invasive species monitoring and control will be necessary.
- Reduce the deer density in the area. Uncommon species of native plants are particularly susceptible to deer herbivory.

Location

Municipalities: *North Coventry Township, Union Township, Warwick Township*
USGS quads: *Elverson, Pottstown*
Previous CNHI reference: *Berks CNAI 2003: "Pine Swamp"; "SP541 / Hopewell Lake Swale"; "French Creek"*
Associated NHAs: *None*
Overlapping Protected Lands: *French Creek State Park, State Game Lands #43*

References and Additional Reading

Block, T.A. & A.F. Rhoads. 2008. Natural Resources Inventory and Management Recommendations for French Creek State Park. Submitted to the Pennsylvania Department of Conservation and Natural Resources, Bureau of State Parks. Harrisburg, PA.

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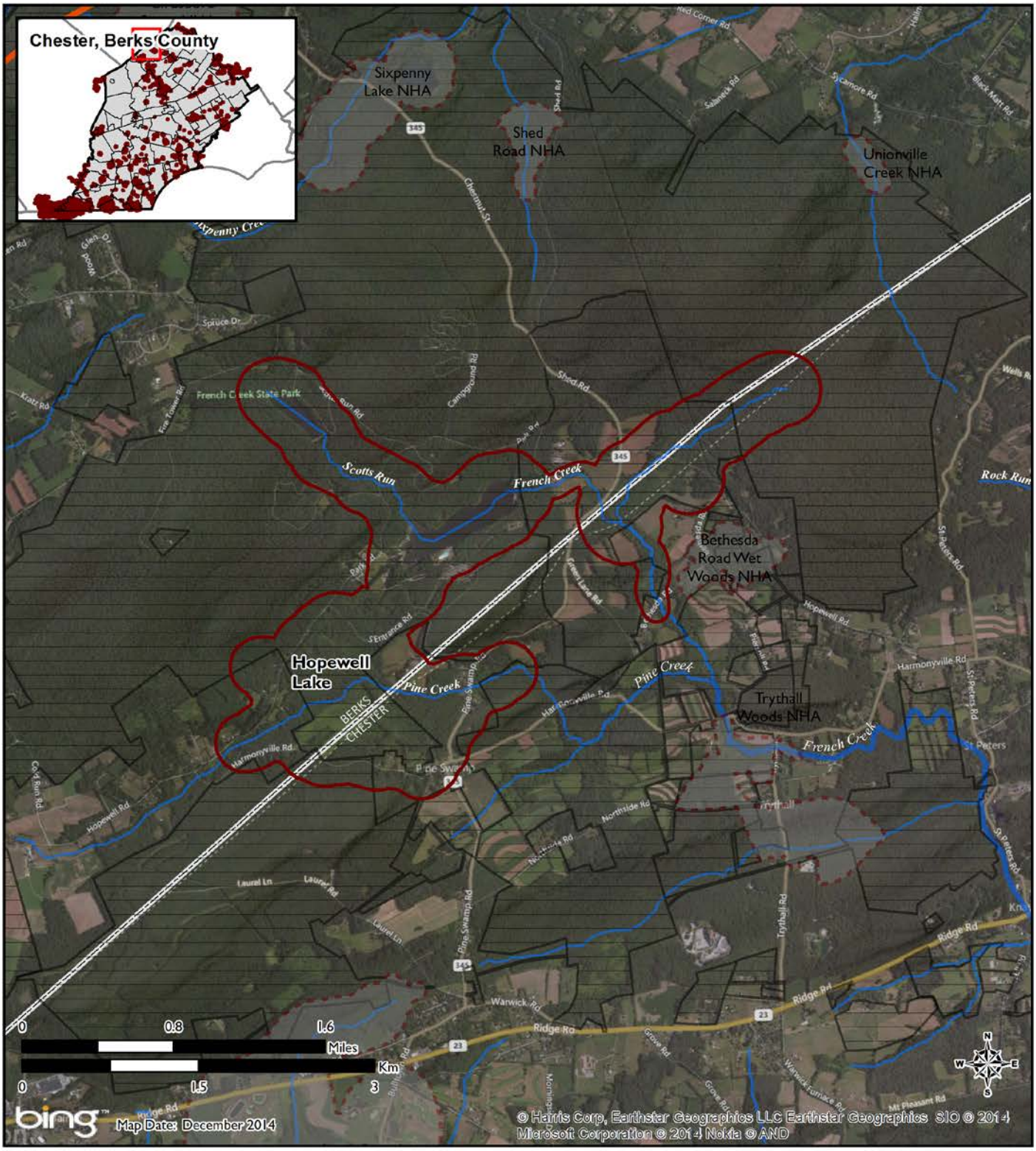


Hopewell Lake
Natural Heritage Area

This site contains two state-rare natural communities along with populations of 14 plant species of concern, 2 dragonfly species of concern, Northern myotis, a critically imperiled bat species, and five additional sensitive species of concern.

Significance Rank:
GLOBAL

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Horsehoe Trail NHA

PNHP Significance Rank: *State*

Site Description

The Horseshoe Trail NHA encompasses a mostly forested landscape surrounding Birch Run. Residential housing is spread intermittently throughout the NHA, which is bordered by active agricultural operations. Birch Run and the adjacent forested landscape found within Horseshoe Trail NHA provide suitable habitat for a **sensitive species of concern** that is not named 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**	---	---	---	4/16/2007	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

The riparian zone and adjacent forest within this NHA are surrounded by active agricultural fields and encroaching residential development.

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 storm water runoff from roadways, suburban development and agriculture should be considered a potential source of significant contamination. Runoff from these sources has significantly higher levels of sediment, nutrients, pesticides, herbicides, and other pollutants than runoff filtered through a natural habitat.
- Fragmentation due to development or infrastructure activities can result in habitat loss and degradation of the site.
- Exotic invasive plant species threaten to compete with and displace native species.
- Over-browsing by white-tailed deer is a serious threat to the overall plant diversity and forest regeneration. An overabundance of deer can create the effect of park-like forests in which the native plant understory and vertical stratification are greatly reduced.

Conservation Recommendations

This site will be best protected by maintaining the integrity of vegetative buffers along Birch Run and assuring a consistent hydrologic regime.

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

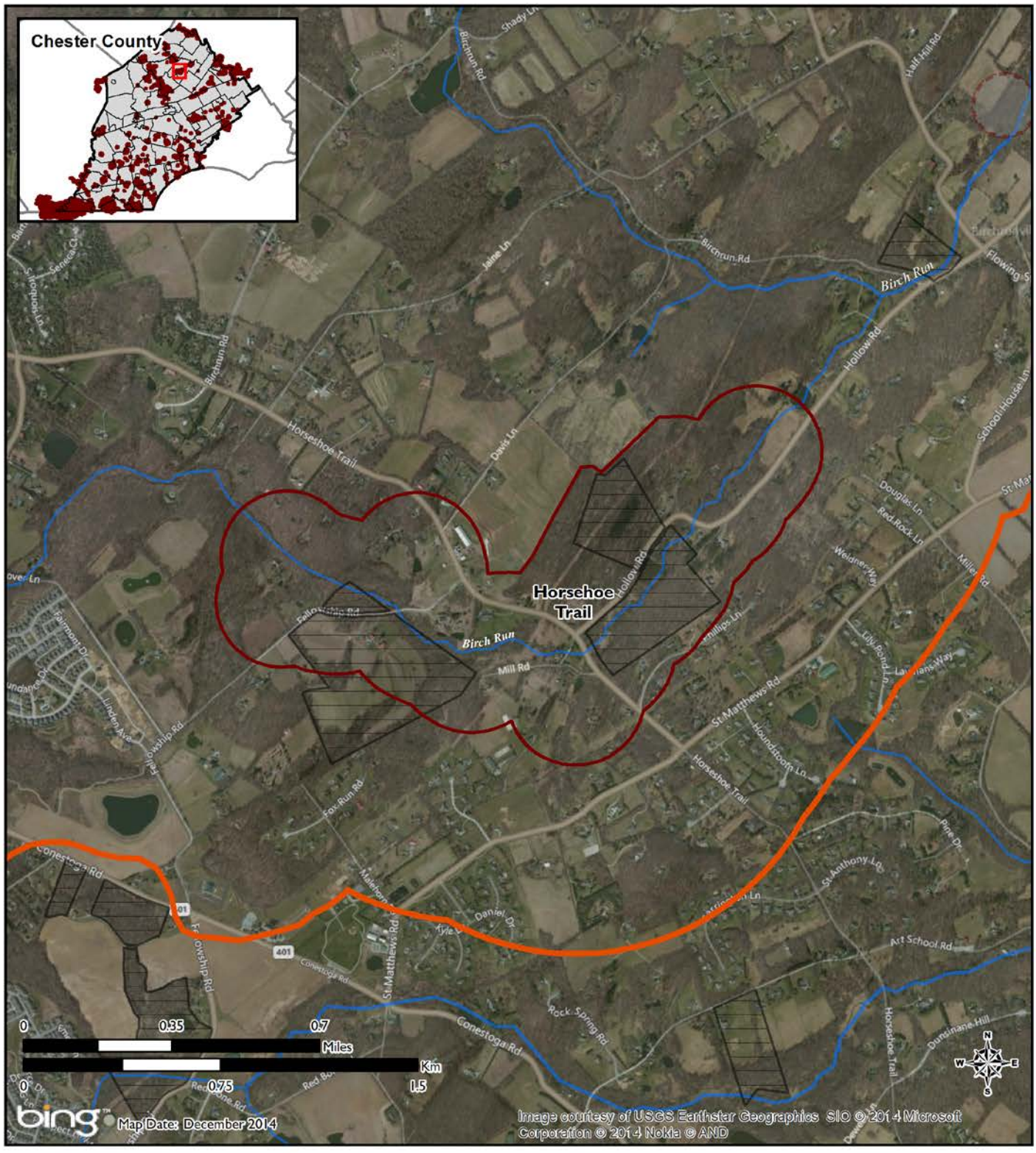
- Protect the riparian zone and repair others that have been degraded by encouraging the growth of native vegetation. Careful determination is needed to avoid planting trees in floodplains that should remain as open canopied herbaceous wetland habitats. These habitats should be

maintained in their current open condition, with tree plantings to occur uphill of areas containing hydric soils.

- Avoid fragmenting the existing forests and wetlands 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.
- Control invasive species of plants to prevent native species from being crowded out by introduced species. 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 and 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.
- Reduce the deer density in the area. Uncommon species of native plants are particularly susceptible to deer herbivory.

Location

Municipalities: *West Vincent Township*
USGS quads: *Pottstown, Downingtown*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *French And Pickering Creek Trust Property, Agricultural Easement*



Horsehoe Trail
Natural Heritage Area

Wetlands at this site support 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***
- ***Conservation Lands***

Indian Run NHA

PNHP Significance Rank: *State*

Site Description

Indian Run NHA is a patch of tulip poplar dominated woods located between Icedale and Springton. This forest block is more than 400 acres, which is one of the large patches of forested habitat in the region. Some residential development occurs in the area surrounding the NHA. This floodplain forest surrounding Indian run supports a population of a **sensitive species of concern**, not named 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**	---	---	---	2006	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

Fragmentation of the forested habitat would allow invasive species to colonize and spread through the openings. Further development of the forested area within the NHA and surrounding area would break up the large patch of habitat. Runoff from the adjacent road and developments may carry sediment and chemicals that can degrade the habitat conditions.

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

- Further fragmentation of the patch of existing forest may alter the structure of the habitat and allow an increase in invasive species.
- Herbicides and fertilizers used along roads and lawns may wash into the forested area and degrade the habitat or cause direct mortality to native species.
- Changes in hydrology may make the habitat unsuitable to the species of concern found here. The streamside habitat is sensitive to changes in flooding regime.
- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

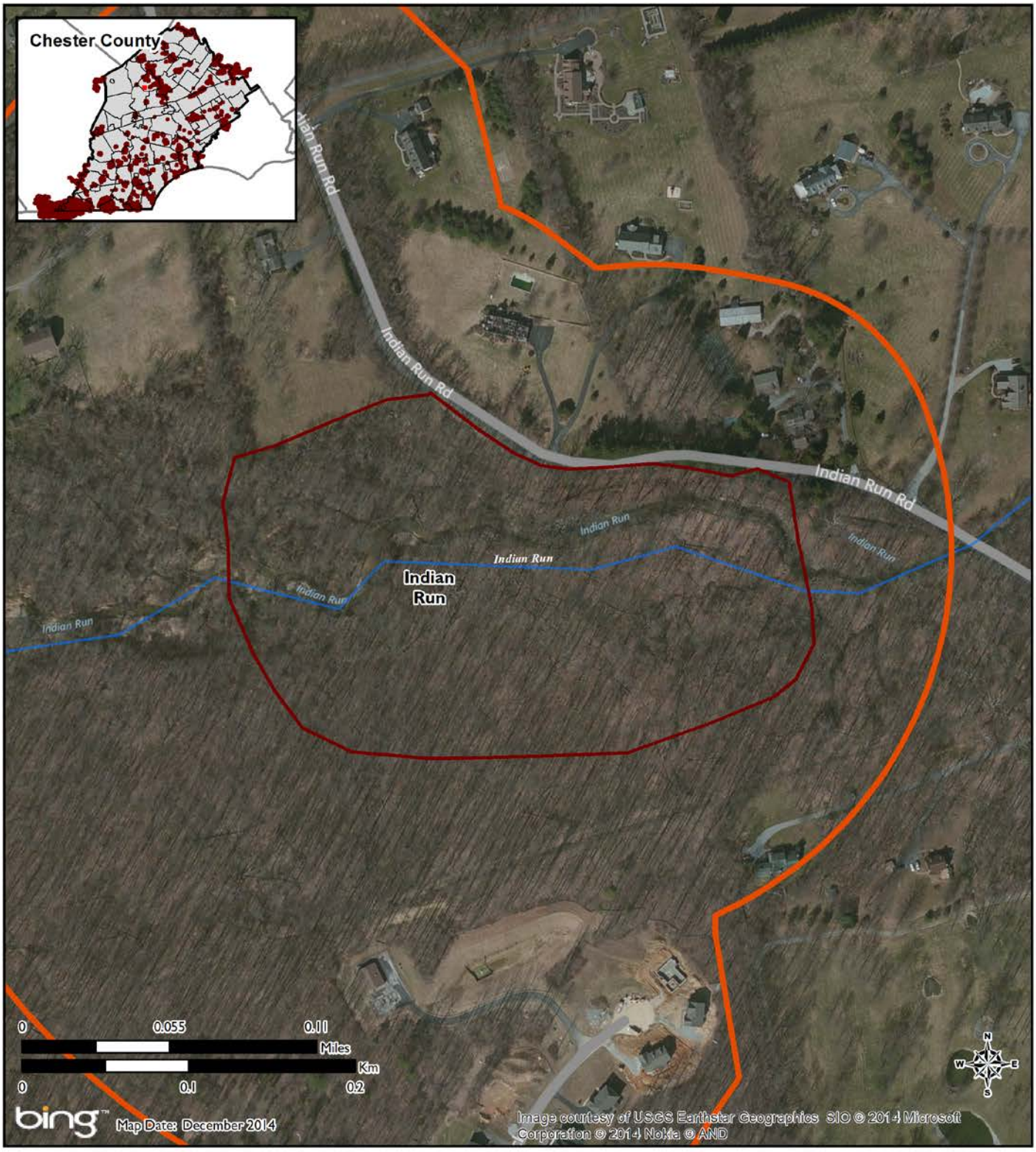
This site is best left in its current condition and should need little active management if disturbances are kept to a minimum. Maintain a vegetated buffer along the stream and increase it along the road and other disturbed areas.

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

- Protect the existing forested areas from logging and disturbance along the forest edge. Maintaining as many intact habitats as possible, given the location within an agricultural area, will help to preserve habitat for as many species as possible.
- Maintain the existing hydrology. Any activities that occur along the roads and other nearby areas should be conducted with a consideration for the impact to the flow of water into the nearby stream and wetlands.
- Maintain a vegetated buffer of at least 100 meters along Indian Run wherever possible to help filter pollutants from runoff. Limit the application of chemicals within the NHA and surrounding areas in order to protect the quality of the habitat.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations. Further disturbance within this habitat will create additional opening for the establishment and spread of invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Wallace Township*
USGS quads: *Wagontown*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Indian Run
Natural Heritage Area

Moist forest along Indian run 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 Supporting Landscape***

Kimberton Meadows NHA

PNHP Significance Rank: *State*

Site Description

Kimberton Meadows is a small woodlot near Hallman. The landscape is a mix of agricultural fields and residential developments. This NHA is located in an area that is predominately agricultural. This small woodlot is less than 20 acres in size and is dominated by oaks. The wooded area within this NHA provides habitat for a **sensitive species of concern**, not named 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**	---	---	---	11/7/2002	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.

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

Threats and Stresses

Invasive species are common throughout the wooded habitat and may outcompete some native species. Herbicides and fertilizers used on nearby fields may wash into the wooded area and degrade the habitat quality. High density of white-tailed deer may also threaten native species by heavily browsing certain species.

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

- Invasive species are common in many areas of this site and may displace native vegetation, including species of concern.
- Logging, development, or other major activities will further fragment the existing woods and alter the conditions of the habitat needed by the species of concern. Disturbances will also open areas that can be easily colonized by invasive species.
- Over-browsing by white-tailed deer and livestock impacts all of the native vegetation and structure of the habitat.
- Herbicides and fertilizers used in lawns, fields, and along roads may wash into the wooded area and degrade the habitat conditions.

Conservation Recommendations

Avoid fragmenting the existing wooded area with logging or infrastructure. Attempt to control invasive species with mechanical removal, using herbicides only if necessary.

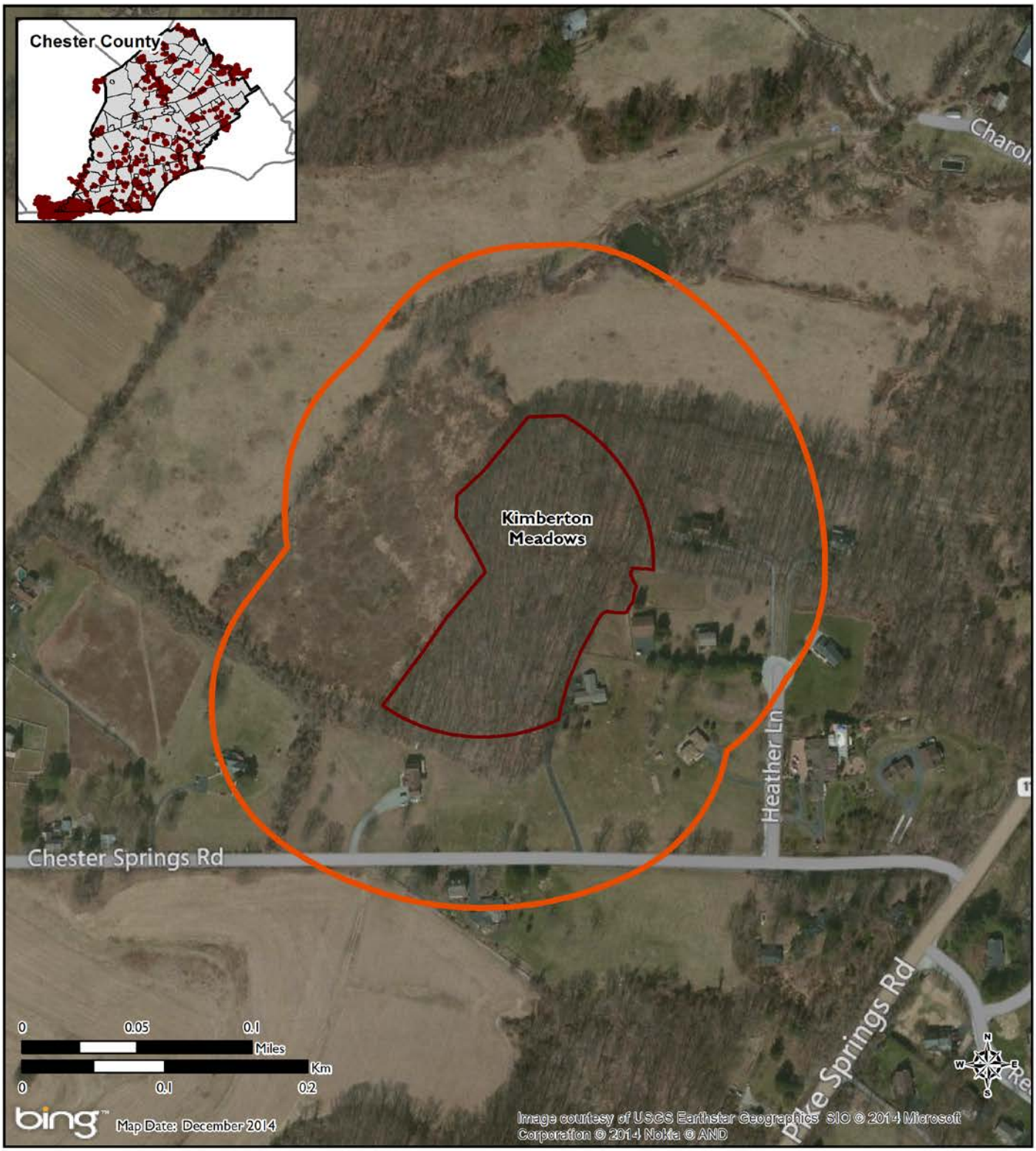
The following steps are recommended to ensure the persistence of these species at this site:

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.

- Protect the existing wooded areas from logging and other large scale disturbance. Keep the woods as intact as possible to protect the habitat and species within it.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape. Continue to keep livestock from entering the wooded habitat.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.

Location

Municipalities: *East Pikeland Township*
USGS quads: *Malvern*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Kimberton Meadows Natural Heritage Area

This site provides habitat for a sensitive species of concern.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

King Ranch Woods NHA

PNHP Significance Rank: *State*

Site Description

King Ranch Woods NHA is a small woodlot approximately 50 acres in size and is dominated by beech, tulip poplar and oak. The surrounding area is almost entirely pastures with other small, scattered woodlots. This site provides habitat for a large population of **puttyroot**, a plant species of concern. A small tributary flows through this site and a small man made pond is located along the northern edge.

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]
Puttyroot (*Aplectrum hyemale*)	G5	S3	PR (PR)	5/30/1991	A

[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.

In Pennsylvania, puttyroot is most commonly found in the southeastern counties and grows in moist woodlands and on forested slopes and streambanks. Puttyroot produces leaves that are visible through the fall and winter. The leaves wither in late spring, and the plant flowers in May and June.

Threats and Stresses

Invasive species are a major threat to this habitat. Further fragmentation of the small wooded area and deer browse also threaten the forest structure.

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

- Invasive species are a major threat to the native species present at this site. Invasive species can out compete native ones and change the habitat structure.
- Logging will further fragment the existing woods and alter the conditions of the habitat needed by the species of concern.
- Over-browsing by white-tailed deer can significantly impact plant species of concern and other native vegetation as well as the structure of the habitat.

Conservation Recommendations

Given the highly fragmented condition of the habitat, it is important to limit the disturbance to the woodlot and surrounding areas. A conservation easement covers much of this NHA, which should help to protect the habitat.

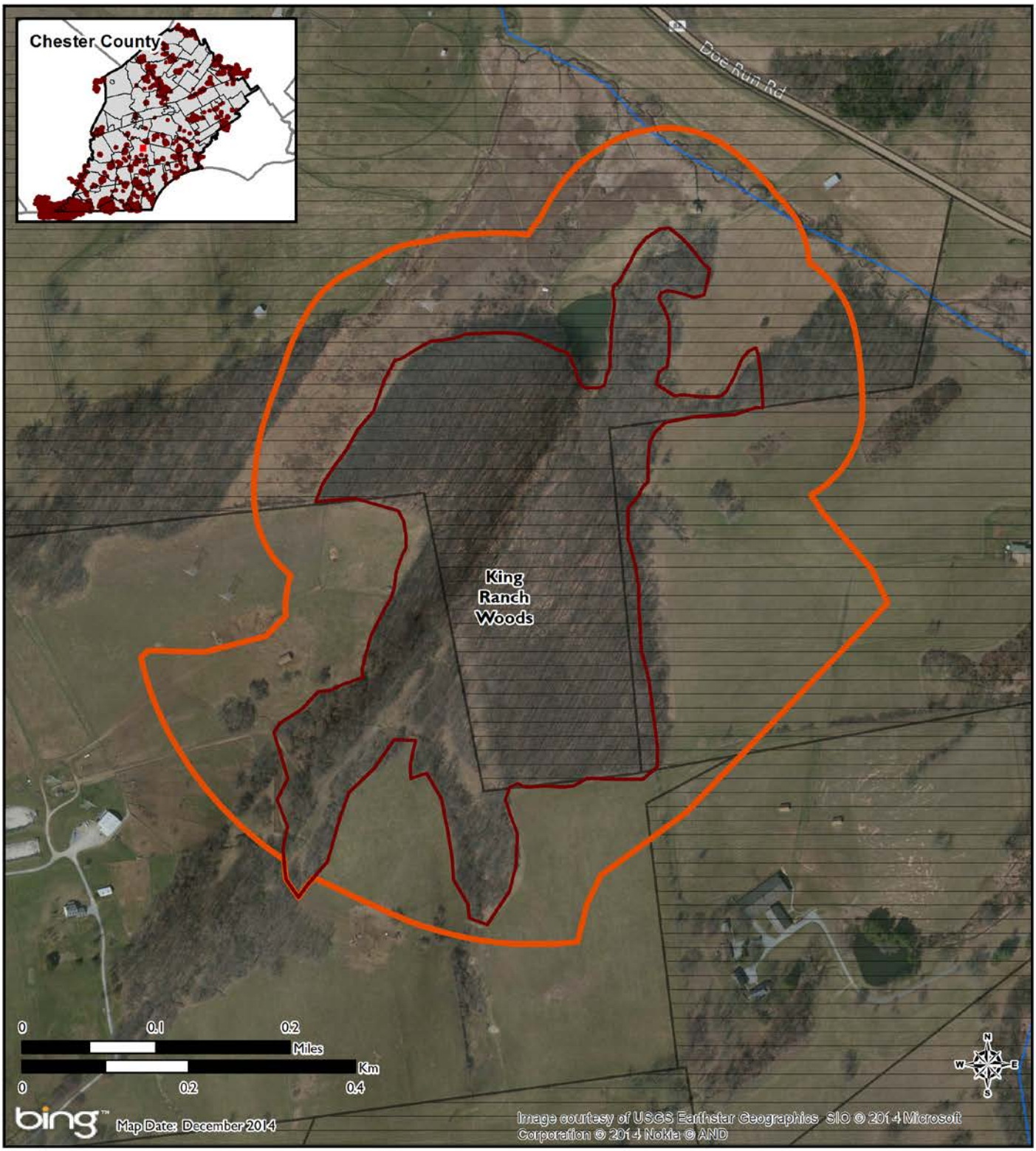
The following steps are recommended to ensure the persistence of these species at this site:

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.

- Protect the existing forested areas from logging. Avoid further fragmentation of the habitat with roads, houses, or other disturbances in order to preserve habitat for as many species as possible.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *West Marlborough Township*
USGS quads: *Coatesville*
Previous CNHI reference: *SA515*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Easement*



King Ranch Woods
Natural Heritage Area

This site supports a population of puttyroot, a vulnerable plant species in Pennsylvania.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Laurel Woods Preserve NHA

PNHP Significance Rank: *State*

Site Description

Laurel Woods Preserve NHA is partially located on a township-owned natural area that has been preserved and used for recreation. The wooded habitat in this area is approximately125 acres in size and borders East Branch White Clay Creek. Some houses have been built within the wooded habitat and residential developments border most of the remnant wooded area. Habitats within the NHA include hillside seeps along East Branch White Clay Creek dominated by tulip poplar, American beech, and maple, as well as drier mixed oak woods. The habitats within Laurel Woods Preserve NHA support a population of **fringe-tree**, a plant species of concern. This site also provides habitat for a **sensitive species of concern**, not named 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]
Fringe-tree (*Chionanthus virginicus*)		G5	S3	N (PT)	8/8/2010	B
Sensitive species of concern A[3]	S	---	---	---	2007-04	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.

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

Fringe-tree is a shrub or small tree found from New York and Massachusetts south to Florida and Texas. It is near the northern end of its range in Pennsylvania and has mostly been documented in the southern counties. Most current records are in the southeastern part of the state. Fringe-tree is found in moist woods and along streams. It is threatened by habitat loss, invasive species, and excessive deer browse.

Threats and Stresses

Changes in hydrology along West Branch White Clay Creek may alter the flow of water into the surrounding forested habitat. Logging and other large scale disturbances will fragment the wooded habitat and provide openings for the establishment of invasive species. Excessive recreational use may create disturbances and spread invasive species.

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

- Logging, development, or other major activities will further fragment the existing forest and alter the conditions of the habitat needed by the species of concern. Disturbances will also open areas that can be easily colonized by invasive species.
- Changes in hydrology may make the habitat unsuitable to the species of concern found here.
- Invasive species are present in this site and may displace native vegetation, including species of concern.
- Herbicide and fertilizer use along roads and in lawns may wash into the forested area and degrade the habitat conditions.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

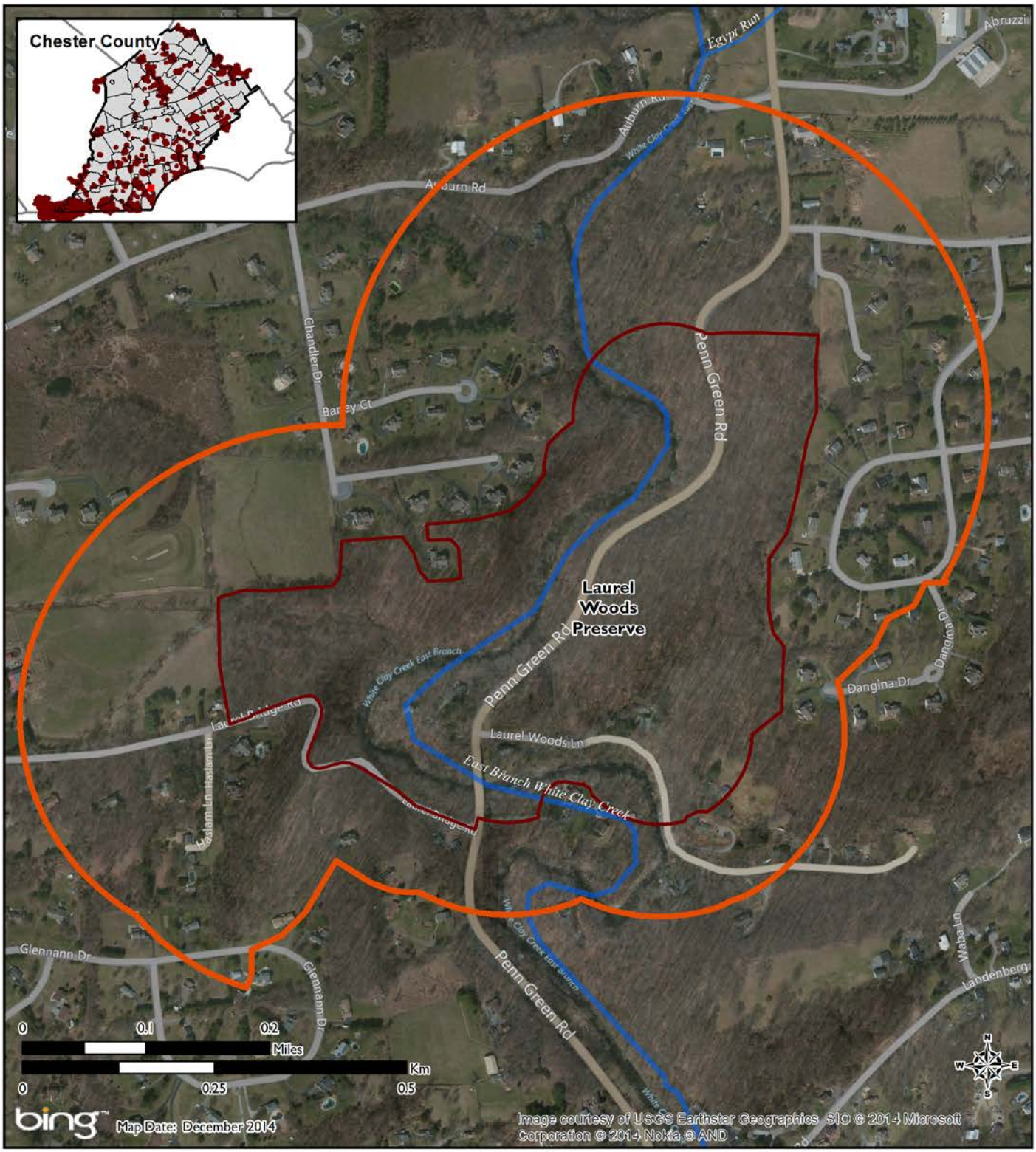
Part of this NHA is owned by New Garden Township and used as a preserve with hiking trails. This should help to protect that area from large scale disturbances. Avoid activities that will fragment the habitat or create other large disturbances. Maintain the existing hydrology of the stream and associated wetlands. Limit the creation of additional trails and maintain existing one to prevent erosion.

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

- Protect the existing forested areas from logging and other large scale disturbance. Keep the forest as intact as possible to protect the habitat and species within it.
- Maintain the existing hydrology. Any activities that occur near the NHA should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Franklin Township, New Garden Township*
USGS quads: *West Grove*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Laurel Woods Preserve
Natural Heritage Area

Forested habitat at this site supports a population of fringe-tree, a plant species of concern, and 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 Supporting Landscape***

Laurels Preserve NHA

PNHP Significance Rank: *State*

Site Description

Laurels Preserve NHA is part of a property owned by the Brandywine Conservancy. This NHA consists of stretch of Buck Run that is approximately a mile long plus part of a small tributary. The surrounding area is a mix of agricultural fields and wooded habitat, with a larger patch of woods to the south of Buck Run adjacent to this NHA. A number of gravel bars occur along Buck Run in this area that provide habitat for **ellisia**, a plant species of concern. Due to the nature of the habitat used by this species, the location and size of the population may vary widely as the habitat shifts.

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]
Ellisia (*Ellisia nyctelea*)	G5	S2	PT (PT)	5/25/2008	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.

Ellisia is a state threatened spring flowering herb found along shady stream banks. It is found throughout much of the United States, but has not been documented in New England, the southeast or the West Coast. It is at the northern end of its range in Pennsylvania and is found along major waterways in the southeast, as far west as the Susquehanna River. Habitat loss and invasive species are the major threats to ellisia.

Threats and Stresses

Japanese hops and other invasive species are found on many of these gravel bars. Invasive species may crowd out native ones and alter the habitat conditions unique to this area. Damming and other alterations to the hydrology would likely change the dynamic nature of the gravel bars and may cause changes to the water level in this area. Logging along the wooded stream edge would fragment the habitat and reduce the riparian vegetation that helps to protect the water quality.

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

- Changes in hydrology may make the habitat unsuitable to the species of concern found here. Ellisia is found on stream bank habitat that is sensitive to changes in flooding regime.
- Invasive species, especially Japanese hops, are common in many areas of this site and may displace native vegetation, including species of concern.
- Logging, development, or other major activities will further fragment the existing forest and alter the conditions of the habitat needed by the species of concern. Disturbances will also open areas that will be easily colonized by invasive species.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Herbicide and fertilizer use in fields may wash into the forested area and degrade the habitat conditions.

Conservation Recommendations

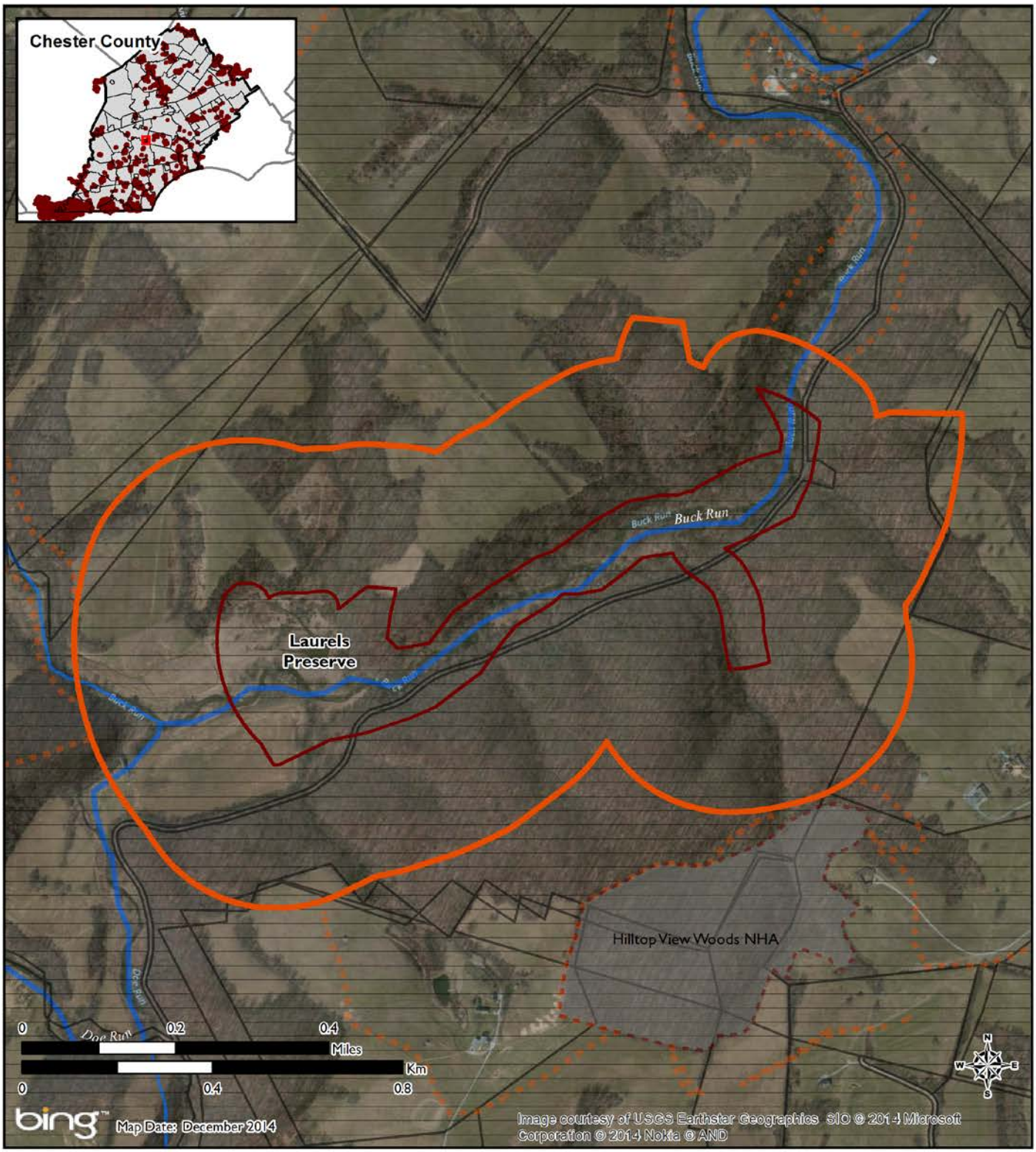
This NHA is entirely within a natural area that is owned and protected by the Brandywine Conservancy. This will allow the habitat within the NHA to be protected from large disturbances. Attempt to control the Japanese hops population, so that it does not out compete native species and alter the habitat. Maintain the existing conditions of the stream and surrounding wooded habitat.

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

- Maintain the existing hydrology. Any activities that occur along in nearby areas should be conducted with a consideration for the impact to the flow of water into the nearby stream and wetlands.
- Attempt to control the introduction and spread of invasive species. Japanese hops is currently the main threat to native species at this location. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Protect the existing forested areas from logging and other large scale disturbance. Keep the forest as intact as possible to protect the habitat and species within it.
- Widen the native vegetated buffer along Buck Run and its tributaries. A width of 100 meters is ideal, but any increase will benefit the stream and adjacent wetlands.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *East Fallowfield Township, Newlin Township*
USGS quads: *Coatesville*
Previous CNHI reference: *Laurel Natural Area*
Associated NHAs: *None*
Overlapping Protected Lands: *Natural Lands Trust Laurels Reserve*



Laurels Preserve
Natural Heritage Area

Sand bars in Buck Run support a population of Ellisia, a threatened 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***
- ***Conservation Lands***

Lenape Road Meadow NHA

PNHP Significance Rank: *State*

Site Description

Lenape Road Meadow NHA is mowed, grassy fields on the north side of Route 1 between Longwood and Hamorton. The fields are primarily surrounded by residential and commercial development. This site provides habitat for a number of grass species, including **Elliot's beardgrass**, a plant 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]
Elliott's Beardgrass (*Andropogon gyrans*)	G5	S3	N (PR)	1/13/2001	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.

Elliot's beardgrass is at the northern edge of its range in Pennsylvania and has only been documented in a few southeastern counties. It spans from New Jersey to Illinois, south from Texas to Florida. This species needs open, early successional habitat in order to persist.

Threats and Stresses

The continued existence of the conditions at this site requires regular maintenance to prevent succession from altering the structure of the habitat. The use of herbicides or mowing during the growing season may have a negative impact on the native species composition.

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

- Succession that is not controlled by mowing or other methods of disturbance will likely cause the habitat to become unsuitable for the species of concern to be able to persist at this site.
- Development of the habitat currently occupied by Elliot's beardgrass will likely eliminate it from this area.
- Herbicide use along the road may cause direct mortality to the species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Invasive species can take over portions of the habitat currently used by the species of concern and other native species.

Conservation Recommendations

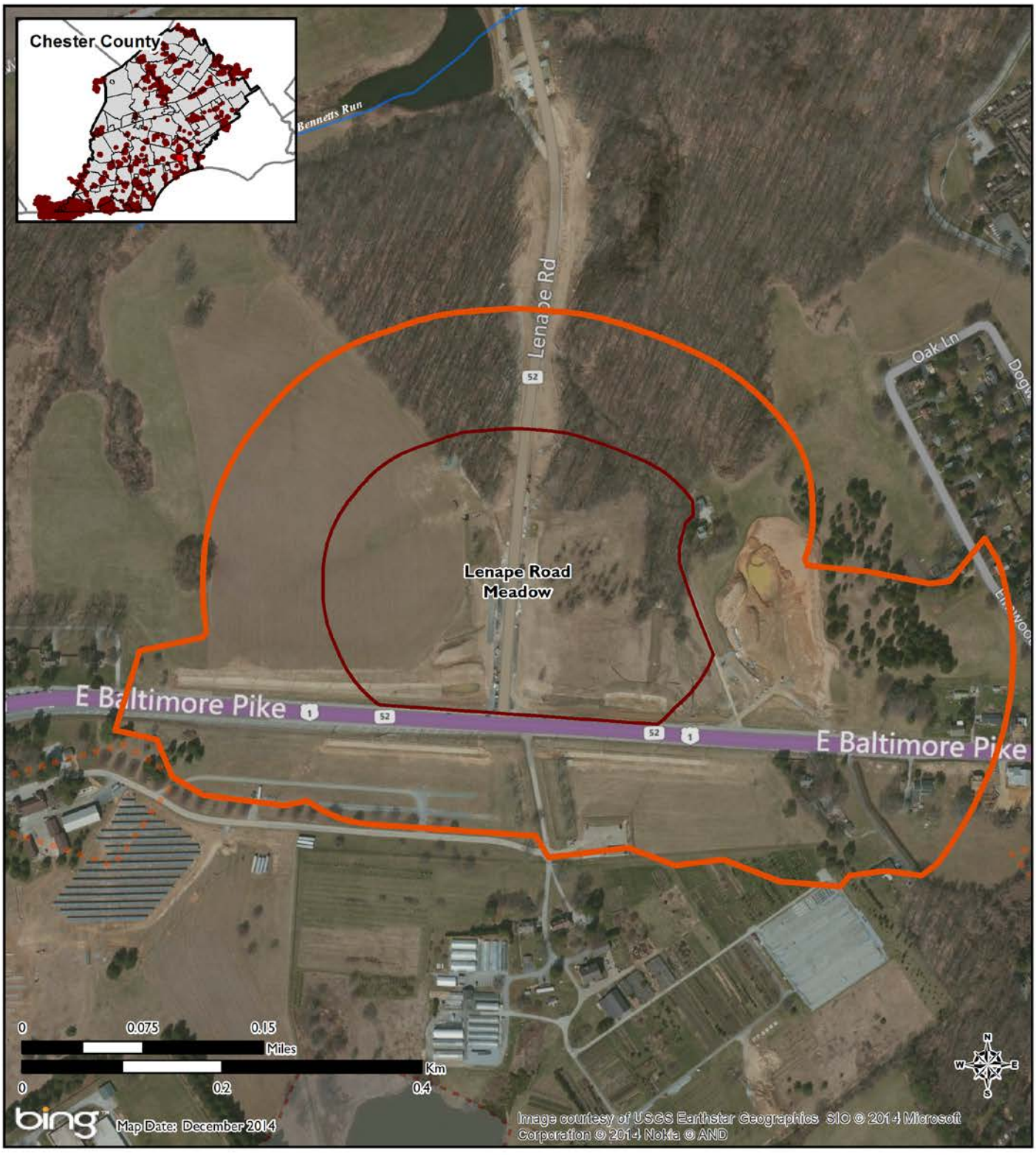
Active maintenance is necessary to maintain the habitat in the existing condition. Periodic mowing or other disturbance needs to be done to prevent establishment of woody species, although too much disturbance may affect the life cycle of some species.

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

- Elliot's beardgrass requires open habitat that needs to be maintained. The needs of this species should be considered when planning the timing and frequency of maintenance.
- Avoid the construction of additional houses or infrastructure in the area where Elliot's beardgrass is known to occur.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.

Location

Municipalities: *Kennett Township*
USGS quads: *Kennett Square*
Previous CNHI reference:
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Lenape Road Meadow
Natural Heritage Area

A population of state rare Elliott's beardgrass is found at this site.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Line Road Woods NHA

PNHP Significance Rank: *State*

Site Description

The majority of this NHA is part of Ashbridge Preserve, which is owned by Willistown Conservation Trust. There is a mix of habitat types, including forest, early successional, and a former reservoir. The area that was once occupied by the reservoir has filled in mostly with reed canary grass, as well as some smaller woody species, such as willows. **Tooth-cup**, a plant species of concern, was found in this wet, early successional habitat. The forested streamside habitat at this site also supports a population of **autumn bluegrass**, a plant species of concern. Changes to the habitats needed for both of these species may affect their persistence at 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]
Autumn Bluegrass (*Poa autumnalis*)		G5	S1	PE (PE)	6/19/1994	BC
Tooth-cup (*Rotala ramosior*)		G5	S3	PR (PR)	9/15/2002	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.

In Pennsylvania, autumn bluegrass has been documented in several southwestern counties and is typically found along stream banks and in moist woods. It is more common in the southern portions of its range, which spans from New Jersey west into Michigan and south to Florida and Texas. Autumn bluegrass is considered critically imperiled in Pennsylvania due to the small number of known populations in a small geographical area.

Tooth-cup grows in exposed, wet habitats. This species has a wide range covering most of the United States and into Canada. In Pennsylvania it is most commonly seen along the Susquehanna River, and has been documented in southeastern counties as well.

Threats and Stresses

Major threats to this site include invasive species, succession, and logging. Disturbances along roads throughout the NHA may also impact the habitat.

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

- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Further fragmentation of the existing forest may alter the structure of the habitat and allow an increase in invasive species. Widening or other disturbances along the roads may have a negative impact on the species of concern.
- Succession of the open, grassy habitat along Ridley Creek may affect light, moisture, and other habitat characteristics required by tooth-cup to persist at this site.

Conservation Recommendations

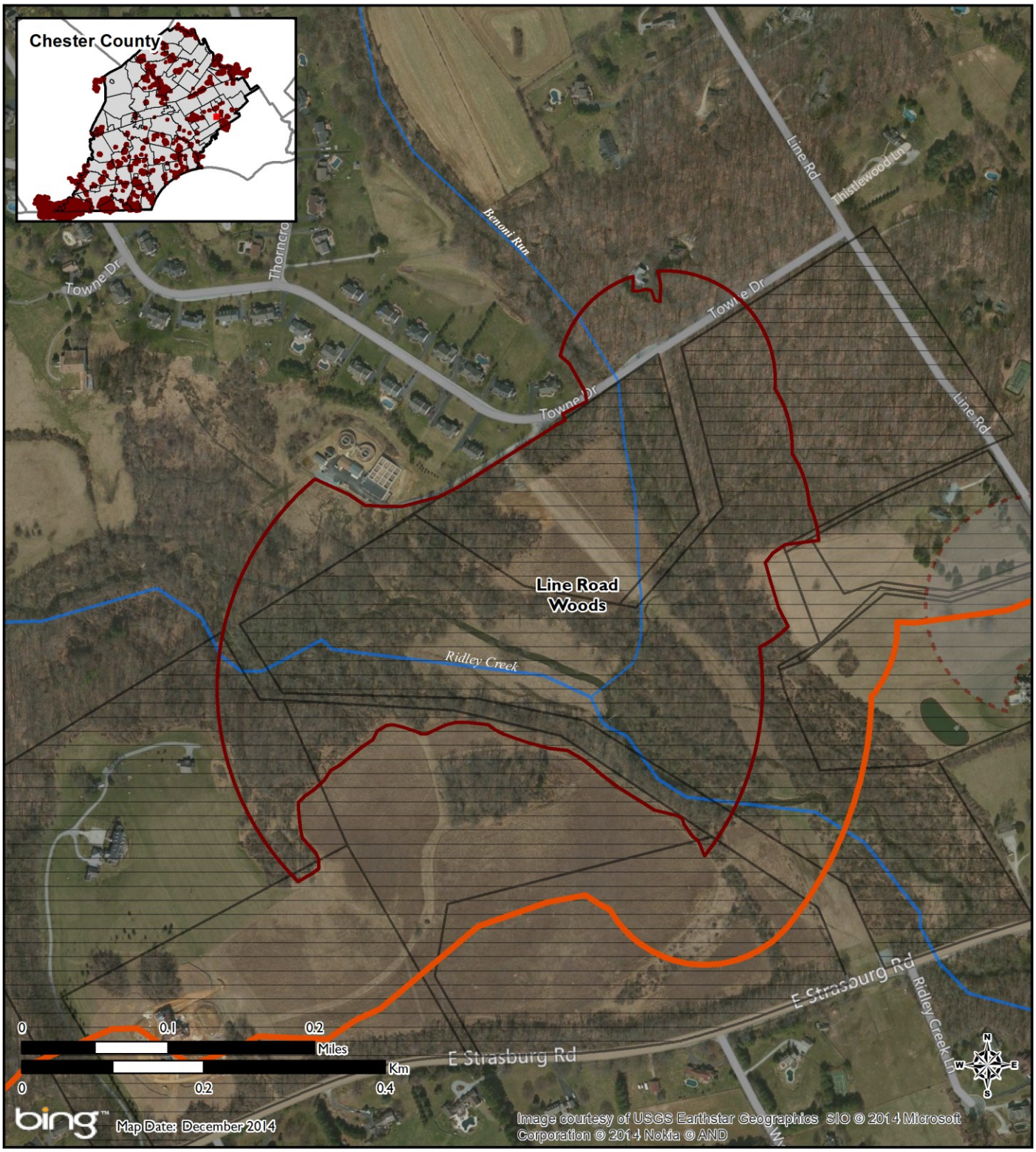
This site is given significant protection by being mostly contained by the Ashbridge Preserve. Management at this site should focus on controlling invasive species and preserving forest habitat.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations. Further disturbance within this habitat will create additional opening for the establishment and spread of invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Protect the existing forested areas from logging and disturbance along the forest edge. Maintaining as many intact habitats as possible will help to preserve habitat for as many species as possible.
- Maintenance of the former reservoir would be necessary for the persistence of tooth-cup at this site. Expansion of reed canary grass and other species may displace other species that are less able to compete. Active control of reed canary grass and woody species is likely necessary to preserve and create open muddy habitat and conditions required by tooth-cup.

Location

Municipalities: *East Goshen Township*
USGS quads: *West Chester*
Previous CNHI reference: Dutton Mill Woods
Associated NHAs: *None*
Overlapping Protected Lands: *Willistown Conservation Trust Ashbridge Preserve, Willistown Conservation Trust Easement*



Line Road Woods
Natural Heritage Area

Riparian and upland forests support populations of tooth-cup and Autumn bluegrass, plant 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***

Linfield Siltation Basin NHA

PNHP Significance Rank: *State*

Site Description

Linfield Siltation Basin NHA is modified habitat along the Schuylkill River. This location was created to allow coals fines found in sediment dredged from the river to settle out and allow clean water to return. Habitats within the settling basin vary from dry mounds of sand and coal fines to wetland depressions that may dry during parts of the year. The dry, loose substrate provides habitat for **Schweinitz's flatsedge**, a plant species of concern. The open, wet habitat supports a population of another plant species of concern, **tooth-cup**.

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]
Schweinitz's Flatsedge (*Cyperus schweinitzii)*	G5	S2	PR (PR)	8/25/1996	C
Tooth-cup (*Rotala ramosior*)	G5	S3	PR (PR)	7/4/1996	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.

Schweinitz's flatsedge is found throughout most of the United States, with the exception of the Southeast, upper New England, California, and Nevada. It is found through most of southern Canada as well. This species has been documented in several locations throughout Pennsylvania. Most of these occurrences are in disturbed habitats. The natural habitat for this species includes riverbanks and other areas with open, sandy habitat. Succession and invasive species are threats to Schweinitz's flatsedge.

Tooth-cup grows in exposed, wet habitats. This species has a wide range covering most of the United States and into Canada. In Pennsylvania it is most commonly seen along the Susquehanna River, and has been documented in southeastern counties as well.

Threats and Stresses

Linfield Siltation Basin NHA was originally used to hold the waste material that was dredged from the Schuylkill River. This has degraded the habitat but also created conditions that made it suitable for new species to colonize the site. ATV use in this area disturbs the habitat and can cause erosion of the loose substrate. Changes in the existing hydrology would disturb the wetland habitat, but may restore some of the original conditions. Succession of woody species will shade the open habitat, but that will likely occur very slowly due to the poor quality of the soil.

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

- Succession of the open sandy habitat and wetlands may cause the habitat used by the species of concern to become overgrown and shaded by woody species.
- Changes in the currently hydrology could significantly alter the habitat for the plant species of concern by making conditions either too wet or too dry to be able to persist at this site.
- Invasive species can take over portions of the habitat currently used by the species of concern and other native species.

- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- ATV use may directly damage species of concern or create disturbances that cause erosion and other negative impacts on the habitat.

Conservation Recommendations

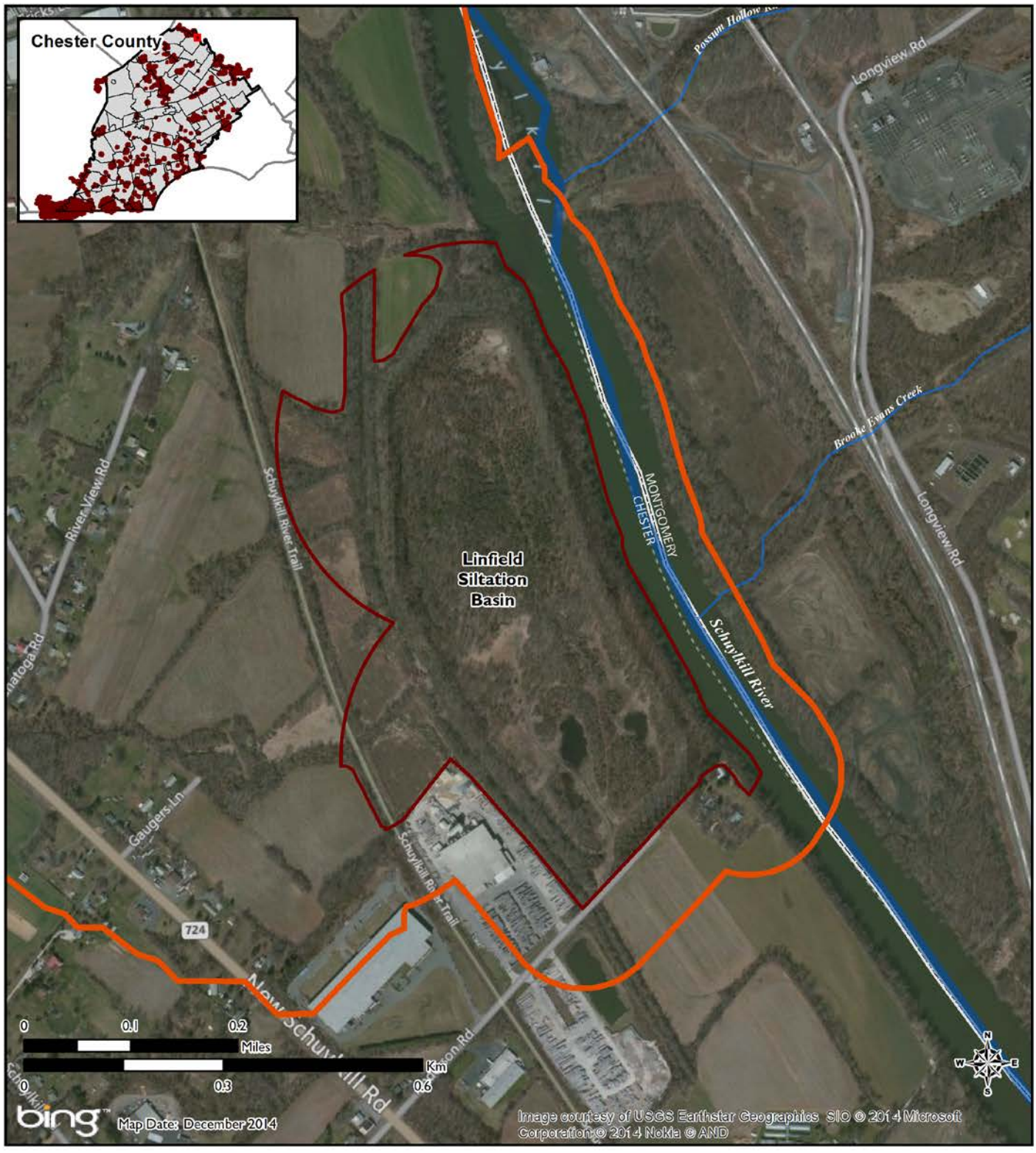
This area is owned by the county, which may help to prevent large scale disturbances to the habitat. Prohibit activities, such as ATV use, that will causes significant disturbance to the habitat. Prevent woody species from becoming established in the early successional areas.

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

- Perform periodic maintenance outside of the growing season to prevent woody species from taking over the early successional habitat. The needs of the species of concern should be considered when planning the timing and frequency of maintenance.
- Maintain the existing hydrology. Any activities that occur along the roads and other areas surrounding the NHA should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Maintain the deer density at a level that is able to be supported by the landscape.
- Prohibit ATV use in this area in order to protect the habitat currently used by the species of concern at this site.

Location

Municipalities: *East Coventry Township*
USGS quads: *Phoenixville*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Linfield Siltation Basin Natural Heritage Area

Forested wetlands along the Schuykill River support populations of two plant species of concern: Schweinitz's flatsedge and tooth-cup.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

London Tract Marsh NHA

PNHP Significance Rank: *State*

Site Description

London Tract Marsh is part of White Clay Creek Preserve near the border with Delaware State. This marsh is adjacent to White Clay Creek and is surrounded by wooded habitat and agricultural fields within the preserve. Residential developments are located outside of the preserve. The marsh habitat is dominated by sedges, ferns, and other herbaceous species. This NHA provides habitat for **swamp lousewort**, a plant 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]
Swamp Lousewort (*Pedicularis lanceolata*)	G5	S1S2	N (PE)	10/30/1994	CD

[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.

Swamp lousewort has a range from southern New England west into the Dakotas and south into Arkansas and Georgia. In Pennsylvania, it occurs mostly in the southern and northwestern counties, where it grows in calcareous wetlands, including boggy meadows, marshes, swamps, and fens. The known occurrences of swamp lousewort and its habitat type will be enhanced by creating buffers around its habitat, removal of invasive species, and protection of wetland hydrology. Excessive deer browsing may be a threat in some locations.


Denise Watts, PNHP
Swamp lousewort (*Pedicularis lanceolata*)

Threats and Stresses

The road adjacent to the marsh may allow chemicals and sediment to wash into the wetland and impact the water quality. Disturbed areas along the road may also allow invasive species to become established and spread through the marsh. Woody species may expand into the habitat and alter the hydrology.

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

- Succession that is not controlled by removing woody species will likely cause the habitat to become unsuitable for the species of concern to be able to persist at this site.
- Changes in hydrology may make the habitat unsuitable to the species of concern found here.
- Herbicide use along the road and in agricultural fields may cause direct mortality to the species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

- Invasive species can take over portions of the habitat currently used by the species of concern and other native species.

Conservation Recommendations

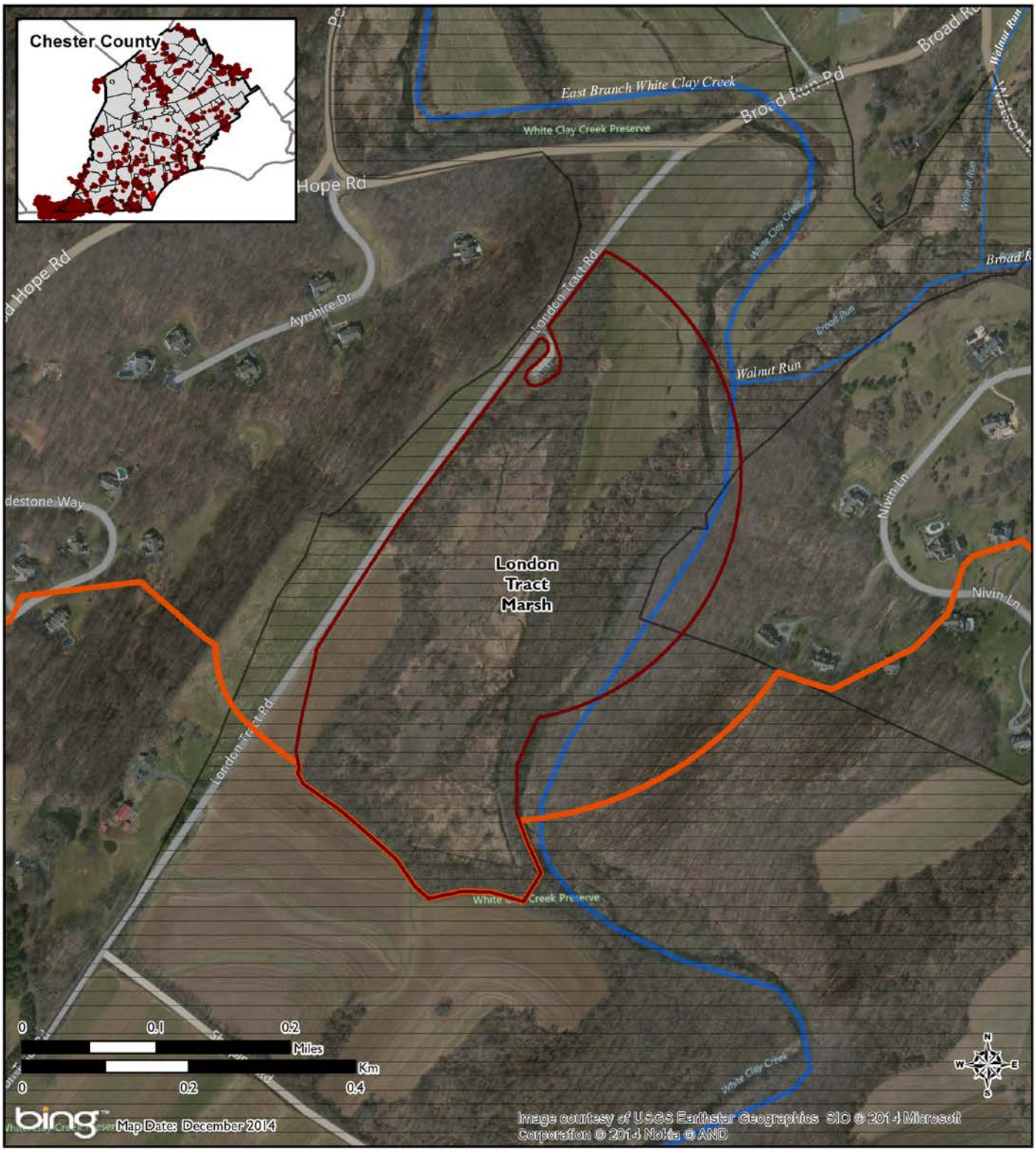
As part of White Clay Creek Preserve, this habitat should be protected from major disturbances. Maintain a forested buffer of at least 100 meters around the wetland and White Clay Creek to protect the water quality. Limit the use of chemicals that may wash into the wetland. Monitor the site to prevent the spread of invasive or woody species that can alter the habitat conditions.

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

- The species of concern at this site require open habitat that needs to be maintained. The needs of this species should be considered when planning the timing and frequency of maintenance.
- Maintain the existing hydrology. Any activities that occur in the fields and along roads should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Reduce the current deer density and continue to monitor and maintain the population at a level that is able to be supported by the landscape.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.

Location

Municipalities: *London Britain Township*
USGS quads: *West Grove*
Previous CNHI reference: *London Tract Woods & Wetland Floodplain*
Associated NHAs: *None*
Overlapping Protected Lands: *White Clay Creek State Park*



London Tract Marsh Natural Heritage Area

Wetland habitat supports a population of swamp lousewort, a critically imperiled plant in Pennsylvania.

Significance Rank:
STATE

Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Longwood Gardens NHA

PNHP Significance Rank: *State*

Site Description

Longwood Gardens NHA is a commercially operated tourist area located north of Route 1. Some areas are landscaped, but other portions of the property are managed to maintain meadow and wooded habitats. Several small wetlands are found within the NHA. Small vernal pools are found in some of the wooded habitat, and a retention pond was also created in part of the wet meadow. These wetlands provide habitat for five plant species of concern – **short-awn foxtail**, **false hop sedge, grass-leaved rush, Scirpus-like rush**, and **swamp dog-hobble**. All of these species are threatened by loss of their wetland habitat.

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]
Short-awn Foxtail (*Alopecurus aequalis*)		G5	S3	N (PT)	5/16/1993	D
False Hop Sedge (*Carex lupuliformis)*		G4	S1	TU (PE)	10/1/1994	CD
Grass-leaved Rush (*Juncus biflorus*)		G5	S2	TU (PT)	10/19/1993	D
Scirpus-like Rush (*Juncus scirpoides*)		G5	S1	PE (PE)	7/22/2008	BC
Swamp Dog-hobble (*Leucothoe racemosa*)		G5	S2S3	TU (PT)	7/20/1992	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.

False hop sedge is found throughout most of the eastern United States and is scattered throughout Pennsylvania. It is a state threatened species found associated with wetlands. They are often found along the edge of vernal pools, but can also be found in swamps and along streams.

Grass-leaved rush has been documented from Massachusetts west to Michigan and south to Florida and Arizona. This species is found in open wet habitats throughout the state, but most populations occur in the southeastern counties.

Scirpus-like rush ranges from New York to Wisconsin and south into Florida and Texas. In Pennsylvania, this species represents a southern species and has been documented in a few eastern counties. Scirpus-like rush is classified as endangered in the state. It grows on shorelines of ponds, lakes and streams, and in bogs and marshes.

Swamp dog-hobble has a mostly coastal range from New York west and south into Texas and Florida. In Pennsylvania, it represents a southerly species and has been documented historically in a number of southeastern counties. It grows in wetlands, particularly swamps, wet thickets, and the margins of ponds and streams.

Threats and Stresses

Changing habitat conditions is a major threat facing this NHA. Logging of the remaining wooded habitat and succession of the meadows will alter the variety of habitats that are found in this NHA. Invasive

species are present in many areas of this site and threaten the structure of the habitat. The vernal pools and wet meadows rely on maintaining the current hydrology to sustain the habitat conditions.

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

- Draining or flooding of wet meadow and forested wetland habitats can eliminate suitable habitat for the species of concern.
- Logging will further fragment the existing woods and alter the conditions of the habitat needed by the species of concern.
- Succession of the open grassy fields may cause the habitat used by grass-leaved rush to become overgrown and shaded by woody species.
- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Runoff and other sources of water pollution from the surrounding area threaten to degrade the water quality of streams and wetlands.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

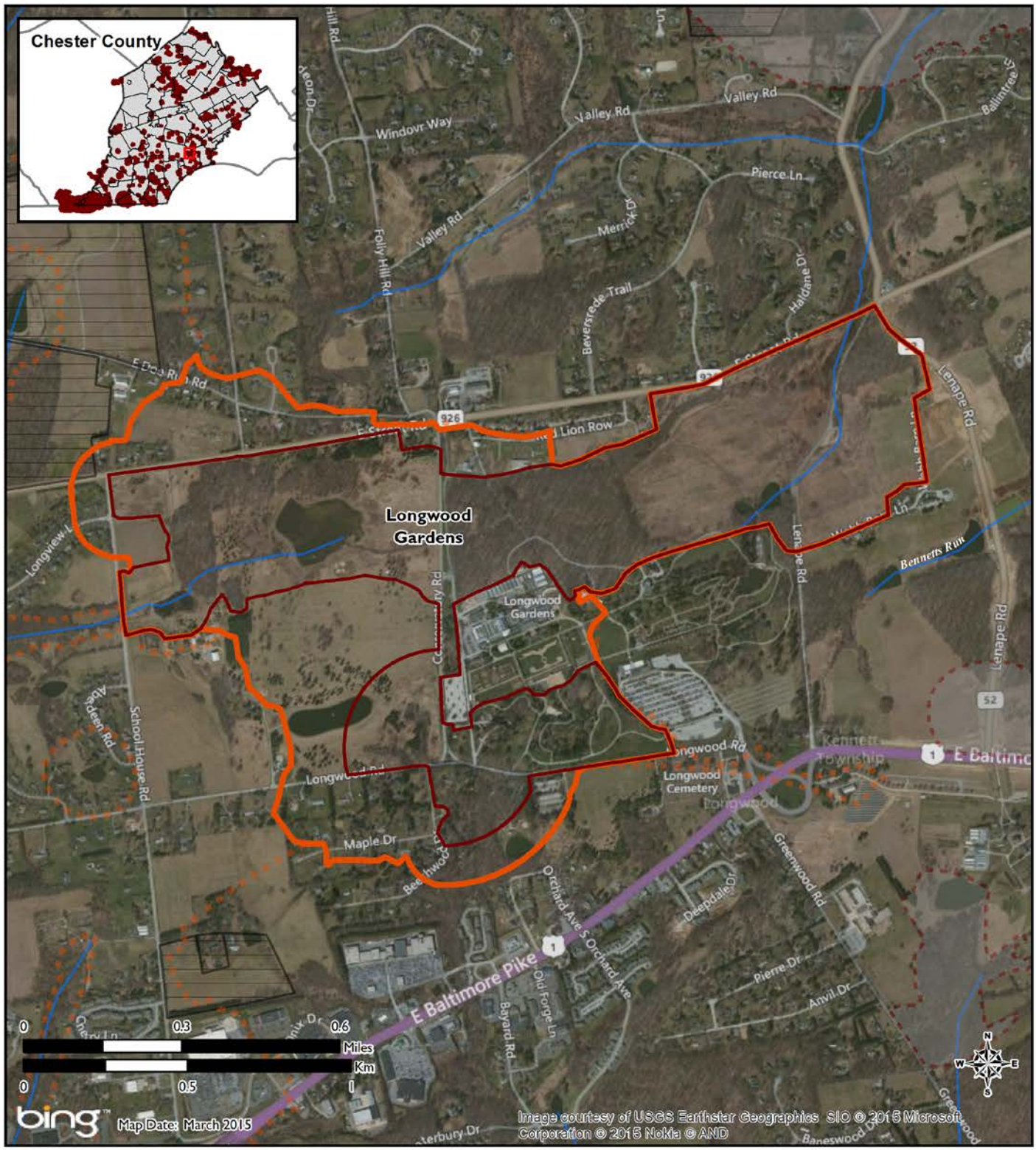
Longwood Gardens NHA is privately owned, but is managed to preserve the habitat conditions found here. For example, nearly ninety acres of meadow were recently restored with native pollinator plants by Longwood Gardens. The wooded area should be left undisturbed in order to protect the habitats needed by the species of concern and other native species present at this site. Maintain the existing hydrologic regime necessary for the wetland habitats present at this NHA. Periodic mowing will be necessary to prevent the establishment of woody species in the early successional habitats.

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

- Protect the existing wooded areas from logging and disturbance along the forest edge. Maintaining as many intact habitats as possible, given the location within a residential area, will help to preserve habitat for as many species as possible.
- Grass-leaved rush requires open habitat that needs to be maintained with mowing or other methods of disturbance. The needs of this species should be considered when planning the timing and frequency of maintenance.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations. Further disturbance within this habitat will create additional opening for the establishment and spread of invasive species.
- Avoid altering the current hydrology of the site, including draining or filling the wetlands and altering the flow of surface water. Consider potential changes to the flow of water when doing any activities within and around this NHA.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *East Marlborough Township*
USGS quads: *Unionville, Kennett Square*
Previous CNHI reference: *Red Lion Woods*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Longwood Gardens Natural Heritage Area

Wetlands at this site support populations of several plant species of concern; among these are false hop-sedge, grass-leaved rush, Scirpus-like rush, and swamp dog-hobble.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Lucky Hill Road NHA

PNHP Significance Rank: *State*

Site Description

Lucky Hill Road NHA is a patch of wooded habitat located along East Branch Brandywine Creek. Agricultural fields surround much of the site. A small pond is located within the NHA that is surrounded by a young forest dominated by black walnut and bitternut hickory. A nursery was located in this area in the 1960s. The eastern half of the NHA is dominated by American beech and sugar maple and also includes some of the floodplain along East Branch Brandywine Creek. The wooded habitat within Lucky Hill Road NHA supports a population of **autumn bluegrass**, a plant species of concern. It also provides habitat for a **sensitive species of concern**, not named 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]
Autumn Bluegrass (*Poa autumnalis*)		G5	S1	PE (PE)	6/2/2007	C
Sensitive species of concern A[3]	S	---	---	---	6/13/2007	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.

In Pennsylvania, autumn bluegrass has been documented in several southwestern counties and is typically found along stream banks and in moist woods. It is more common in the southern portions of its range, which spans from New Jersey west into Michigan and south to Florida and Texas. Autumn bluegrass is considered critically imperiled in Pennsylvania due to the small number of known populations in a small geographical area.

Threats and Stresses

Fragmentation of the existing wooded habitat would alter the current habitat conditions and species composition. Invasive species are found throughout this NHA and may negatively affect native species if not controlled.

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

- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Further fragmentation of the small patch of existing forest may alter the structure of the habitat and allow an increase in invasive species.

Conservation Recommendations

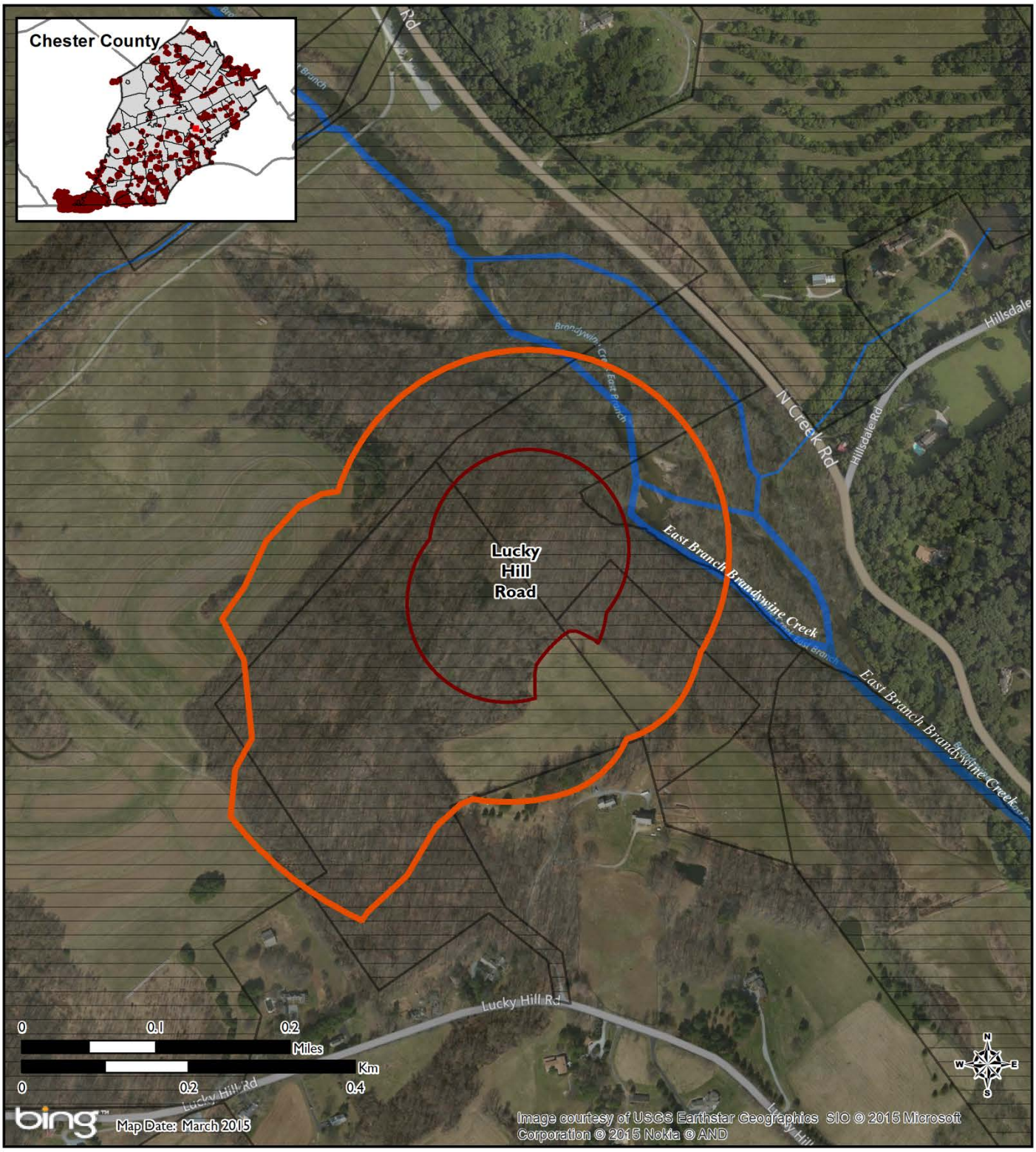
Almost all of the NHA is covered by a conservation easement, which should help to maintain the existing conditions of the wooded habitat. Minimize disturbance to the remaining forest. Avoid logging, development, or other activities that will fragment the habitat. Control invasive species in order to preserve the native species found in this NHA.

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

- Protect the existing forested areas from logging and disturbance along the forest edge. Maintaining as many intact habitats as possible, given the location within an agricultural area, will help to preserve habitat for as many species as possible.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations. Further disturbance within this habitat will create additional opening for the establishment and spread of invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *East Bradford Township*
USGS quads: *Unionville*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Easement*



Lucky Hill Road Natural Heritage Area

Forested habitat supports a population of autumn bluegrass and 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***

Marsh Creek Lake NHA

PNHP Significance Rank: *State*

Site Description

Marsh Creek Lake NHA is located near Wallace south of the Pennsylvania Turnpike, with a small section of the site extending north of the highway along the inflow of the lake. Most of the NHA is part of Marsh Creek State Park, but surrounding housing developments and agricultural fields are included as well. Marsh Creek Lake was created in the 1970s and is more than 500 acres in size. Wetlands are also located around the lake and streams that enter into it. Sedge dominated wetlands along one of the small streams provide habitat for **black dash** and **mulberry wing**, two butterfly species of concern. A pipeline right-of-way occurs at the northern end if the site that provides habitat for **Nuttalls' tick trefoil**, a plant species of concern. Marsh Creek Lake NHA also supports a **sensitive species of concern**, not named 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]
Black Dash (*Euphyes conspicuus*)		G4	S3	N (N)	7/19/1997	BC
Mulberry Wing (*Poanes massasoit*)		G4	S2	N (N)	7/12/1997	BC
Nuttalls' Tick-trefoil (*Desmodium nuttallii*)		G5	S2	TU (PT)	10/10/2006	BC
Sensitive species of concern A[3]	S	---	---	---	9/23/2011	E
Sensitive species of concern B[3]	S	---	---	---	5/14/2008	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.

Black dash and mulberry wing are two butterfly species of concern found in marshes, swamps, and other open wetland habitats. Both species use sedges as a host plant, most likely uptight sedge (*Carex stricta*). They are both found in the upper Midwest, Northeast, and Atlantic Coast, as well as in parts of southern Canada.

Nuttall's tick-trefoil is at the northern edge of its range in Pennsylvania. It is found from New Jersey west to Illinois and south to Florida and Texas. It has been documented mostly in the southeastern corner of the state. This species is found on dry, open hillsides, utility right-of-ways, and other open habitats.

Threats and Stresses

Degradation of the quality of the lake, streams, and wetlands would impact the native species found in this area. Additional changes to the hydrology would alter the existing habitats, although removal of the dam may return some of the area to its natural state.

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. Runoff from industrial and residential

development, agricultural fields, and roads have significantly higher levels of sediment, nutrients, pesticides, herbicides and other pollutants than runoff filtered through a natural habitat.
- Changes in the currently hydrology could significantly alter the habitat for the plant species of concern by making conditions either too wet or too dry to be able to persist at this site.
- Herbicides sprayed on the pipeline right-of-way may cause direct mortality to the species of concern and other native species.
- Growth of woody species in the right-of-way and other early successional habitat may cause the area used by Nuttalls' tick-trefoil to become overgrown and shaded.
- Invasive species are found in many areas of this site and may displace native vegetation, including species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

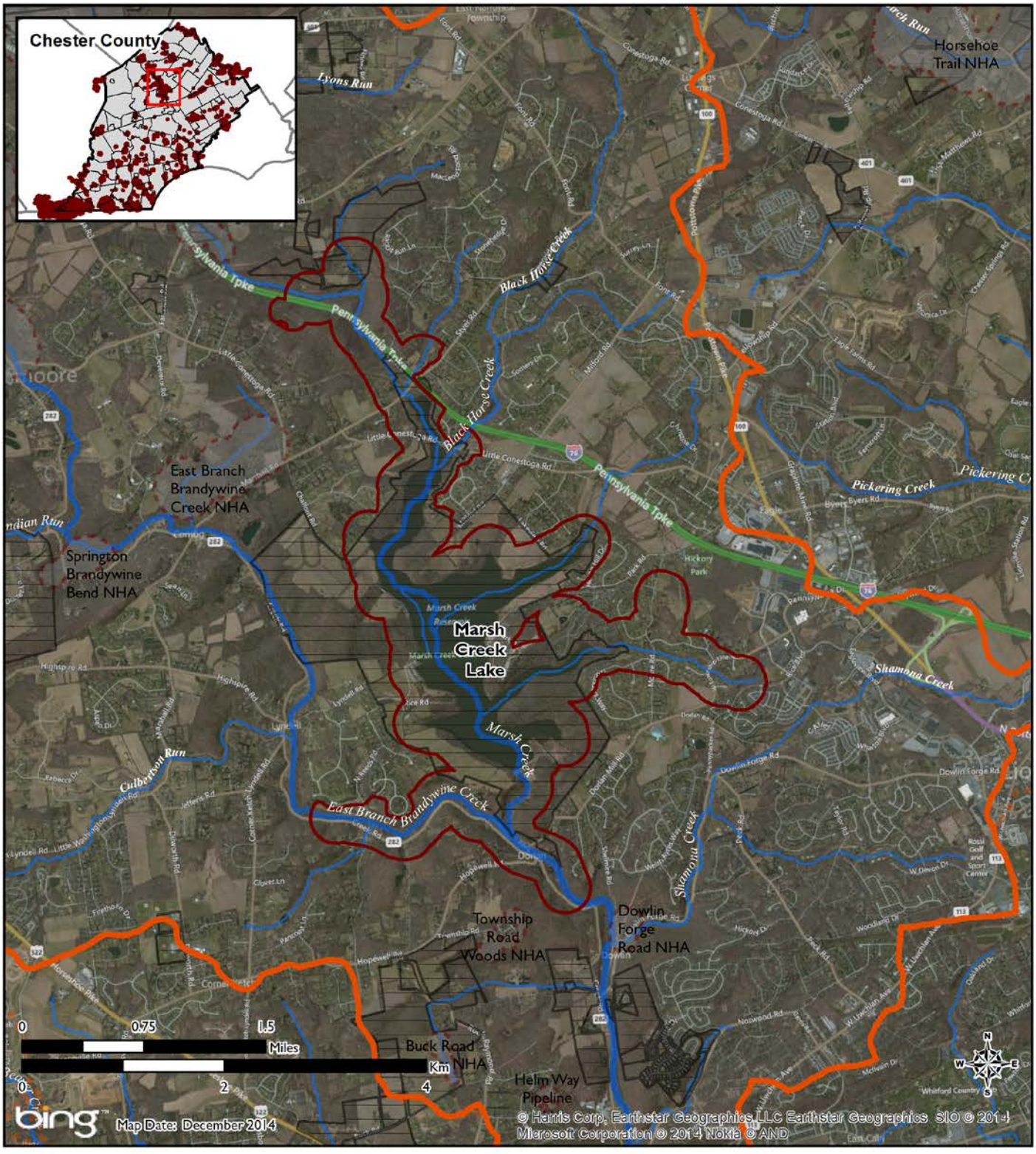
Conservation Recommendations

Most of this NHA is part of Marsh Creek State Park, which should help to prevent the fragmentation that has occurred in much of the surrounding area. Protect the riparian vegetation and expand it where possible in order to filter out sediment and pollutants from runoff.

The following steps are recommended to ensure the persistence of these species at this site:
- Avoid disrupting the hydrology of the site by draining or filling the wetlands as well as disturbing the surface or groundwater hydrology.
- Protect the riparian zone and repair others that have been degraded by encouraging the growth of native vegetation. Careful determination is needed to avoid planting trees in floodplains that should remain as open canopied herbaceous wetland habitats. These habitats should be maintained in their current open condition, with tree plantings to occur uphill of areas containing hydric soils.
- Avoid fragmenting the existing forests and wetlands 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.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Nuttalls' tick-trefoil requires open habitat that needs to be maintained with mowing or other methods of disturbance. The needs of this species should be considered when planning the timing and frequency of maintenance.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *East Brandywine Township, East Nantmeal Township, Wallace Township, Upper Uwchlan Township, Uwchlan Township*
USGS quads: *Downingtown*
Previous CNHI reference: *Marsh Creek Lake, SP520, SP514*
Associated NHAs: *None*
Overlapping Protected Lands: *Marsh Creek State Park, Great Marsh*



Marsh Creek Lake Natural Heritage Area

Aquatic and wetland habitats support two butterfly species of concern, mulbery wing and black dash, a plant species of concern, Nuttall's tick trefoil, and 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***
- ***Conservation Lands***

Marshallton Barrens NHA

PNHP Significance Rank: *State*

(PNHP)

Tall Gramma
(*Bouteloua curtipendula*)

Site Description

A small serpentine bedrock influenced herbaceous opening occurs within the context of active agriculture and scattered woodlots. The serpentine habitats are often referred to as grasslands, and these herbaceous openings can have a strong representation of warm season grasses and grass-like plants, but they often also contain a good diversity of other plant species, many uncommon at the state and global levels.

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]
Tall Gramma (*Bouteloua curtipendula*)		G5	S2	PT (PT)	7/27/1993	C
Plain Ragwort (*Packera anonyma*)		G5	S2	PR (PR)	7/27/1993	E
Sensitive species of concern A[3]	S	---	---	---	7/27/1993	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.

The plant species of concern found within this Natural Heritage Area are found primarily within the strongly serpentine influenced herbaceous opening or within the adjacent thin woodlands. In the past, natural disturbance, such as wildfires, would have helped to keep this area in an open condition. Without active management, the open grassy area will gradually close due to natural succession. An active restoration effort to maintain the serpentine openings will be necessary to ensure the continued existence of this habitat and the species it contains.

Threats and Stresses

Historically, wildfires likely helped to maintain the open aspect of these habitats. Early accounts record the intentional setting of fire by Native Americans to help open areas for greater potential hunting success. Because of the past prevalence of intentional or accidental wildfires, this habitat was historically less dominated by woody trees and shrubs, but recent fire suppression has favored the expansion of wooded habitats at the expense of herbaceous openings. Invasion of serpentine herbaceous openings by woody trees and shrubs can influence the surrounding habitat. As woody vegetation encroaches on the openings, they tend to trap more organic debris and allow deeper soils to accumulate. As deeper soils occur on the site, they succeed to more common woodland and forest types. Fire disturbances had maintained these herbaceous openings in the past. In the absence of fire, active woody vegetation removal will be necessary to maintain these openings.

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

- The lack of natural fire disturbance poses one of the greatest threats to this habitat. In the absence of natural fire events, most of the open serpentine barrens habitats will gradually succeed to more common woody vegetation such as junipers, pines and oaks.

- Currently the serpentine habitat occurs within an agricultural context. Conversion of the area to residential or other uses would diminish the long term prospects for this habitat.
- Invasive species of plants can displace native species of plants.
- Over browsing by white-tailed deer is a serious threat to the overall plant diversity.

Conservation Recommendations

These serpentine habitats occur in isolated patches as the bedrock material, serpentinite, is exposed at the surface of the ground in a scattered fashion much like an archipelago chain of islands. Each habitat has a slightly different species composition, largely due to the slightly different environmental conditions found at each distinct location. A long range goal for these isolated habitats is to recognize them as a single system and plan for their ecological needs. The area between and around these habitats should be maintained to provide the necessary buffer to allow prescribed burns to maintain the mosaic of open habitat once a network of the woody species have been removed.

Rocky Gleason (PNHP)

Active woody plant removal is necessary to maintain herbaceous openings.

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

- There appears to be no specific formal management plan for this Natural Heritage Area, and the site would benefit from a thorough review of the site-specific goals and procedures for management here. In the interim, general goals and actions could be gleaned from other serpentine management plans such as the Goat Hill Management Plan (Furedi 2008); Unionville Serpentine Barrens Restoration and Management Plan (Latham 2012); Pink Hill Serpentine Barrens Restoration and Management Plan (Latham 2008).
- The plants that characterize these habitats are adapted to the dry, nutrient poor soils and periodic fire events. A priority for the security of these globally rare habitats should be to establish protection for the core habitats as well as to provide for the landscape context in which natural process can be maintained.
- Active stewardship of these habitats is necessary. In the absence of natural fire disturbance, or active vegetation removal, these habitats will succeed into woodlands and forests, replacing the globally rare habitat with a more common type.
- Habitat restoration activities should strive to establish a mosaic of habitat types to accommodate the variety of organisms and their diverse habitat preferences. While some of these plants will only thrive in the open on thin soils, or even bare bedrock conditions, others need the limited shelter of scattered trees or even the deep shade provided by a mature forest. Some of the insect species require conifers during part of their life cycle while others need deciduous trees or specific shrubs or wildflower host plants. There is no "one-size-fits-all" management recommendation for this habitat other than to provide for a mosaic of habitat diversity. "It's essential in restoring and maintaining disturbance-dependent ecosystems to vary the intensity and frequency of the disturbance in patchwork fashion, so that there is always a mosaic of patches of differing disturbance history. …the patchy landscape produced by random variation in disturbance history from one patch to another is essential to sustain the diversity of habitats and organisms that make up the total ecosystem." (Roger Latham, personal communication November 7th, 2014)


Rocky Gleason (PNHP)

Plain Ragwort (*Packera anonyma*)

- Management activities should be coordinated with long-term habitat monitoring. "Analysis of desired conditions, inventory of existing conditions, and long-term monitoring of an array of key indicators is essential to know whether restoration and management efforts are accomplishing all of the goals or if some of the threatened or endangered species whose recovery is first and foremost among those goals might be inadvertently falling by the wayside." (Roger Latham, personal communication November 7th, 2014)
- Expand herbaceous openings as needed on convex landscapes by removing trees and other woody plants. Focus woody plant removal on areas of pines and junipers, which tend to indicate drier, thinner soils. The establishment of hardwoods should be taken as an indicator of deeper, moister soils. Where deeper soils occur, soil organic matter reduction may be necessary to establish thin soils over serpentine bedrock. "Soil organic matter reduction has proven effective in restoring serpentine grassland vegetation where it has been fully displaced by forest succession, as long as intact grassland adjoins the treated area to serve as a seed source. SOM reduction consists of skimming the surface organic horizons from the soil profile using a backhoe or front-end loader and transporting the material offsite by dump truck. It is particularly effective in restoring serpentine grassland where it has been invaded by a dense thicket of common greenbrier (Smilax rotundifolia)." (Roger Latham, personal communication November 18th, 2014)
- These systems may be best maintained in an agricultural or rural setting. Residential development near or between these barrens should be strongly discouraged. Adjacent residential development can conflict with or greatly reduce the options for management using prescribed fire.
- Educate the adjacent landowners on the significance of the globally rare habitat and the need for ongoing management activities.
- Suppress the spread of invasive species of plants to prevent native species from being crowded out of the habitat. Removal of invasive plants in the immediately vicinity of the species of concern can help these populations compete for space against much more aggressive species. Invasive species management should be coordinated by individuals familiar with the rare species as well as the invasive species present. Continual invasive species monitoring and control will be necessary.
- Reduce deer herd density to suitable levels to prevent overbrowsing of sensitive species.

Location

Municipalities: *East Bradford Township, West Bradford Township*
USGS quads: *Unionville*
Previous CNHI reference: *Marshallton Barrens*
Associated NHAs: *None*
Overlapping Protected Lands: *Natural Lands Trust Property*

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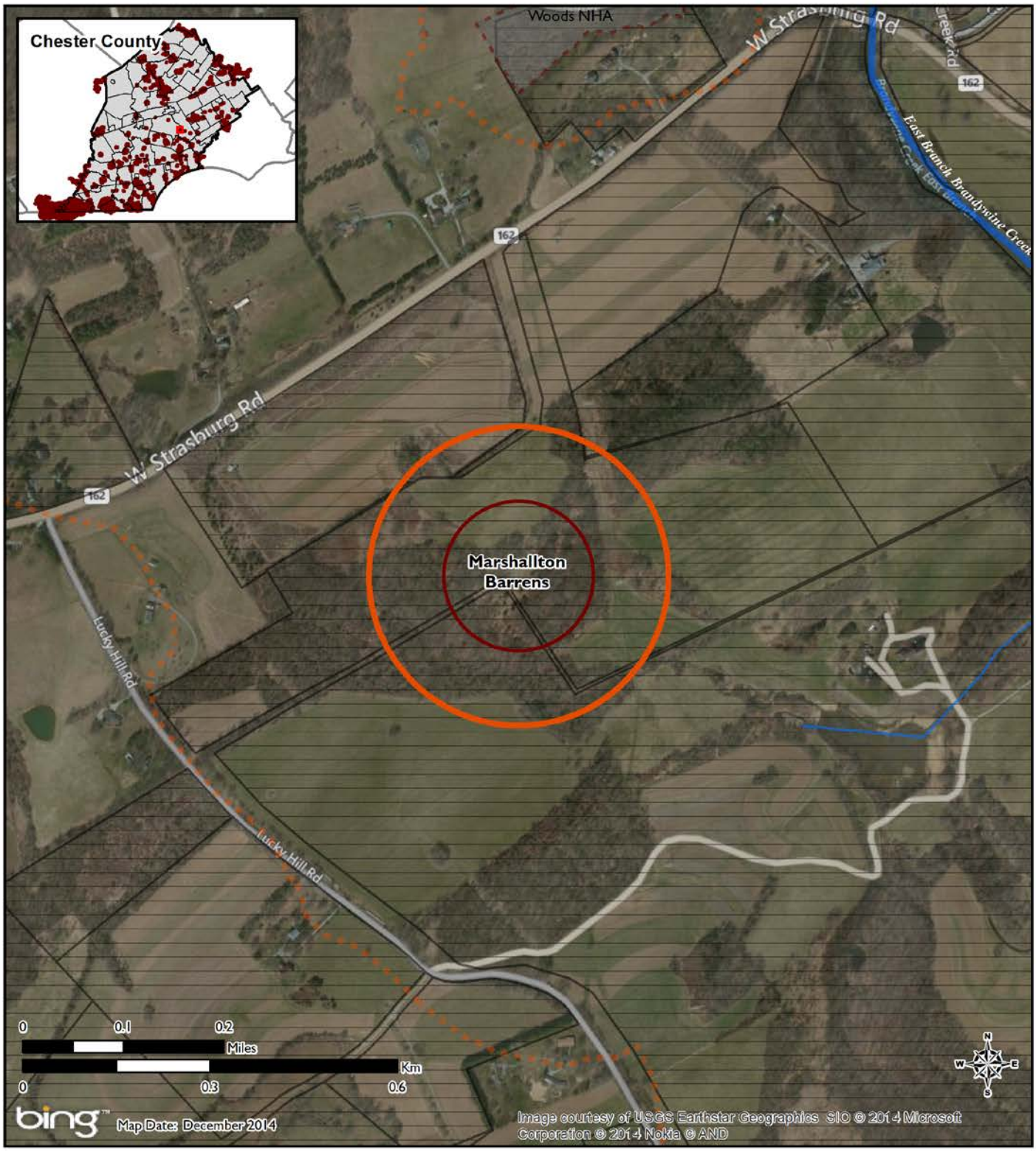


Marshallton Barrens Natural Heritage Area

This small serpentine barren provides habitat for two plant species of concern: plain ragwort and tall gramma, in addition to 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*
- *Conservation Lands*

Merrybell Lane Woods NHA

PNHP Significance Rank: *State*

Site Description

Merrybell Lane Woods NHA is located on the border with Delaware State along a meandering tributary to Red Clay Creek. The wooded habitat is fragmented by a pipeline right-of-way that crosses through the northern end of the NHA. The surrounding habitat is a mix of woods, agricultural fields, and residential developments. The wooded habitat within Merrybell Lane Woods NHA supports a population of **autumn bluegrass**, a plant 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]
Autumn Bluegrass (*Poa autumnalis*)	G5	S1	PE (PE)	6/6/1999	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.

In Pennsylvania, autumn bluegrass has been documented in several southwestern counties and is typically found along stream banks and in moist woods. It is more common in the southern portions of its range, which spans from New Jersey west into Michigan and south to Florida and Texas. Autumn bluegrass is considered critically imperiled in Pennsylvania due to the small number of known populations in a small geographical area.

Threats and Stresses

Fragmentation of the remaining forest will alter the existing habitat conditions. Disturbance along the right-of-way may kill native species with herbicide use and contribute to the spread of invasive species while mowing or cutting along the wooded edge habitat.

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

- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Further fragmentation of the small patch of existing forest may alter the structure of the habitat and allow an increase in invasive species.
- Herbicides sprayed on the pipeline right-of-way may enter the wooded habitat and cause direct mortality to autumn bluegrass and other native species.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

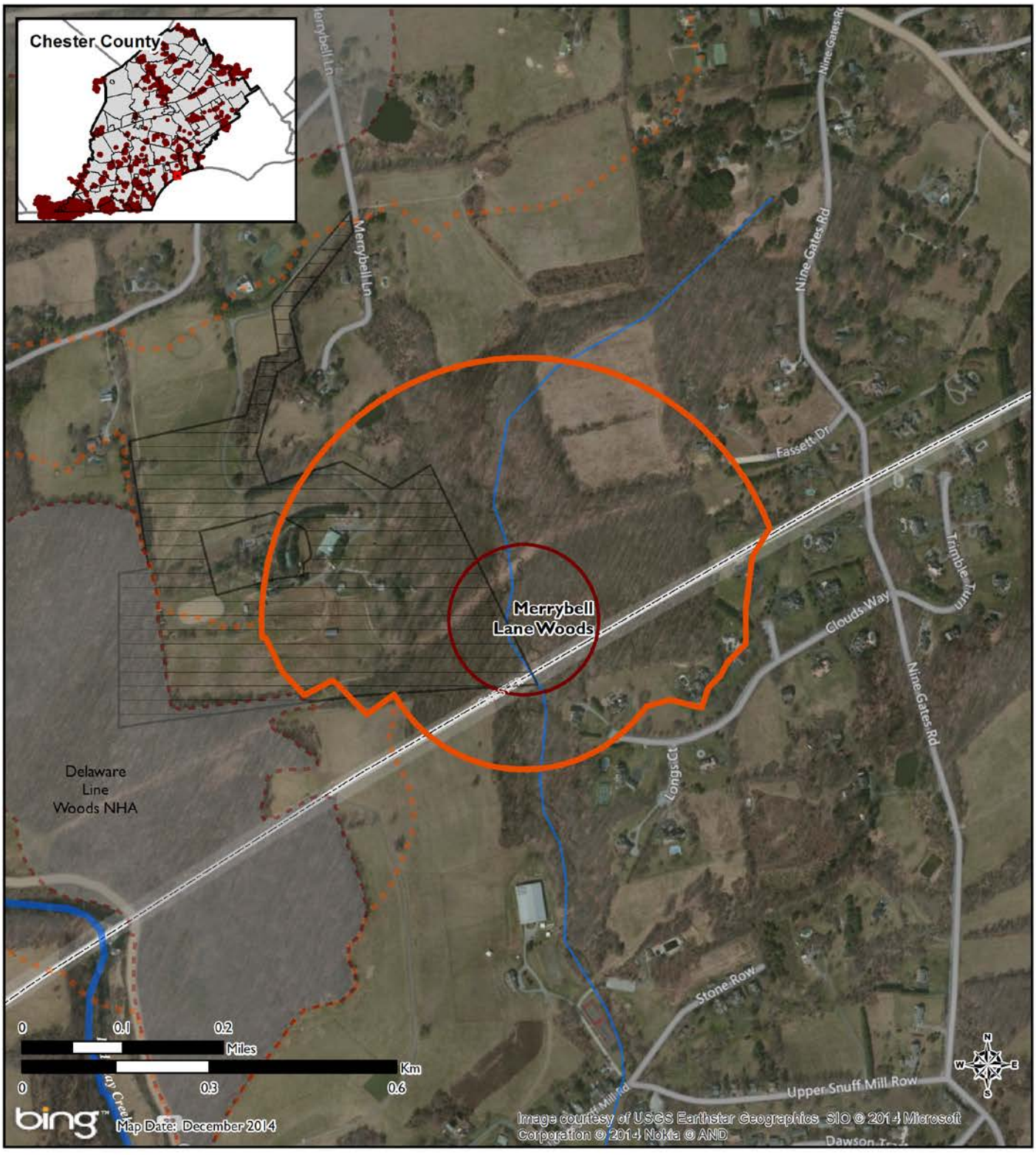
Part of this NHA is covered by a conservation easement that will protect this property from major disturbances. Avoid activities that will fragment the patch of wooded habitat. Limit the use of herbicides on the right-of-way to prevent mortality of native species within and around the opening.

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

- Protect the existing forested areas from logging and disturbance along the forest edge. Maintaining as many intact habitats as possible, given the location within an agricultural area, will help to preserve habitat for as many species as possible.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations. Further disturbance within this habitat will create additional openings for the establishment and spread of invasive species.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Kennett Township*
USGS quads: *Kennett Square*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Easement*



Merrybell Lane Woods Natural Heritage Area

Upland forest at this site supports a population of Autumn bluegrass, 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***
- ***Conservation Lands***

Middle Branch White Clay Creek NHA

PNHP Significance Rank: *Regional*

Site Description

Middle Branch White Clay Creek NHA is located along a stretch of the stream around Wickerton. With approximately three and a half miles of stream length of Middle Branch White Clay Creek, plus additional stretches of several tributaries, this site encompasses a large area with a number of land uses. Much of this area has been cleared for agricultural fields and residential development, with scattered woodlots in between. These remnant wooded habitats support populations of **autumn bluegrass** and **puttyroot**, two plant species of concern. This NHA also provides habitat for two sensitive species of concern, not named at the request of the jurisdictional agencies overseeing their 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]
Puttyroot (*Aplectrum hyemale*)		G5	S3	PR (PR)	12/12/2003	B
Autumn Bluegrass (*Poa autumnalis*)		G5	S1	PE (PE)	5/19/2007	BC
Virginia Bunchflower (*Veratrum virginicum*)		G5	S1	N (PE)	6/16/2006	BC
Sensitive species of concern A[3]	**S**	---	---	---	6/15/2007	E
Sensitive species of concern B[3]	**S**	---	---	---	1/12/1992	CD

[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.

In Pennsylvania, autumn bluegrass has been documented in several southwestern counties and is typically found along stream banks and in moist woods. It is more common in the southern portions of its range, which spans from New Jersey west into Michigan and south to Florida and Texas. Autumn bluegrass is considered critically imperiled in Pennsylvania due to the small number of known populations in a small geographical area.

In Pennsylvania, puttyroot is most commonly found in the southeastern counties and grows in moist woodlands and on forested slopes and stream banks. Puttyroot produces leaves that are visible through the fall and winter. The leaves wither in late spring, and the plant flowers in May and June.

Threats and Stresses

Alteration of the hydrology of the streams and wetlands within and adjacent to this site would likely alter the condition of the habitat and species composition. Impacts from the surrounding fields and developments threaten the water quality, especially in areas with a minimal riparian buffer.

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

- Degradation of riparian zones within this NHA threatens the integrity of water quality in Middle Branch White Clay Creek and adjacent wetlands. The stormwater runoff from roadways and development should be considered a potential source of significant contamination. Runoff from these sources has significantly higher levels of pollutants than runoff filtered through a natural habitat.

- Natural succession from open, wet meadows to shrub and tree dominated habitats can eliminate suitable open canopied habitats supporting species of concern.
- Forest fragmentation due to development or infrastructure activities could result in habitat loss and degradation of the site.
- Exotic invasive plant species threaten to compete with and displace native species.
- 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 park-like forests in which the native plant understory and vertical stratification are greatly reduced.

Conservation Recommendations

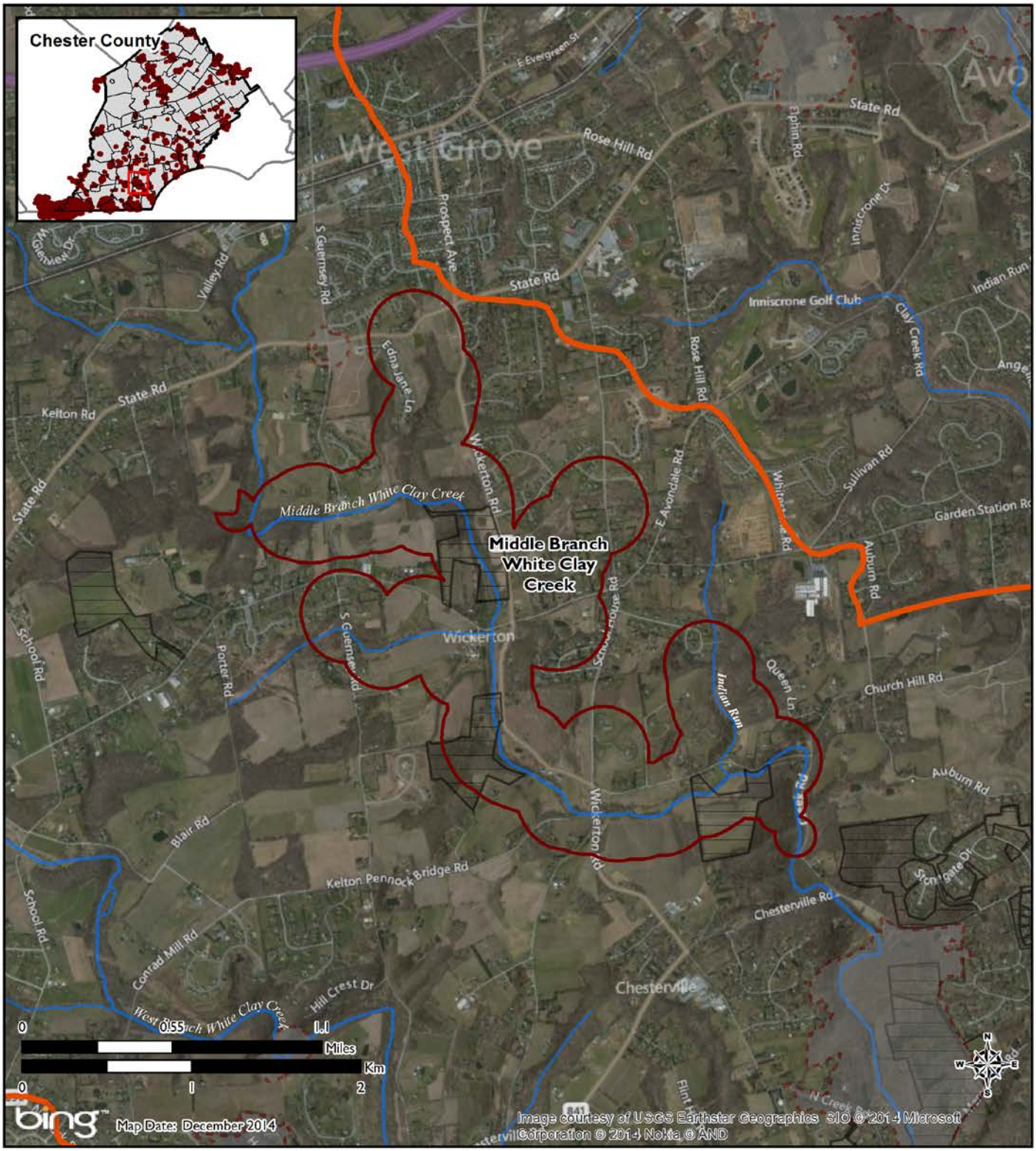
Several conservation easements protect portions of this NHA. This site will be best protected by maintaining the integrity of vegetative buffers and assuring a consistent hydrologic regime to protect wetlands.

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

- Avoid disrupting the hydrology of the site by draining or filling the wetlands, as well as disturbing the surface or groundwater hydrology.
- Maintain open, wet meadow habitats by periodic removal of woody species of plants. This action will temporarily help set back succession to a closed canopy habitat and preserve the open, wet meadow habitat conditions preferred by some of the species of concern.
- Protect the riparian zone and repair others that have been degraded by encouraging the growth of native vegetation. Careful determination is needed to avoid planting trees in floodplains that should remain as open canopied herbaceous wetland habitats. These habitats should be maintained in their current open condition, with tree plantings to occur uphill of areas containing hydric soils.
- Avoid fragmenting the existing forests and wetlands 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.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations. Further disturbance within this habitat will create additional opening for the establishment and spread of invasive species.
- Reduce deer density, then continue to monitor and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *London Grove Township, Franklin Township*
USGS quads: *West Grove*
Previous CNHI reference: *Wickerton North Site, Wickerton North Woods, Wickerton Woods, Chesterville Woods*
Associated NHAs: *None*
Overlapping Protected Lands: *Natural Lands Trust Conservation Easement, Brandywine Conservancy Easement*



Middle Branch White Clay Creek Natural Heritage Area

Riparian and wetland habitats support populations of several 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***

Middle Branch White Clay Creek Wetlands NHA

PNHP Significance Rank: *State*

Site Description

Middle Branch White Clay Creek Wetlands NHA is a patch of wooded habitat approximately 130 acres in size west of Chatham. This is one of the larger patches of wooded habitat that remains in a largely agricultural area. Small wetland depressions occur along the stream channel that support a population of **false hop sedge**, a plant species of concern. A small pasture makes up the northern portion of this NHA. This meadow and other early successional areas within this NHA provide habitat for **stiff cowbane**, another plant species of concern. A **sensitive species of concern** was also documented at this location, which is not named 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]
False Hop Sedge (*Carex lupuliformis*)		G4	S1	TU (PE)	11/18/2006	C
Stiff Cowbane (*Oxypolis rigidior*)		G5	S2	TU (PT)	7/1/2006	D
Sensitive species of concern A[3]	**S**	---	---	---	4/15/2009	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.

False hop sedge is found throughout most of the eastern United States and is scattered throughout Pennsylvania. It is a state threatened species found associated with wetlands. This species is often found along the edge of vernal pools, but can also be found in swamps and along streams.

Stiff cowbane is a plant species in the carrot family. Its range spans from New Jersey west to Minnesota and south to Texas and Florida. It is at the northern edge of its range in Pennsylvania and has mostly been documented in southern counties. Stiff cowbane is found in open, wet habitats.

Threats and Stresses

Further fragmentation of the wooded habitat will create openings for the establishment of invasive species and alter the habitat conditions. Much of the surrounding riparian habitat flows through agricultural fields with little vegetated buffer. Fertilizers, herbicides, and sediment from the surrounding fields may wash into the wetland and degrade the water quality.

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

- Herbicides, fertilizers, and sediment from agricultural fields and roads may wash into the wetland area and degrade the habitat conditions.
- Invasive species are present at this site and may displace native vegetation, including species of concern.
- Changes in hydrology may make the habitat unsuitable to the species of concern found here.
- Succession in the meadow habitat that is not controlled by mowing or other methods of disturbance will likely cause the habitat to become unsuitable for stiff cowbane to be able to persist at this site. Excessive mowing will also negatively impact stiff cowbane.

- Over-browsing by white-tailed deer and livestock impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

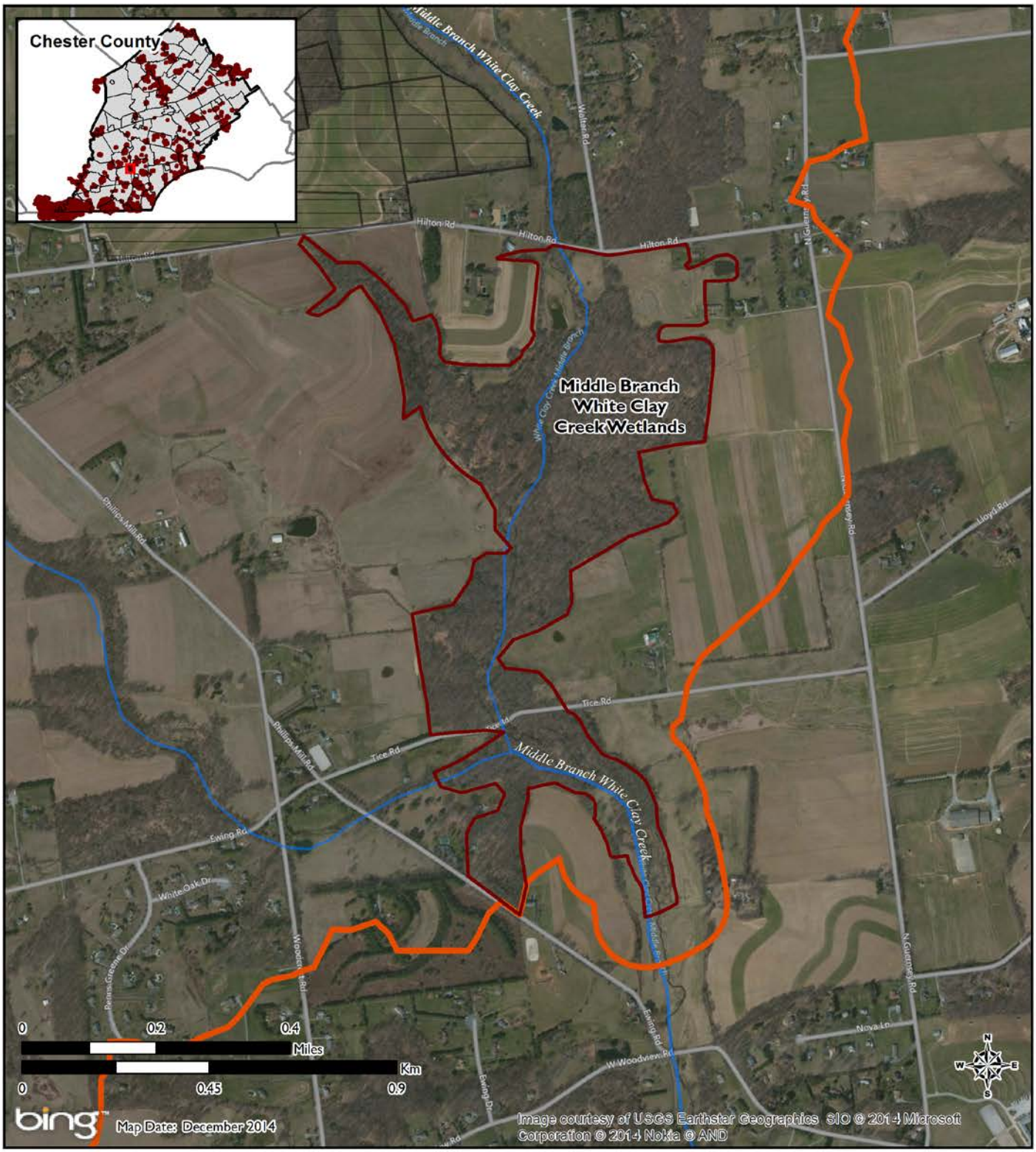
Maintain the existing wooded habitat and limit activities that will create disturbances. Increase the forested buffer along East Branch Big Elk Creek to protect the water quality of the stream and surrounding wetlands. Limit the use of chemicals on the fields to prevent them entering into the stream in the runoff.

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

- Limit herbicide use to situations where it is necessary, such as to control invasive species. Create a sufficient vegetated buffer along the stream in order to filter sediment and chemicals from runoff. A buffer of 100 meter is ideal, but any increase will help to protect the water quality.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Maintain the existing hydrology. Any activities that occur in the fields and along roads should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Limit livestock access to the wetland openings.

Location

Municipalities: *London Grove Township, Penn Township*
USGS quads: *West Grove*
Previous CNHI reference: *Tice Road Site*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Middle Branch White Clay Creek Wetlands Natural Heritage Area

Forested wetlands at this site support two plant species of concern, false hop sedge and stiff cowbane.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

Modena Railroad Yard NHA

PNHP Significance Rank: *State*

Site Description

Modena Railroad Yard NHA is located near West Branch Brandywine Creek. The railroad travels along the floodplain and cuts through the riparian forested habitat in this area. The active railroad track has dry cinder areas along it that have created dry openings. The disturbed, open habitat supports a population of **forked-chickweed**, a plant 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]
Forked-chickweed (*Paronychia fastigiata* var. *nuttallii*)	G5T3T5	S1S2	TU (PE)	7/9/1994	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.

Forked-chickweed is documented in Pennsylvania, Virginia, and West Virginia. Other portions of the range do not recognize this as a distinct variety. In Pennsylvania, it has been documented in several southern counties. This species is most often found in disturbed, open habitats.

Threats and Stresses

This NHA is an artificial habitat that would be susceptible to change via succession or additional disturbances. Invasive species may also be spread through waste along the railroad that can spread into this habitat

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

- Runoff of sediment and pollutants from the adjacent railroad may degrade the quality of the habitat needed to support the species of concern.
- Succession of the open area may cause the habitat used by forked-chickweed to become overgrown and shaded by woody species.
- Waste dumped in the area may cover native species or degrade the quality of the habitat. Invasive species may be spread by moving fill material that contains seeds.
- Invasive species are likely present in this site and may displace native vegetation, including species of concern.

Conservation Recommendations

Activity along the railroad will likely allow this area to remain open. Remove woody species and invasives that begin to colonize the area, but limit large disturbances and dumping in this area.

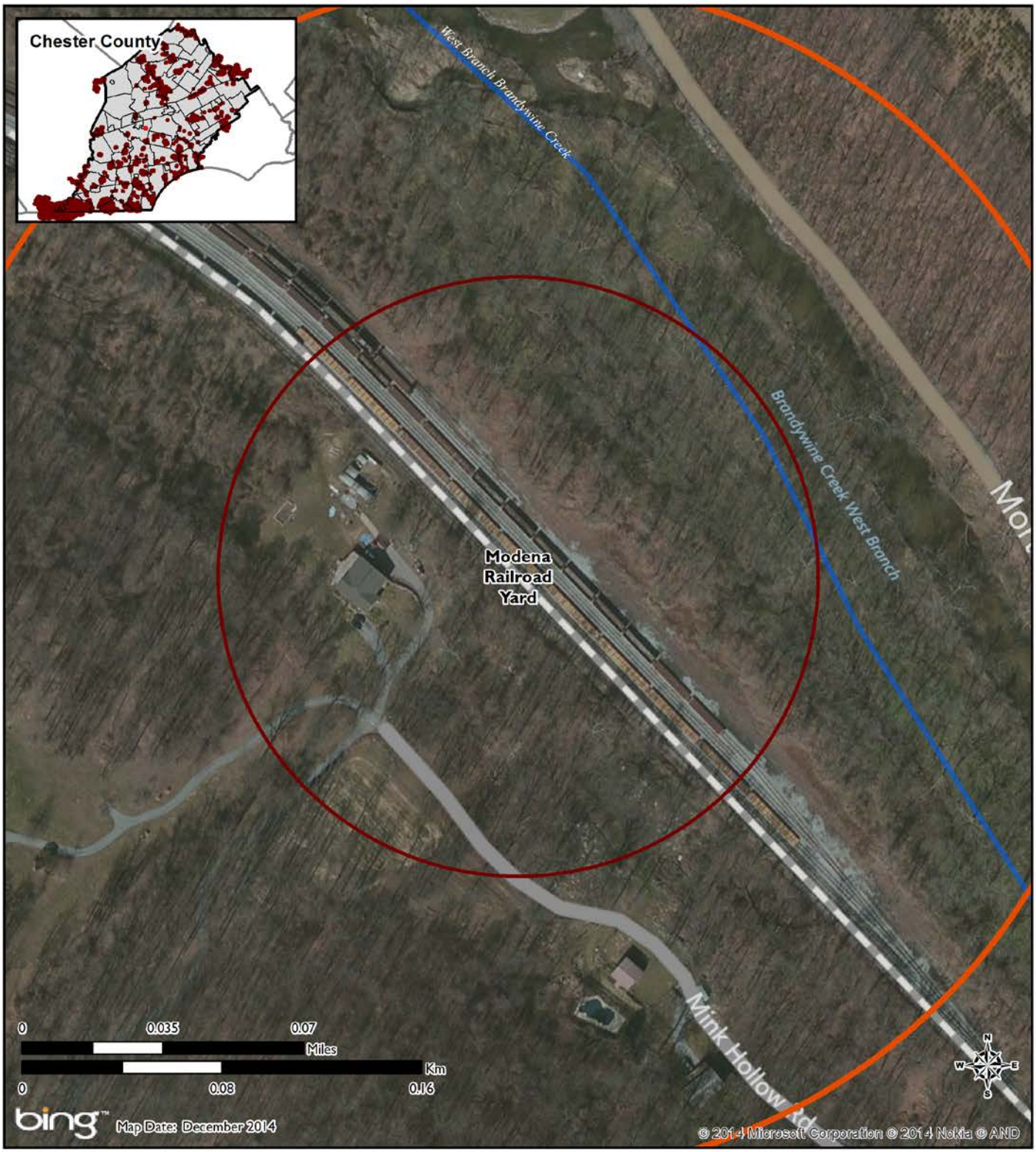
The following steps are recommended to ensure the persistence of these species at this site:

- Maintain the open habitat for forked-chickweed and other early successional species. Perform periodic maintenance to remove woody species before they becoming established.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.

- Dump waste materials in appropriate areas that will prevent the degradation of surrounding habitats.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.

Location

Municipalities: *East Fallowfield Township*
USGS quads: *Coatesville*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Modena Railroad Yard
Natural Heritage Area

Dry, cinder-filled uplands at this site support a population of forked-chickweed, a critically imperiled plant species in Pennsylvania.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

Mosquito Lane NHA

PNHP Significance Rank: *State*

Site Description

Located in southern Chester County, this NHA includes riparian and wetland habitats along State Route 841 and 41 near the town of Chatham. Wetland, riparian woodland and aquatic habitats support a **sensitive species of concern**. This species cannot be named 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**	---	---	---	5/1/2013	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 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 sensitive species of concern at this site relies on good water quality, and is vulnerable to siltation and chemical pollution.

Conservation Recommendations

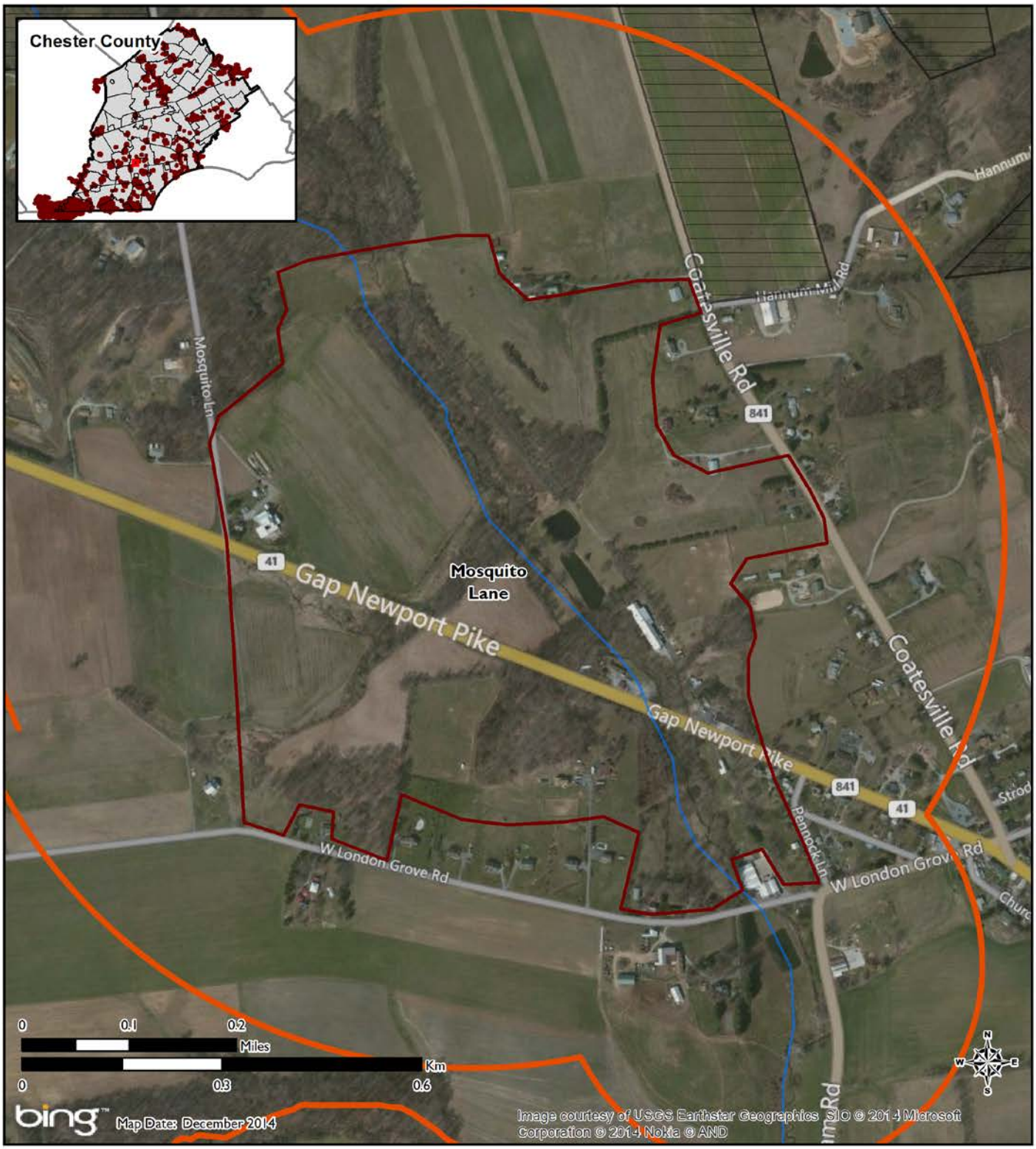
The entire site is privately owned and landowners in the Core Habitat should be aware that the species is sensitive to disturbance.

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

- Avoid disturbance from human activities within the Core Habitat during the breeding season (December – July).
- Additional development within the Core Habitat should be avoided to protect the sensitive species of concern.
- 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.
- 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.
- 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 are. Maintaining high quality aquatic habitat is important to this species.

Location

Municipalities: *London Grove Township*
USGS quads: *West Grove*
Previous CNHI reference:
Associated NHAs: *None*
Overlapping Protected Lands: None



Mosquito Lane
Natural Heritage Area

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 Supporting Landscape*
- *Conservation Lands*

Mt. Hope Road NHA

PNHP Significance Rank: *State*

Site Description

Mt. Hope Road NHA is a wooded area near Elkdale that surrounds a series of man made ponds that flow into East Branch Big Elk Creek. This woodlot is approximately 13 acres in size and is surrounded by agricultural fields and a housing development. The habitat along the pond edge provides habitat for a small population of **bushy aster**, a plant 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]
Bushy Aster (*Symphyotrichum dumosum*)	G5	S1	TU (PE)	10/17/1999	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.

Bushy aster is located throughout the eastern United States from Maine west to Wisconsin and south to Florida and Texas. It occurs through some parts of Canada as well. Most occurrences in Pennsylvania have been documented in the southeastern counties. It is classified as critically imperiled in the state due to the small number of known occurrences. Bushy aster is most often found in open habitat and along shrubby edge habitat.

Threats and Stresses

Further logging and other disturbances will fragment the habitat and allow for the introduction and spread of invasive species. Changes in hydrology will alter the habitat conditions and species composition within the NHA and surrounding habitats.

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

- Logging, development, or other major activities can further fragment the existing habitat and alter the conditions needed by the species of concern. Disturbances can also open areas that may be easily colonized by invasive species.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Herbicides and fertilizers used in lawns, fields, and along roads may wash into the forested area and degrade the habitat conditions.
- Changes in the currently hydrology could significantly alter the habitat for the plant species of concern by making conditions either too wet or too dry to be able to persist at this site.

Conservation Recommendations

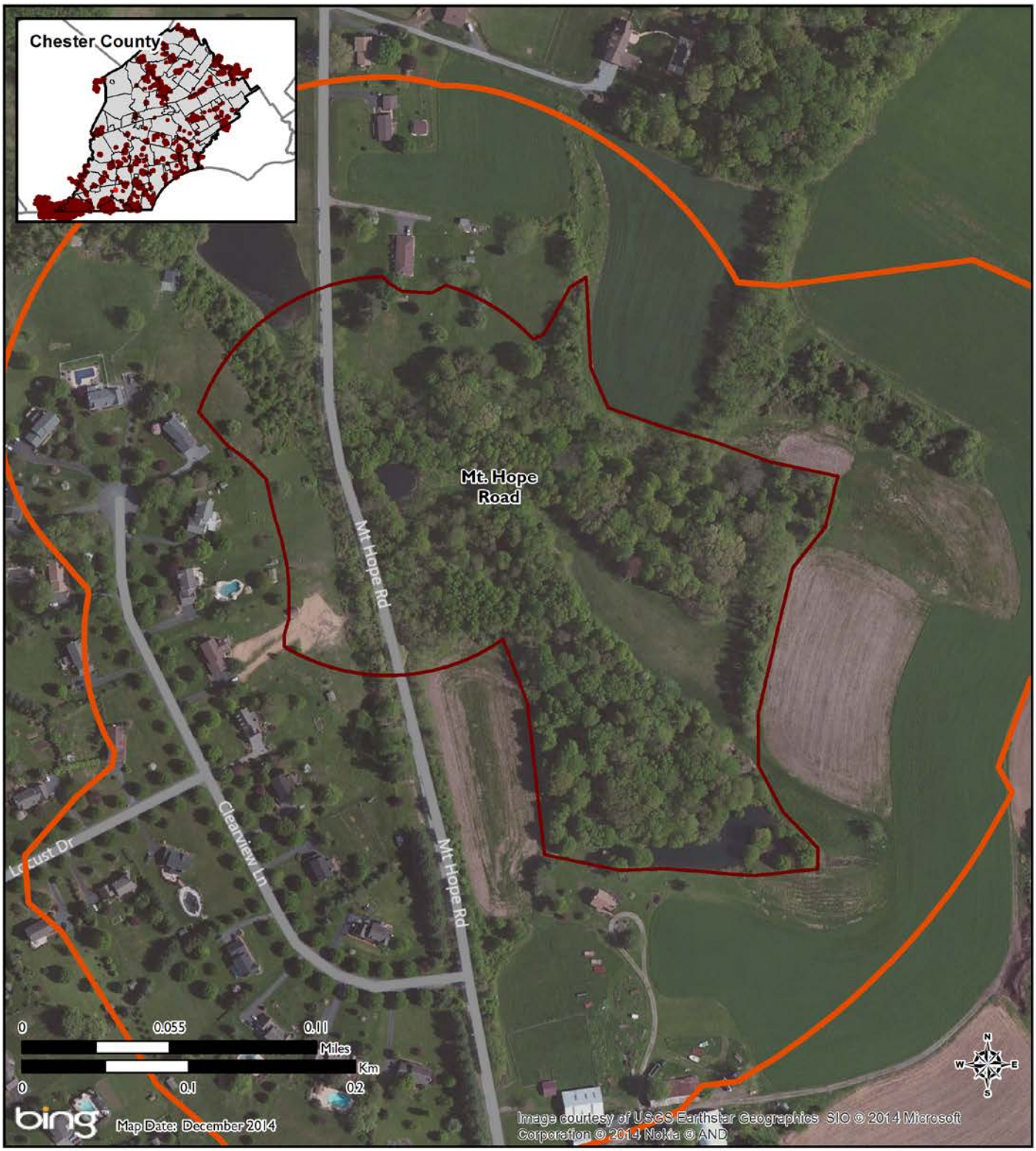
Avoid further fragmentation of the habitat and maintain the current hydrologic conditions in order to protect the existing habitat structure.

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

- Protect the existing wooded areas from logging and other large scale disturbance. Keep the forest as intact as possible to protect the habitat and species within it.
- Maintain the existing hydrology. Any activities that occur along the roads should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.
- Widen the native vegetated buffer along the stream. A width of 100 meters is ideal, but any increase will benefit the stream and adjacent wetlands.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.

Location

Municipalities: *New London Township*
USGS quads: *Oxford*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Mt. Hope Road
Natural Heritage Area

Open, disturbed forest habitat at this site supports a population of Pennsylvania critically imperiled bushy aster.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

Myrick Conservation Center NHA

PNHP Significance Rank: *State*

Site Description

The Brandywine Valley Association owns H.E. Myrick Conservation Center. This property is a mix of woodland, wetland, and meadow habitats, as well as agricultural fields. The Myrick Conservation Center NHA is delineated around a portion of the wooded habitat. Route 842 runs through the NHA and a small tributary to West Branch Brandywine Creek flows through the property. The wooded habitat is dominated by tulip poplar, beech, and oak. This habitat supports a population of **puttyroot**, a plant species of concern, as well as a sensitive species of concern, not named 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]
Puttyroot (*Aplectrum hyemale*)		G5	S3	PR (PR)	11/28/2002	BC
Sensitive species of concern A[3]	**S**	---	---	---	3/24/2002	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.

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

In Pennsylvania, puttyroot is most commonly found in the southeastern counties and grows in moist woodlands and on forested slopes and stream banks. Puttyroot produces leaves that are visible through the fall and winter. The leaves wither in late spring, and the plant flowers in May and June.

Threats and Stresses

Fragmentation and other disturbance within the NHA will break up the habitat and alter habitat structure and species composition. Recreation may disturb the wooded habitat with trails that may cause erosion and contribute to the spread of invasive species.

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

- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Logging will further fragment the existing forest and alter the conditions of the habitat needed by the species of concern.
- Trails and other recreation may cause erosion and create openings for the spread of invasive species.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

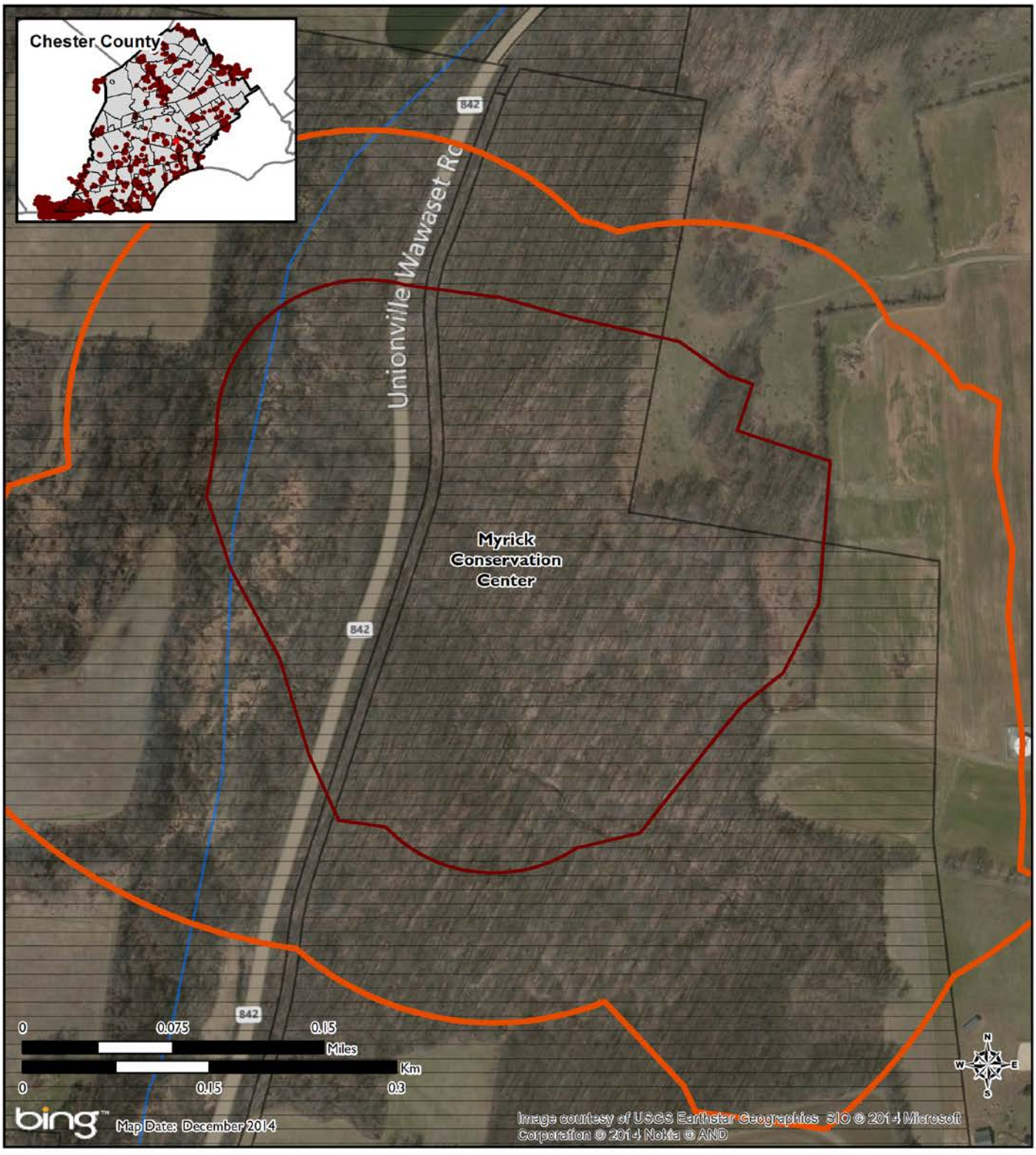
The Brandywine Valley Association owns the property where this NHA is located. This will protect the wooded habitat from large disturbances. Avoid further fragmentation of the woods with additional roads and trails. Maintain recreational areas to minimize disturbance to the natural habitat.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Protect the existing forested areas from logging. Avoid fragmenting the habitat with roads, houses, or other disturbances in order to preserve habitat for as many species as possible.
- Maintain the existing trails to prevent erosion and minimize the creation of new trails that will cause additional disturbance.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Pocopson Township*
USGS quads: *Unionville*
Previous CNHI reference: *Myrick Forest*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Valley Association Property*



Myrick Conservation Center Natural Heritage Area

This forested site supports a population of the state rare plant, puttyroot, and a sensitive species of concern.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Nantmeal Powerline NHA

PNHP Significance Rank: *State*

Site Description

Nantmeal Powerline NHA is open habitat that is maintained as part of the right-of-way. Wooded habitat and agricultural fields surround the NHA. Wet and dry early successional habitats occur in the maintained grassy openings in the powerline right-of-way. The wet habitat supports a small population of **grass-leaved rush**, a plant 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]
Grass-leaved Rush (*Juncus biflorus*)	G5	S2	TU (PT)	9/19/1993	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.

Grass-leaved rush has been documented from Massachusetts west to Michigan and south to Florida and Arizona. This species is found in open wet habitats throughout the state, but most populations occur in the southeastern counties.

Threats and Stresses

Herbicides used to manage the right-of-way will cause mortality and may alter species composition. Succession of woody species can shade out early successional species, but excessive mowing may also have a negative impact on native species. Invasive species are found throughout this site and may spread to crowd out native species that currently exist in this NHA.

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

- Invasive species are common throughout this NHA and may displace native vegetation, including species of concern.
- Succession within the right-of-way may cause the area used by grass-leaved rush to become overgrown and shaded by woody species.
- Herbicides sprayed on the powerline right-of-way may cause direct mortality to grass-leaved rush and other native species.
- Changes in the currently hydrology could significantly alter the habitat for the plant species of concern by making conditions either too wet or too dry to be able to persist at this site.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

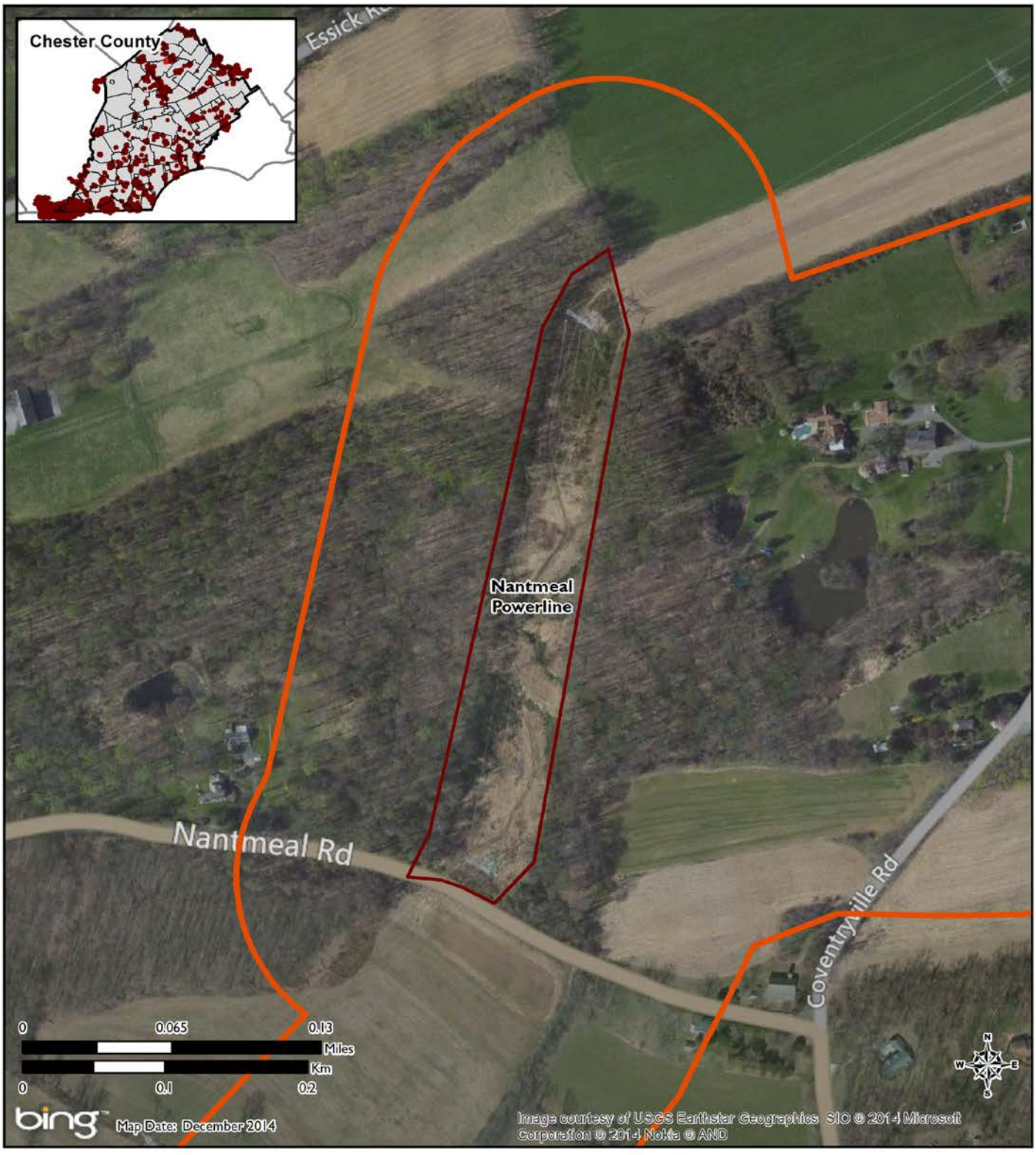
Occasional disturbance will likely be necessary to maintain the habitat conditions and prevent the succession of woody species. Maintenance should be done outside of the growing season with minimal herbicide use to limit impact to native species.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Grass-leaved rush requires open habitat that needs to be maintained with mowing or other methods of disturbance. The needs of this species should be considered when planning the timing and frequency of maintenance.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Maintain the existing hydrology. Any activities that occur along the right-of-way should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *East Nantmeal Township*
USGS quads: *Pottstown*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Nantmeal Powerline Natural Heritage Area

Wetland habitat in this powerline corridor supports a population of grass-leaved rush, an imperiled 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***

New Garden Airfield - North NHA

PNHP Significance Rank: *State*

Site Description

New Garden Airfield – North NHA is made up of the early successional habitat around the buildings and runways of the airport near Toughkenamon. Agricultural fields and woodlots surround the habitats within this NHA. These fields are maintained to prevent succession, which preserves the habitat for a number of early successional species. **Elliot's beardgrass**, **grass-leaved rush**, **Nuttail's tick-trefoil**, and **St. Andrew's-cross** are all plant species of concern found in this open habitat.

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]
Elliott's Beardgrass (*Andropogon gyrans*)		G5	S3	N (PR)	4/18/2006	BC
Nuttalls' Tick-trefoil (*Desmodium nuttallii*)		G5	S2	TU (PT)	9/4/2006	B
St Andrew's-cross (*Hypericum stragulum*)		G4	S2	N (PT)	8/13/2006	C
Grass-leaved Rush (*Juncus biflorus*)		G5	S2	TU (PT)	6/24/2006	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.

Elliot's beardgrass is at the northern edge of its range in Pennsylvania and has only been documented in a few southeastern counties. It spans from New Jersey to Illinois, south from Texas to Florida. This species needs open, early successional habitat in order to persist.

Grass-leaved rush has been documented from Massachusetts west to Michigan and south to Florida and Arizona. This species is found in open wet habitats throughout the state, but most populations occur in the southeastern counties.

Nuttall's tick-trefoil is at the northern edge of its range in Pennsylvania. It is found from New Jersey west to Illinois and south to Florida and Texas. It has been documented mostly in the southeastern corner of the state. This species is found on dry, open hillsides, utility right-of-ways and other open habitats.

St. Andrew's-cross is near the northern edge of its range in Pennsylvania. This species occurs from New York and Massachusetts south into Georgia and west to Kansas and Texas. It is common in the southern portions of its range. In Pennsylvania it has been documented in several southern counties, most commonly in the southeast. It is found in a number of dry, open habitat types.

Threats and Stresses

Succession of woody species can shade out early successional species, but excessive mowing may also have a negative impact on native species. Invasive species are found throughout this site and may spread to crowd out native species that currently exist in this NHA. Herbicides sprayed on the airfields and surrounds fields and roads may cause mortality to native species.

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

- Invasive species are common throughout this NHA and may displace native vegetation, including species of concern.
- Succession of the open, grassy habitat may cause the area used by species of concern to become overgrown and shaded by woody species.
- Herbicides sprayed on the fields may cause direct mortality to the species of concern and other native species.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

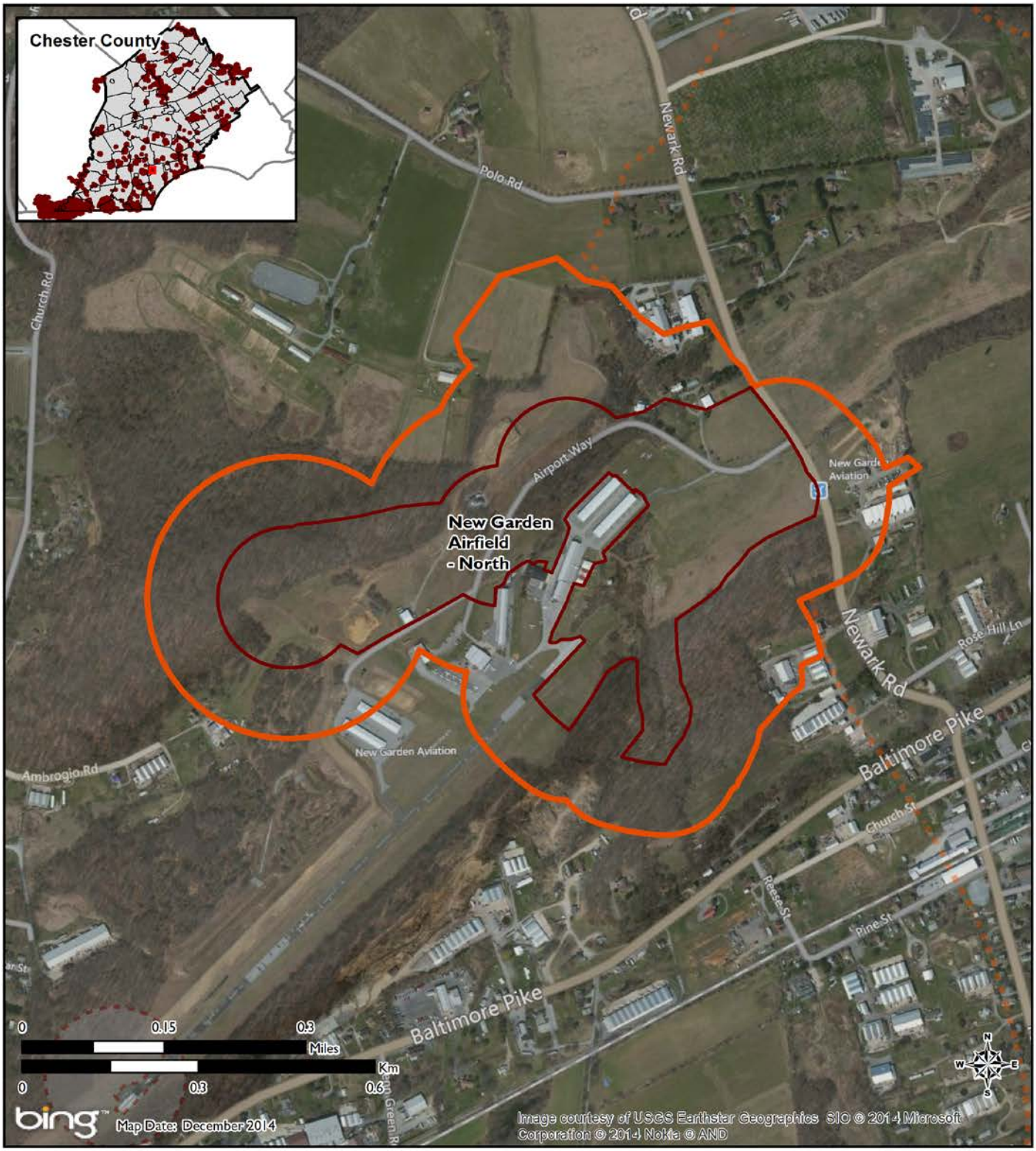
Occasional disturbance will likely be necessary to maintain the habitat conditions and prevent the succession of woody species. Maintenance should be done outside of the growing season with minimal herbicide use to limit impact to native species.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- The species of concern found at this NHA require open habitat that needs to be maintained with mowing or other methods of disturbance. The needs of these species should be considered when planning the timing and frequency of maintenance.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *New Garden Township*
USGS quads: *West Grove*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



New Garden Airfield - North Natural Heritage Area

Disturbed areas of open, upland habitat support populations of 4 plant 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***

New Garden Airfield NHA

PNHP Significance Rank: *State*

Site Description

New Garden Airfield NHA is located near Avondale in the early successional area along the runway. This area is mowed to allow visibility along the runway, which maintains the open grassy habitat. A narrow forested strip surrounds the open habitat with industrial development from the airport and residential developments nearby. The grassy mowed habitat supports a population of **smooth tick-trefoil**, a plant 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]
Smooth Tick-trefoil (*Desmodium laevigatum*)	G5	S1	N (PE)	8/13/2006	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.

Smooth tick-trefoil is found from New York west to Illinois and south to Florida and Texas. In Pennsylvania, it is classified as critically imperiled and has been documented primarily in the eastern and southeastern areas of the state. Smooth tick-trefoil is found in open habitats, including edge habitats and dry open woods. This species often needs management to maintain the open habitat conditions needed.

Threats and Stresses

The habitat within New Garden Airfield NHA will be altered if woody species are allowed to become established, but excessive or ill-timed maintenance will negatively impact native species. Herbicides used to control woody species may also cause mortality to native species.

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

- Succession that is not controlled by mowing or other methods of disturbance will likely cause the habitat to become unsuitable for the species of concern to be able to persist at this site.
- Herbicide and fertilizer use in fields and along roads may wash into the field and degrade the habitat conditions.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Invasive species can take over portions of the habitat currently used by the species of concern and other native species.

Conservation Recommendations

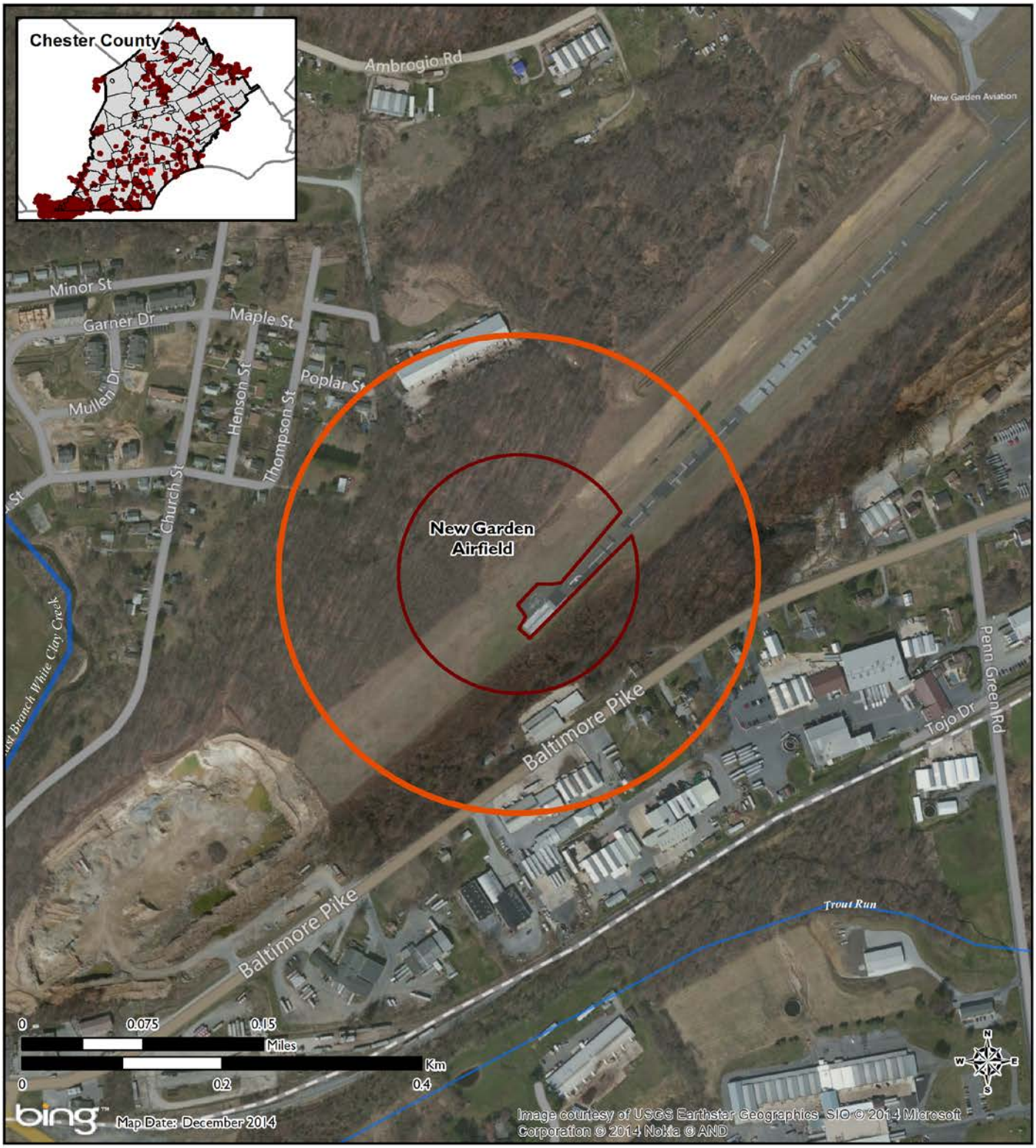
Periodic maintenance, such as mowing, is needed to preserve the existing habitat conditions. Maintenance should be done outside of the growing season to allow native species to complete their life cycle. Use manual disturbance to reduce the limit the need for herbicide application.

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

- Smooth tick-trefoil requires open habitat that needs to be maintained. The needs of this species should be considered when planning the timing and frequency of maintenance.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.

Location

Municipalities: *New Garden Township*
USGS quads: *West Grove*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



New Garden Airfield Natural Heritage Area

Open grassy habitats support a population of smooth tick-trefoil, a plant species of concern which is critically imperiled in Pennsylvania.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

North Valley Hills NHA

PNHP Significance Rank: *State*

Site Description

North Valley Hills NHA is a patch of wooded habitat north of Exton that is bordered by residential development to the north and agricultural fields to the south. A utility right-of-way cuts through the middle of this site. The wooded habitat is dominated by oaks and is situated along a steep, south-facing slope. This area provides habitat for **southern red oak**, a tree species of concern. The right-of-way is managed to maintain early successional habitat. This opening supports a population of **stagger-bush**, a plant 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]
Stagger-bush (*Lyonia mariana*)		G5	S1	PE (PE)	6/27/1993	D
Southern Red Oak (*Quercus falcata*)		G5	S1	PE (PE)	3/25/1997	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.

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

As its name suggests, southern red oak is more common throughout the southern portion of its range, which stretches from New York south and west into Florida and Texas. In Pennsylvania, it is found in a few southeastern counties. Due to the small range in the state, it has been classified as endangered. Southern red oak is found in dry wooded habitats. Populations are threatened by habitat loss, invasive species, and deer browse.

Stagger-bush is most commonly found along the Atlantic Coast and has also been documented in the southern United States as well. In Pennsylvania, this species is listed as endangered due to the limited range in several southeastern counties. Stagger-bush is often found in swamps and forests on sandy soils.

Threats and Stresses

Further fragmentation of this habitat will impact the structure and species composition. Increasing the edge habitat will create more openings that may allow invasive species to become established. The steepness of the slope in this area should limit development, but logging is still a threat in this area.

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

- Logging, development, or other major activities can further fragment the existing forest and alter the conditions of the habitat needed by the species of concern. Disturbances will also open areas that may be easily colonized by invasive species. Logging may also directly remove southern red oak individuals that are found here.
- Invasive species can take over portions of the habitat currently used by the species of concern and other native species.
- Herbicides sprayed on the right-of-way may cause direct mortality to the species of concern and other native species. Herbicides and fertilizers from within the NHA and surrounding lawns, fields, and roads may also wash into the wooded areas and degrade habitat conditions.

- Growth of woody species in the early successional habitat along the right-of-way may cause the area used by stagger-bush to become overgrown and shaded.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

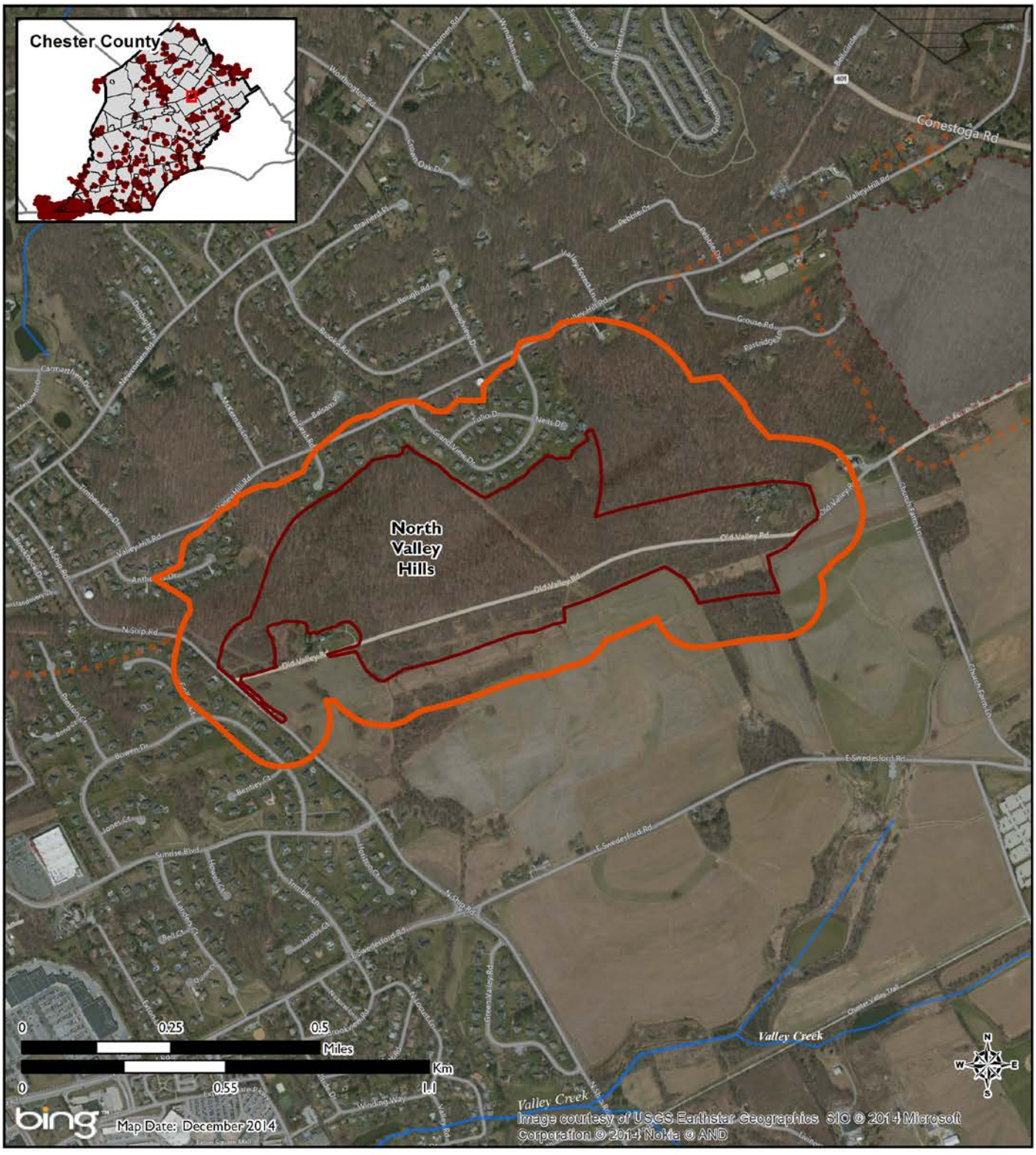
Avoid loggingthe wooded habitat, or perform other activities that will fragment the remaining habitat. Continue to periodically mow along the right-of-way to maintain the early successional conditions.

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

- Protect the existing forested areas from logging and other large scale disturbance. Keep the forest as intact as possible to protect the habitat and species within it.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Stagger-bush requires open habitat that needs to be maintained with mowing or other methods of disturbance. The needs of this species should be considered when planning the timing and frequency of maintenance.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *West Whiteland Township*
USGS quads: *Malvern*
Previous CNHI reference: *North Valley Hills*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



North Valley Hills Natural Heritage Area

Two plant species of concern, stagger-bush and Southern red oak, have populations in the upland forest at this site.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Northbrook Serpentine Meadow NHA

PNHP Significance Rank: *Global*

Site Description

A small serpentine bedrock influenced herbaceous opening occurs within the context of active agriculture, scattered woodlots and expanding suburban development. This is one of the smaller serpentine habitats that make an ecologically unique system occurring in scattered, mostly small patches. The serpentine habitats are often referred to as grasslands, and these herbaceous openings can have a strong representation of warm season grasses and grass-like plants, but they often also contain a good diversity of other plant species, many uncommon at the state and global levels.

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]
Elliott's Beardgrass (*Andropogon gyrans*)		G5	S3	N (PR)	2003	B
Arrow-feathered Three-awn (*Aristida purpurascens*)		G5	S2	PT (PT)	9/26/2002	B
Heller's Witchgrass (*Dichanthelium oligosanthes*)		G5	S3	N (PT)	6/25/2002	B
Plain Ragwort (*Packera anonyma*)		G5	S2	PR (PR)	6/24/2002	B
Few Flowered Nutrush (*Scleria pauciflora*)		G5	S2	PT (PT)	6/24/2002	B
Spring Ladies'-tresses (*Spiranthes vernalis*)		G5	S1	PE (PE)	7/14/2002	B
Serpentine Aster (*Symphyotrichum depauperatum*)		G2	S2	PT (PT)	10/3/2002	B
Sensitive species of concern A[3]	S	---	---	---	6/25/2002	CD

[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.

The plant species of concern found within this Natural Heritage Area are associated with the serpentine influenced herbaceous opening and the adjacent thin woodlands. In the past, natural disturbance, such as wildfires, or grazing by large mammals, would have helped to keep this area in an open condition. Without active management, the open grassy area will gradually close due to natural succession. In this agricultural / residential setting, typical periodic mowing likely has helped to preserve the open aspect preferred by the species of concern.

John Kunsman (PNHP)

Serpentine Aster (*Symphyotrichum depauperatum*)

Serpentine aster is a species of plant that deserves special mention based on its potential for global extinction due to its extremely limited global population. This species is predominantly known to occur in the eastern serpentine barrens of Pennsylvania and Maryland, with a few far flung outliers in Virginia and North Carolina (Gustafson 2005; Kartesz 2013). This extremely limited distribution has given this species the status of G2 – globally imperiled. Serpentine aster is found in the more open areas of serpentine barrens, suggesting that fire

or other active management may be needed to remove woody overgrowth and maintain this preferred habitat.

Threats and Stresses

Reviews of aerial photos taken in 1937 show this area as dominated by active agriculture with part of this area being used as an active orchard. The other portion was likely used as pasture, which would have been a suitable habitat for the plant species of concern. Some of the farms in the area have since been replaced by residential development, though the dry, grassy yards appear to have offered the plant species of concern some refuge.


Rocky Gleason (PNHP)

Few Flowered Nutrush
(*Scleria pauciflora*)

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

- Houses and their associated infrastructure have eliminated some of the suitable habitat for the species of concern at this location.
- Efforts to replace the dry, grassy opening with other landscaping would likely eliminate the habitat for the plant species of concern.
- Invasive species of plants can displace native species of plants.
- Over browsing by white-tailed deer is a serious threat to the overall plant diversity.

Conservation Recommendations

These serpentine habitats occur in isolated patches as the bedrock material, serpentinite, is exposed at the surface of the ground in a scattered fashion much like an archipelago chain of islands. Each habitat has a slightly different species composition, largely due to the slightly different environmental conditions found at each distinct location. A long range goal for these isolated habitats is to recognize them as a single system and plan for their ecological needs.

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

- Educate the adjacent landowners on the significance of the globally rare habitat and the need for ongoing management activities. The serpentine influenced plant species are considered quite rare in the state and could be cultivated at this location as part of the residential landscape. Maintain the dry, herbaceous openings, fostering the populations of serpentine influenced plants by removing their more common competitors. This is a relatively unique assortment of plants and there will be very few other landscapes with this assortment of species.
- Suppress the spread of invasive species of plants to prevent native species from being crowded out of the habitat. Removal of invasive plants in the immediately vicinity of the species of concern can help these populations compete for space against much more aggressive species. Invasive species management should be coordinated by individuals familiar with the rare species as well as the invasive species present. Continual invasive species monitoring and control will be necessary.
- Reduce deer herd density to suitable levels to prevent overbrowsing of sensitive species.

Location

Municipalities: *Pocopson Township*
USGS quads: *Unionville*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*

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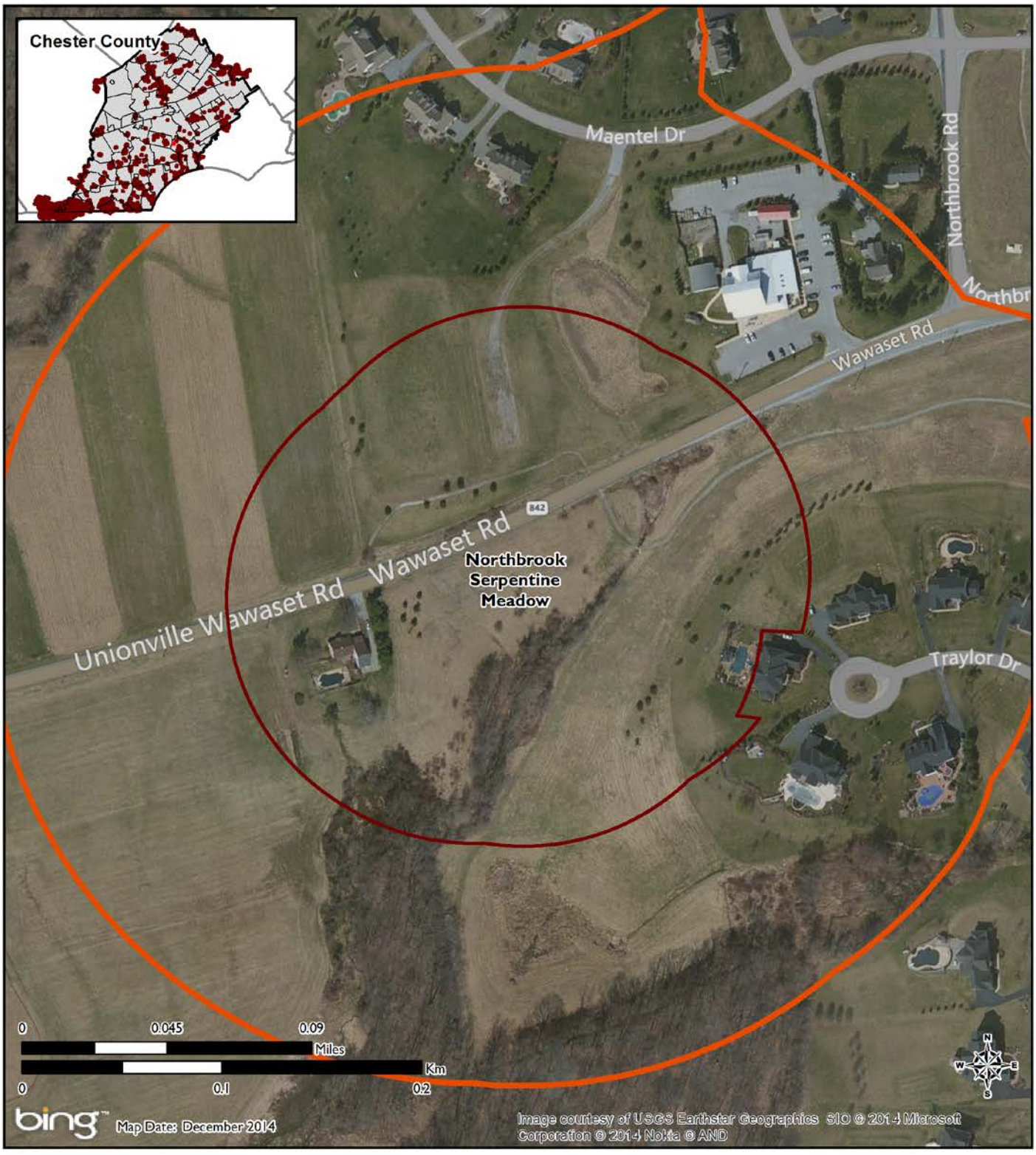


Northbrook Serpentine Meadow Natural Heritage Area

A serpentine meadow supports populations of 7 plant species of concern and a sensitive species of concern.

Significance Rank:
GLOBAL

PNHP
Pennsylvania Natural Heritage Program

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

Norway Road West NHA

PNHP Significance Rank: *State*

Site Description

The majority of Norway Road West NHA is a patch of forested habitat near Burnt Mills that is approximately 100 acres in size. The northeastern corner of the NHA also has early successional roadside habitat. Residential developments and agricultural fields surround most of this site. A small tributary to East Branch Red Clay Creek flows along the northern end of the NHA. The forested habitat is dominated by tulip popular with some areas that also have beech and oak as a main part of the canopy. This forested portion of this NHA supports a small population of **puttyroot**, a plant species of concern. The early successional area along Norway Road has grassy meadows with some lawn habitat. The open roadside provides habitat for **Elliot's beardgrass**, a plant 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]
Elliott's Beardgrass (*Andropogon gyrans*)		G5	S3	N (PR)	1/13/2001	B
Puttyroot (*Aplectrum hyemale*)		G5	S3	PR (PR)	3/14/2010	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.

Elliot's beardgrass is at the northern edge of its range in Pennsylvania and has only been documented in a few southeastern counties. It spans from New Jersey to Illinois, south from Texas to Florida. This species needs open, early successional habitat in order to persist.

In Pennsylvania, puttyroot is most commonly found in the southeastern counties and grows in moist woodlands and on forested slopes and stream banks. Puttyroot produces leaves that are visible through the fall and winter. The leaves wither in late spring, and the plant flowers in May and June.

Threats and Stresses

Logging and development would fragment the existing patch of forested habitat. Disturbances along edges and interior habitat would make openings to allow invasive species to spread quickly through the site. Invasives are already prevalent throughout much of this area. The high deer density is another major threat to the habitat. Deer browse is heavy in most of this NHA and impacts many native species and the overall structure of the habitat.

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

- Invasive species are common in many areas of this site and may displace native vegetation, including species of concern.
- Logging will further fragment the existing forest and alter the conditions of the habitat needed by the species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Succession of the open grassy fields may cause the habitat used by Elliot's beardgrass to become overgrown and shaded by woody species.

- Herbicides, fertilizers, and sediment from lawns and roadways may wash into the forested area and degrade the habitat conditions.

Conservation Recommendations

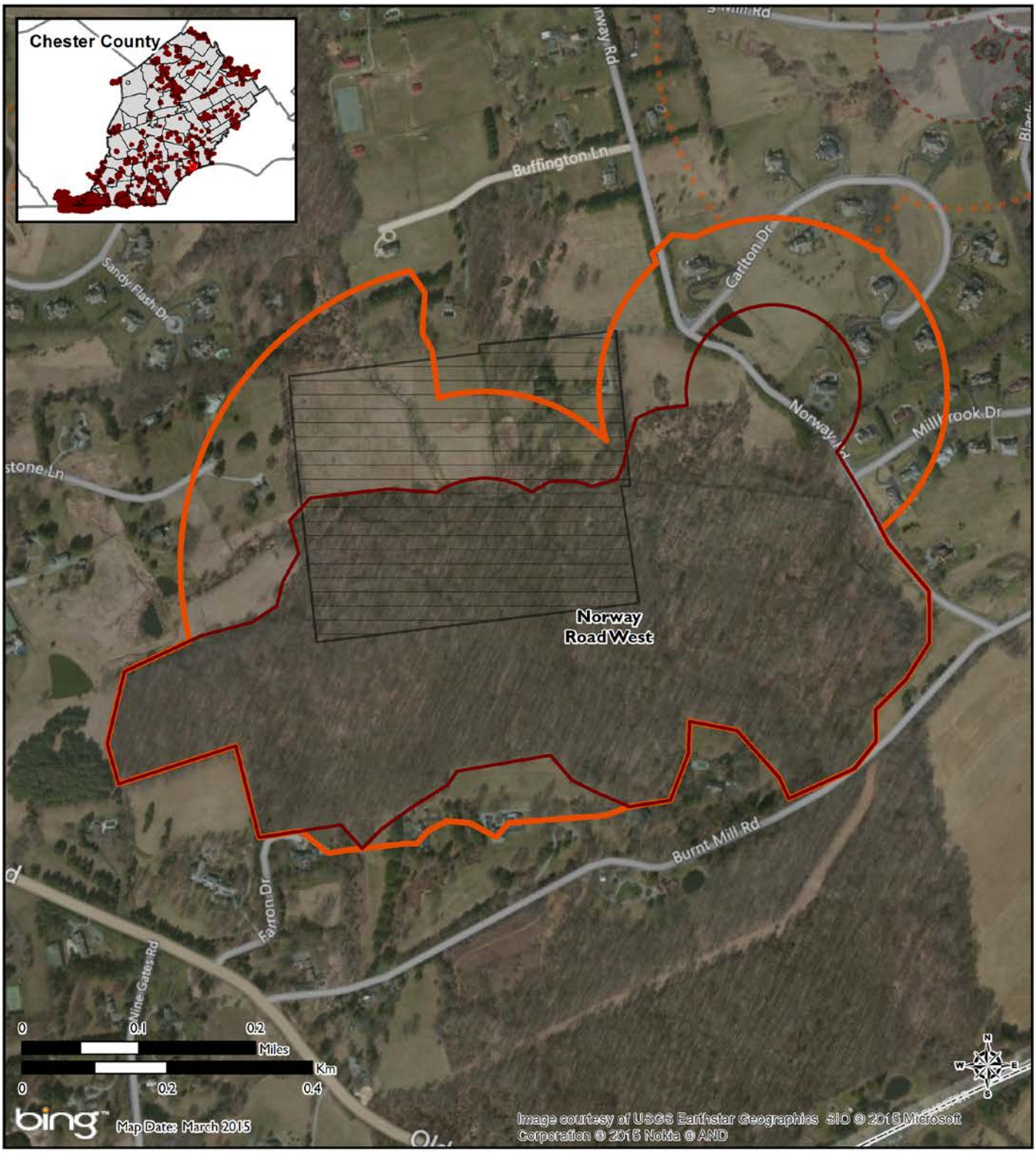
A portion of this NHA is covered under a conservation easement, but most is privately owned with no formal protection. Avoid fragmenting the existing habitat or loging the remaining forest. Discourage development of additional areas in the forested or early successional habitats. Attempt to remove invasive species and limit the introduction of new invasives. Reduce the size of the deer herd within this NHA and surrounding areas.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Protect the existing forested areas from logging. Avoid further fragmentation of the habitat with roads, houses, or other disturbances in order to preserve habitat for as many species as possible.
- Reduce the deer population, then continue to monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Remove woody species and maintain the grassy habitat openings for Elliot's beardgrass and other early successional species. Perform periodic maintenance, such as mowing, to prevent woody species from taking over the area.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.

Location

Municipalities: *Kennett Township*
USGS quads: *Kennett Square*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Easement*



Norway Road West
Natural Heritage Area

Forests and early succesional habitat at this site support popuations of puttyroot and Elliott's beardgrass.

Significance Rank:
STATE

Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Nottingham Serpentine Barrens NHA

PNHP Significance Rank: *Global*

Juniper Hairstreak (*Callophrys gryneus*)

Andrew Strassman (PNHP)

Site Description

This large Natural Heritage Area at the Pennsylvania / Maryland border contains a globally rare serpentine habitat in a mosaic of the characteristic serpentine barren plant communities, which include open gravel areas, grassy meadows, and conifer and deciduous dominated woodland habitats in various stages of natural succession. Nottingham Serpentine Barrens is one of several serpentine habitats that make up the State Line Serpentine Barrens, an ecologically unique system occurring in scattered, mostly small patches along this part of the PA/MD border. The serpentine habitats are often referred to as grasslands, and the scattered herbaceous openings can have a strong representation of warm season grasses and grass-like plants, but they also contain a good diversity of other plant species, many rare at the state and global levels. Nottingham Serpentine Barrens is currently known to support 38 animal species of concern, most of which are butterflies & moths that feed on the unique variety of plants present, 29 plant species of concern, and an additional six sensitive species of concern. The serpentine community itself is considered globally uncommon due to the limited occurrences of this habitat type around the world.

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]
Summer Tanager (*Piranga rubra*)		G5	S3B	N (CA)	5/30/2004	E
Serpentine grassland	C	GNR	S1	N (N)	2005	A
Serpentine pitch pine - oak forest	C	GNR	S1	N (N)	2005	--
Common Roadside Skipper (*Amblyscirtes vialis*)		G4	S2	N (N)	6/2/1995	E
Falcate Orangetip (*Anthocharis midea*)		G4G5	S3	N (N)	5/14/1997	E
Dusted Skipper (*Atrytonopsis hianna*)		G4G5	S2	N (N)	5/14/1997	C
Juniper Hairstreak (*Callophrys gryneus*)		G5	S3	N (N)	5/14/1997	CD
Leonard's Skipper (*Hesperia leonardus*)		G4	S3	N (N)	9/19/1996	E
Cobweb Skipper (*Hesperia metea*)		G4	S2	N (N)	5/14/1997	B
Spiny Oakworm Moth (*Anisota stigma*)		G5	S1S2	N (N)	7/16/2004	C
A Geometrid Moth (*Apodrepanulatrix liberaria*)		G3	S1S3	N (N)	10/13/2001	CD
Dot-lined White Moth (*Artace cribraria*)		G5	S1	N (N)	7/1/2000	E
Southern Pine Looper Moth (*Caripeta aretaria*)		G4	S1S2	N (N)	8/26/2000	E
An Underwing Moth (*Catocala umbrosa*)		G5	S1	N (N)	7/23/1998	C
Packard's Lichen Moth (*Cisthene packardii*)		G5	S1S3	N (N)	8/27/2004	C
Lead-colored Lichen Moth (*Cisthene plumbea*)		G5	S1	N (N)	8/27/2004	E
Regal Moth (*Citheronia regalis*)		G4G5	SU	N (N)	7/16/2004	E
Pure Lichen Moth (*Crambidia pura*)		G4	SU	N (N)	8/27/2004	E

Species or Natural Community Name		PNHP Rank[1] Global	State	PA Legal Status[1]	Last Seen	Quality[2]
A Noctuid Moth (*Elaphria cornutinis*)		G5	SU	N (N)	7/16/2004	E
Broad-lined Erastria Moth (*Erastria coloraria*)		G3G4	S1	N (N)	6/22/2002	CD
Barrens Buckmoth (*Hemileuca maia*)		G5	S1S2	N (N)	5/14/1997	C
Joyful Holomelina Moth (*Holomelina laeta*)		G4	S1S2	N (N)	8/27/2004	C
Esther Moth (*Hypagyrtis esther*)		G5	S2S3	N (N)	8/8/1996	C
A Wave Moth (*Idaea violacearia*)		G4	S1	N (N)	10/13/2001	B
Black-waved Flannel Moth (*Lagoa crispata*)		G5	S1	N (N)	6/12/2004	C
An Owlet Moth (*Macrochilo hypocritalis*)		G4	SU	N (N)	7/23/1998	E
Footpath Sallow Moth (*Metaxaglaea semitaria*)		G5	S2	N (N)	9/30/2000	E
A Borer Moth (*Papaipema marginidens*)		G4	SU	N (N)	9/13/1996	E
A Noctuid Moth (*Parahypenodes quadralis*)		G4	SU	N (N)	8/31/1998	E
A Noctuid Moth (*Renia* sp. 1 nr. *discoloralis*)		G4	S1?	N (N)	8/26/2000	C
A Noctuid Moth (*Richia acclivis*)		G4G5	S1S2	N (N)	8/26/2000	E
A Noctuid Moth (*Sutyna privata teltowa*)		G5T4	S1	N (N)	9/15/2001	C
Tolype Moth (*Tolype notialis*)		G4G5	S1	N (N)	7/16/2004	C
Southern Variable Dart Moth (*Xestia elimata*)		G5	S2S3	N (N)	8/27/2004	C
A Zale Moth (*Zale curema*)		G3G4	S1	N (N)	5/14/1997	C
Oblique Zale Moth (*Zale obliqua*)		G5	S1	N (N)	7/2/1998	C
A Noctuid Moth (*Zale squamularis*)		G4	S2S3	N (N)	7/16/2004	C
A Zale Moth (*Zale submediana*)		G4	S2	N (N)	5/14/1997	C
Pine Barrens Zanclognatha (*Zanclognatha martha*)		G4	S1S2	N (N)	8/27/2004	C
Blue Corporal (*Ladona deplanata*)		G5	S1	N (N)	5/7/2008	E
Small White-snakeroot (*Ageratina aromatica*)		G5	S3	N (PR)	9/25/2008	B
Arrow-feathered Three-awn (Aristida purpurascens)		G5	S2	PT (PT)	10/15/2008	B
Mead's Sedge (*Carex meadii*)		G4G5	S1	TU (PE)	8/26/1997	BC
Richardson's Sedge (*Carex richardsonii*)		G5	S1	N (PE)	5/3/2005	BC
Field Chickweed *(Cerastium velutinum var. velutinum)*		G5T4?	S3	N (SP)	5/4/2011	E
Fringe-tree (*Chionanthus virginicus*)		G5	S3	N (PT)	10/15/2008	BC
Horrible Thistle (*Cirsium horridulum*)		G5	S1	PE (PE)	6/3/2007	D
Field Dodder (*Cuscuta pentagona*)		G5	S2	N (PT)	10/9/2008	C
Tufted Hairgrass (*Deschampsia cespitosa*)		G5	S3	N (PT)	6/2/2010	B
Serpentine Panic-grass (*Dichanthelium annulum*)		GNR	S2	TU (PT)	9/25/2008	B
Heller's Witchgrass (*Dichanthelium oligosanthes*)		G5	S3	N (PT)	9/25/2008	BC
A Eupatorium (*Eupatorium rotundifolium*)		G5	S3	TU (TU)	10/9/2008	B
Cluster Fescue (*Festuca paradoxa*)		G5	S1	PE (PE)	7/10/2007	D
Annual Fimbry (*Fimbristylis annua*)		G5	S2	PT (PT)	10/15/2008	A
St Andrew's-cross (*Hypericum stragulum*)		G4	S2	N (PT)	7/30/2008	B
American Holly (*Ilex opaca*)		G5	S2	PT (PT)	9/21/1996	B
Sandplain Wild Flax (*Linum intercursum*)		G4	S1	PE (PE)	8/10/1997	AB
Stagger-bush (*Lyonia mariana*)		G5	S1	PE (PE)	6/16/1993	D
Umbrella Magnolia (*Magnolia tripetala*)		G5	S2	PT (PR)	8/15/1990	C
Plain Ragwort (*Packera anonyma*)		G5	S2	PR (PR)	9/25/2008	B

Species or Natural Community Name		PNHP Rank[1] Global	State	PA Legal Status[1]	Last Seen	Quality[2]
Southern Red Oak (*Quercus falcata*)		G5	S1	PE (PE)	10/15/2008	C
Sand Blackberry (*Rubus cuneifolius*)		G5	S1	TU (PE)	6/3/2007	D
Few Flowered Nutrush (*Scleria pauciflora*)		G5	S2	PT (PT)	9/21/1996	B
Narrow-leaved White-topped Aster (*Sericocarpus linifolius*)		G5	S1	PE (PE)	7/21/1990	C
Spring Ladies'-tresses (*Spiranthes vernalis*)		G5	S1	PE (PE)	7/23/1989	B
Prairie Dropseed (*Sporobolus heterolepis*)		G5	S1	PE (PE)	9/25/2008	C
Wild Bean (*Strophostyles umbellata*)		G5	S2	N (PE)	7/23/1996	E
Serpentine Aster (*Symphyotrichum depauperatum*)		G2	S2	PT (PT)	9/25/2008	A
Bushy Aster (*Symphyotrichum dumosum*)		G5	S1	TU (PE)	9/24/1996	D
Sensitive species of concern A[3]	S	---	---	---	5/14/1997	D
Sensitive species of concern B[3]	S	---	---	---	9/22/1996	D
Sensitive species of concern C[3]	S	---	---	---	5/20/2009	B
Sensitive species of concern D[3]	S	---	---	---	4/15/2013	B
Sensitive species of concern E[3]	S	---	---	---	6/13/2011	A
Sensitive species of concern F[3]	S	---	---	---	6/23/2007	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.

Many of the butterfly and moth species (Lepidoptera) documented at this location are limited in distribution in Pennsylvania to serpentine and other grassland habitats, which are often set in a matrix of open oak and pine woodlands. Conservation of these species requires protection of the habitat they use during all stages of their life cycles. Maintaining a mosaic of grassland, oak, and pine areas at serpentine barrens sites and the surrounding area will create a diverse and healthy habitat capable of supporting the rare Lepidoptera listed above. Creation of corridors between barrens sites could also encourage movement of species between sites and help create more secure populations. Pesticide application, especially for the control of gypsy moths, can have a devastating effect on populations of Lepidoptera species of concern and should not be used in this area.

John Kunsman (PNHP)

Serpentine Aster (*Symphyotrichum depauperatum*)

Most of the plant species of concern found within this Natural Heritage Area are found primarily within the strongly serpentine influenced small herbaceous openings or within the adjacent thin woodlands. Among these include small white-snakeroot , arrow-feathered three-awn, Mead's sedge, Richardson's sedge, field chickweed, tufted hairgrass, serpentine panic-grass, Heller's witchgrass, cluster fescue, annual fimbry, St. Andrews cross, sandplain wild flax, plain ragwort, sand blackberry, few-flowered nutrush, prairie dropseed and a serpentine aster. In the past, natural disturbance, such as wild fires, would have helped to keep these areas in an open condition. With the relatively recent suppression of fire, the open areas have gradually closed due to natural succession. An active restoration effort to restore the serpentine openings will be necessary to ensure the continued existence of these habitats and the species they contain. Other plants within this area are not

specifically adapted to the open habitats, but are more closely associated with wooded and forested habitats. These include fringe-tree, American holly, stagger-bush, and southern red oak. Efforts to restore serpentine openings should take into account the presence of these species and avoid disturbing the habitat where they occur.

- Serpentine aster is a species of plant that deserves special mention based on its potential for global extinction due to its extremely limited global population. This species is predominantly known to occur in the eastern serpentine barrens of Pennsylvania and Maryland, with a few far flung outliers in Virginia and North Carolina (Gustafson 2005; Kartesz 2013). This extremely limited distribution has given this species the status of G2 – globally imperiled. Serpentine aster is found in the more open areas of serpentine barrens, suggesting that fire or other active management may be needed to remove woody overgrowth and maintain this preferred habitat.

Threats and Stresses

Historically, wildfires likely helped to maintain the open aspect of these habitats. Early accounts record the intentional setting of fire by Native Americans to help open areas for greater potential hunting success. Because of the past prevalence of intentional or accidental wildfires, this habitat was historically less dominated by woody trees and shrubs, but recent fire suppression has favored the expansion of wooded habitats at the expense of herbaceous openings. Invasion of serpentine herbaceous openings by woody trees and shrubs can influence the surrounding habitat. As woody vegetation encroaches on the openings, they tend to trap more organic debris and allow deeper soils to accumulate. As deeper soils occur on the site, they succeed to more common woodland and forest types. Fire disturbances had maintained these herbaceous openings in the past. In the absence of fire, active woody vegetation removal will be necessary to maintain these openings.

Joan King

Flowers of Stagger-bush (*Lyonia mariana*)

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

- The lack of natural fire disturbance poses one of the greatest threats to this habitat. In the absence of natural fire events, most of the open serpentine barrens habitats will gradually succeed to more common woody vegetation such as junipers, pines and oaks (along with a nearly impenetrable tangle of greenbrier). Active management to maintain herbaceous openings will be necessary in the absence of wildfire.
- Management activities can inadvertently damage the habitat of sensitive species of concern.
- Use of pesticides to control gypsy moths or other insect pests can pose a significant hazard to the insect species of concern at this location. Elimination of specific insect host plants can also eliminate insect species of concern.
- Aggressive invasive species of plants can displace native species.
- Overbrowsing by deer can have a severely negative impact on small populations of plant species of concern.

Conservation Recommendations

Much of the primary serpentine influenced habitat is owned by Chester County and managed as public park. There appears to be no specific formal management plan for Nottingham Serpentine Barrens, and the site would benefit from a thorough review of the site-specific goals and procedures for management

here. In the interim, general goals and actions could be gleaned from other serpentine management plans such as the Goat Hill Management Plan (Furedi 2008); Unionville Serpentine Barrens Restoration and Management Plan (Latham 2012); Pink Hill Serpentine Barrens Restoration and Management Plan (Latham 2008). Park staff along with an all-volunteer organization, the Friends of the State Line Serpentine Barrens, has been conducting habitat management on this site for many years to maintain the serpentine openings. These serpentine habitats occur in isolated patches along this section of the Pennsylvania / Maryland border as the bedrock material, serpentinite, is exposed at the surface of the ground in a scattered fashion much like an archipelago chain of islands. Each habitat has a slightly different species composition, largely due to the slightly different environmental conditions found at each distinct location. A long-range goal for these isolated habitats is to recognize them as a single system and plan for their ecological needs. The area between and around these habitats should be maintained to provide the necessary buffer to allow prescribed burns to maintain the mosaic of open habitat once a network of the woody species have been removed.

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

- The plants that characterize these habitats are adapted to the dry, nutrient poor soils and periodic fire events. A priority for the security of these globally rare habitats should be to establish protection for the core habitats as well as to provide for the landscape context in which natural process can be maintained.
- Active stewardship of these habitats is necessary. In the absence of natural fire disturbance, or active vegetation removal, these habitats will succeed into woodlands and forests, replacing the globally rare habitat with a more common type.

Prescribed fire is an excellent vegetation management tool for serpentine habitats.

- Habitat restoration activities should strive to establish a mosaic of habitat types to accommodate the variety of organisms and their diverse habitat preferences. While some of these plants will only thrive in the open on thin soils, or even bare bedrock conditions, others need the limited shelter of scattered trees or even the deep shade provided by a mature forest. Some of the insect species require conifers during part of their life cycle while others need deciduous trees or specific shrubs or wildflower host plants. There is no "one-size-fits-all" management recommendation for this habitat other than to provide for a mosaic of habitat diversity. "It's essential in restoring and maintaining disturbance-dependent ecosystems to vary the intensity and frequency of the disturbance in patchwork fashion, so that there is always a mosaic of patches of differing disturbance history. …the patchy landscape produced by random variation in disturbance history from one patch to another is essential to sustain the diversity of habitats and organisms that make up the total ecosystem." (Roger Latham, personal communication November 7th, 2014)
- Management activities should be coordinated with long-term habitat monitoring. "Analysis of desired conditions, inventory of existing conditions, and long-term monitoring of an array of key indicators is essential to know whether restoration and management efforts are accomplishing all of the goals or if some of the threatened or endangered species whose recovery is first and foremost among those goals might be inadvertently falling by the wayside." (Roger Latham, personal communication November 7th, 2014)
- Expand herbaceous openings as needed on convex landscapes by removing trees and other woody plants. Focus woody plant removal on areas of pines and junipers, which tend to

indicate drier, thinner soils. The establishment of hardwoods should be taken as an indicator of deeper, moister soils. Where deeper soils occur, soil organic matter reduction may be necessary to establish thin soils over serpentine bedrock. "Soil organic matter reduction has proven effective in restoring serpentine grassland vegetation where it has been fully displaced by forest succession, as long as intact grassland adjoins the treated area to serve as a seed source. SOM reduction consists of skimming the surface organic horizons from the soil profile using a backhoe or front-end loader and transporting the material offsite by dump truck. It is particularly effective in restoring serpentine grassland where it has been invaded by a dense thicket of common greenbrier (*Smilax rotundifolia*)." (Roger Latham, personal communication November 18th, 2014)

- Avoid unintentional destruction of species of concern. Management activities should be conducted with the site-specific knowledge of the presence of species of concern, so that management actions coincide with the habitat needs of the species of concern present. Regular park maintenance and mowing should be conducted by personnel informed on the specific locations of sensitive species of concern.
- Avoid the use of pesticides to control gypsy moths in this area to avoid the collateral damage to sensitive insect species of concern.
- Conservation of the core habitat and supporting landscape and connecting linkages between this serpentine habitat and those nearby should be considered among the highest conservation priorities in the county.
- Expand herbaceous openings on convex landscapes by removing trees and other woody plants. Focus woody plant removal on pines and junipers, which tend to indicate drier, thinner soils. The establishment of hardwoods should be taken as an indicator of deeper, moister soils. Where deeper soils occur, soil removal may be necessary to establish thin soils over serpentine bedrock.
- Locate, preserve and expand nectar plants for specialized Lepidoptera species, in particular, wild indigo (*Baptisia tinctoria*) and New Jersey tea (*Ceanothus americanus*). These species are the preferred larval host for two Lepidoptera species of concern. Deer exclosures may be necessary to protect these host plant populations.
- In the past, naturally occurring fires helped maintain the open aspect characteristic of the serpentine barren habitat. Today, active vegetation management, primarily in the form of volunteer work crews of the "Friends of the State Line Serpentine Barrens", as well as County park personnel help to remove trees and shrubs that in the past would have been cleared by fire events, or active large mammal grazing. These work crews have made great progress over the years to create the mosaic of patchy openings resembling in places, a grass land, in others, an oak savannah, or pitch pine woodland, or juniper–catbrier shrubland, or mixed oak forest, or bare soil gravel bed. All these, as well as other small patch natural communities, play an important role in sustaining the diversity of plants and animals in these important ecosystems.
- These systems may be best maintained in an agricultural or rural setting. Residential development near or between these barrens should be strongly discouraged. Adjacent residential development can conflict with or greatly reduce the options for management using prescribed fire.
- Educate the adjacent landowners on the significance of the globally rare habitat and the need for ongoing management activities.
- Suppress the spread of invasive species of plants to prevent native species from being crowded out of the habitat. Removal of invasive plants in the immediately vicinity of the species of concern can help these populations compete for space against much more aggressive species. Invasive species management should be coordinated by individuals familiar with the rare species as well as the invasive species present. Continual invasive species monitoring and control will be necessary.

- Reduce the deer density in the area. Uncommon species of native plants are particularly susceptible to deer herbivory.

Location

Municipalities: *West Nottingham Township*
USGS quads: *Kirkwood, Rising Sun*
Previous CNHI reference: *Kirks Bridge Woods, Black Run, Nottingham Serpentine Barrens*
Associated NHAs: *New Texas Serpentine Barrens, Goat Hill Serpentine Barrens, Oxford Airport Barrens, Chrome Serpentine Barrens*
Overlapping Protected Lands: *Goat Hill Serpentine Barrens, Nottingham Serpentine Barrens, Valley Forge State Forest, Nottingham Serpentine Barrens, Octoraro Creek Greenway, Brandywine Conservancy Easement, Agricultural Easement*

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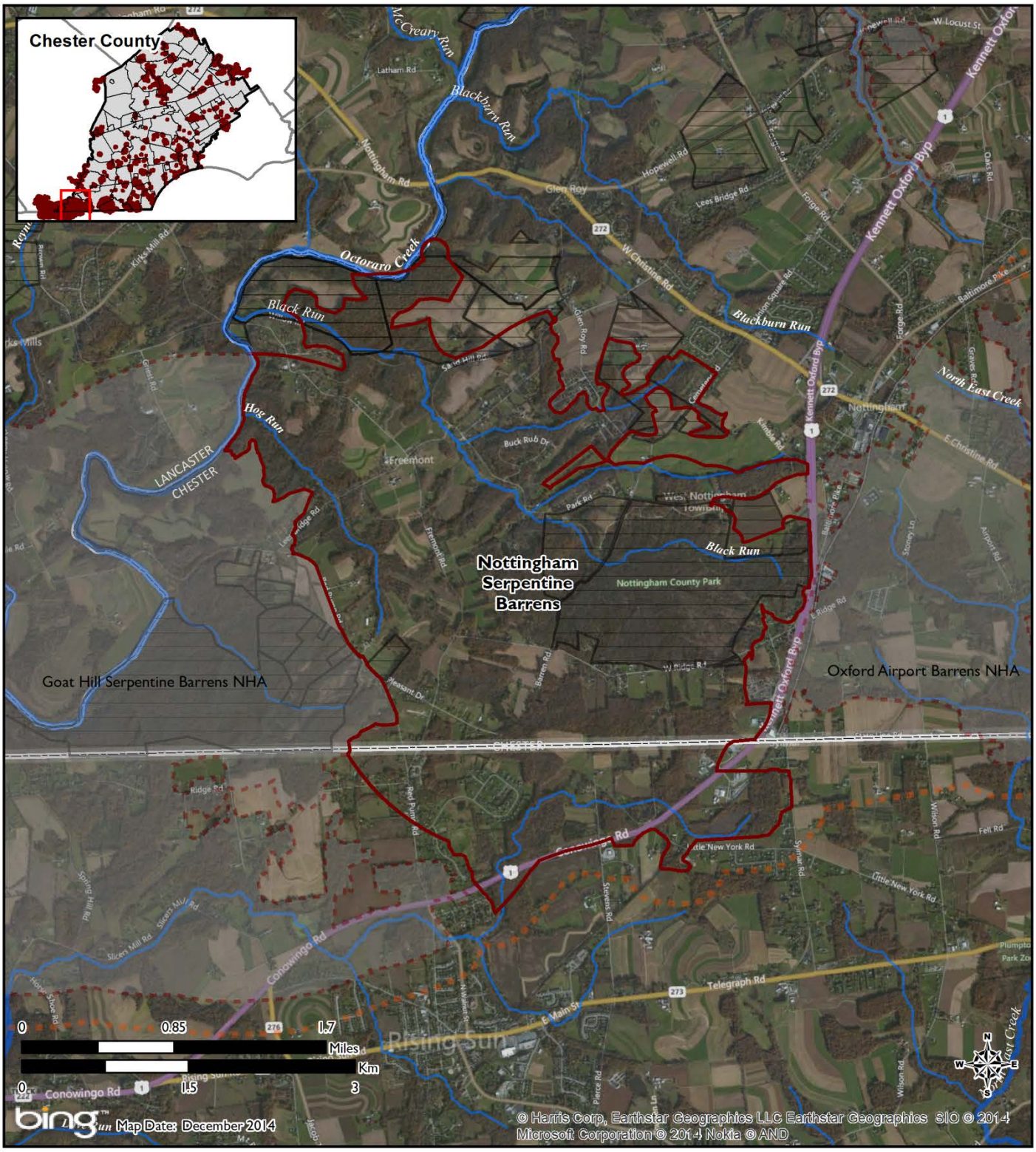


Nottingham Serpentine Barrens Natural Heritage Area

This diverse site contains globally rare Serpentine Grassland and Serpentine Pitch Pine-Oak Forest communities and supports populations of more than 70 species of concern - including many moths and butterflies, numerous plants, and some vertebrates.

Significance Rank:
GLOBAL

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Octoraro Lake NHA

PNHP Significance Rank: *Regional*

Site Description

Octoraro Lake NHA covers approximately 18 miles along East and West Branch Octoraro Creek and Tweed Creek. East Branch Octoraro Creek creates the border between Chester and Lancaster Counties in this area. These streams pass through a heavily farmed area with a minimal riparian buffer. Small patches of natural habitat are found along the streams. A red maple swamp provides habitat for **stiff cowbane**, a plant species of concern. A patch of oak and hickory dominated wooded habitat along a steep riparian slope supports a population of **fringe-tree**, a plant species of concern. Disturbed habitat within the NHA provides habitat for **Virginia ground-cherry**. Octoraro Lake NHA also provides habitat for **two sensitive species of concern**, not named at the request of the jurisdictional agencies overseeing their 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]
Fringe-tree (*Chionanthus virginicus*)		G5	S3	N (PT)	10/17/2004	BC
Maryland Golden-aster (*Chrysopsis mariana*)		G5	S1	PT (PE)	10/10/1996	D
American Holly (*Ilex opaca*)		G5	S2	PT (PT)	3/28/2014	E
Stiff Cowbane (*Oxypolis rigidior*)		G5	S2	TU (PT)	9/15/2007	C
Virginia Ground-cherry (*Physalis virginiana*)		G5	S1S2	TU (PE)	7/16/2003	BC
Tooth-cup (*Rotala ramosior*)		G5	S3	PR (PR)	8/25/1994	B
Sensitive species of concern A[3]	S	---	---	---	2008	E
Sensitive species of concern B[3]	S	---	---	---	2008	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.

Fringe-tree is a shrub or small tree found from New York and Massachusetts south to Florida and Texas. It is near the northern end of its range in Pennsylvania and has mostly been documented in the southern counties. Most current records are in the southeastern part of the state. Fringe-tree is found in moist woods and along streams. It is threatened by habitat loss, invasive species, and excessive deer browse.

Stiff cowbane is a plant species in the carrot family. Its range spans from New Jersey west to Minnesota and south to Texas and Florida. It is at the northern edge of its range in Pennsylvania and has mostly been documented in southern counties. Stiff cowbane is found in open, wet habitats.

Virginia ground-cherry is found throughout eastern and Midwestern United State and Canada. It has been documented in scattered counties throughout Pennsylvania. It is often found in open or partially shaded habitats with sandy soil and in disturbed areas, such as railroad beds.

Threats and Stresses

The limited riparian buffer along much of the streams within this NHA threatens the water quality of these wetland habitats. Runoff from adjacent agricultural fields and housing developments can have a major impact on the habitat conditions.

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. Runoff from industrial and residential development, agricultural fields, and roads have significantly higher levels of sediment, nutrients, pesticides, herbicides and other pollutants than runoff filtered through a natural habitat.
- Logging, development, or other major activities will further fragment the existing forest and alter the conditions of the habitat needed by the species of concern. Disturbances can also open areas that may be easily colonized by invasive species.
- Changes in hydrology may make the habitat unsuitable for some of the species of concern found at this site.
- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

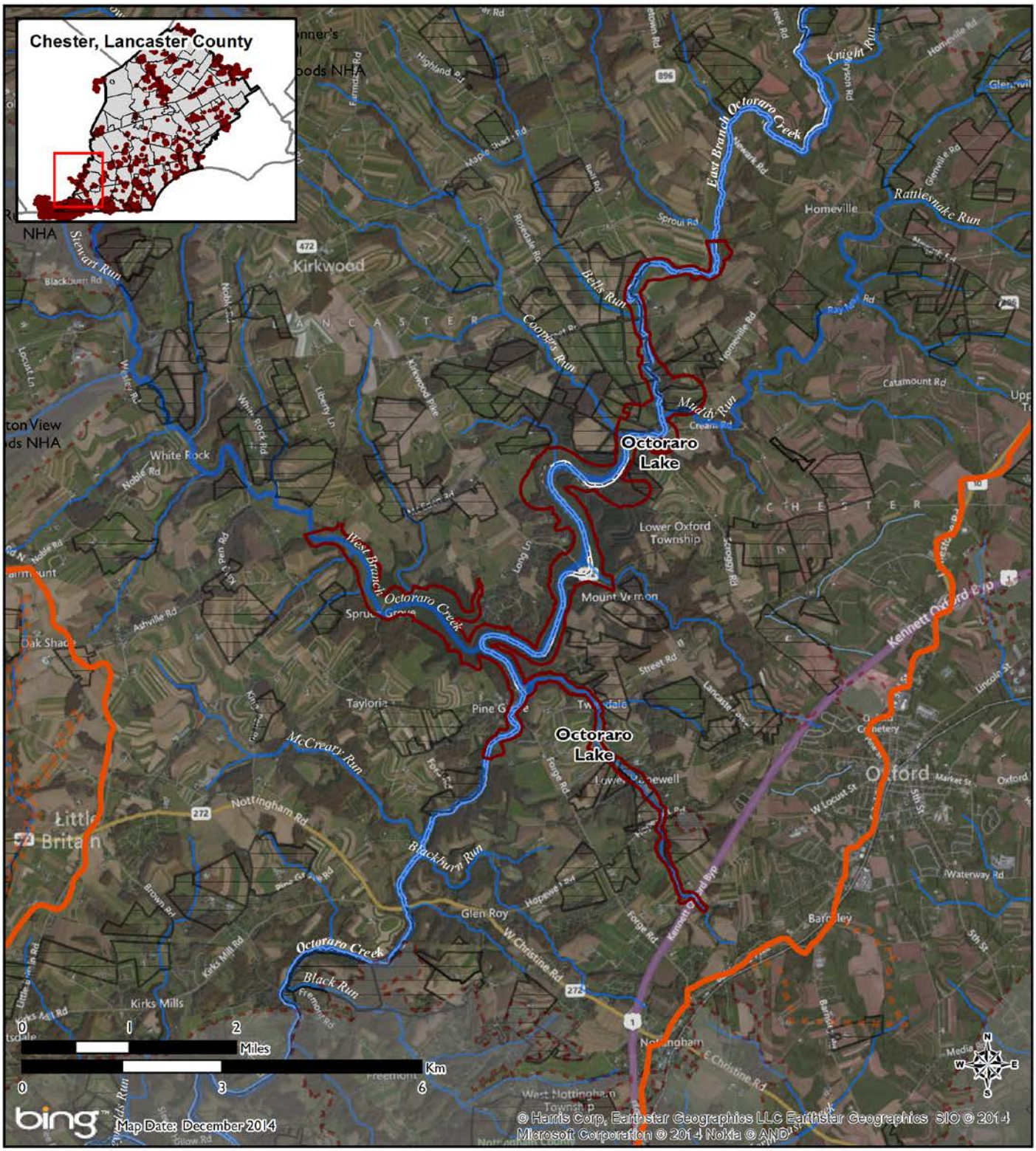
The highly fragmented nature of this area limits restoration activities that can be done. Avoid further disturbances within the existing riparian vegetation. Expand the riparian area with native vegetation in order to improve water quality.

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

- Protect remaining portions of the forested riparian zone and repair others that have been degraded, by encouraging the growth of native vegetation. Careful determination is needed to avoid planting trees in floodplains that should remain as open canopied herbaceous wetland habitats. These habitats should be maintained in their current open condition, with tree plantings to occur uphill of areas containing hydric soils.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Protect the existing forested areas from logging and other large scale disturbance. Keep the forest as intact as possible to protect the habitat and species within it.
- Limit herbicide use to situations where it is necessary, such as to control invasive species. Be especially cautious using herbicides near wetland areas.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Maintain the existing hydrology. Any activities that occur along the roads should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.

Location

Municipalities: *East Nottingham Township, Lower Oxford Township, Upper Oxford Township, Little Britain Township, Colerain Township*
USGS quads: *Kirkwood*
Previous CNHI reference: *East Branch Octoraro Creek Wetland & Octoraro Creek Scenic River*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Easement, Agricultural Easement*



Octoraro Lake
Natural Heritage Area

This site supports populations of 6 species of concern. Included among these are 4 state rare plants: fringe-tree, Virginia ground-cherry, Maryland golden-aster, and stiff cowbane.

Significance Rank:
GLOBAL

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Officers Run NHA

PNHP Significance Rank: *Regional*

Site Description

Several patches of open and forested wetland habitat occur along Officers Run and Valley Creek that are captured within this NHA. Officers Run NHA is located in Atglen and contains a mix of agricultural fields, woodlots, and residential development. Routes 41 and 372 cross through the NHA, as well as railroad and utility right-of-ways. The young, red maple dominated wooded wetland provides habitat for **bog goldenrod**, **eastern coneflower**, **few flowered nutrush**, and **stiff cowbane**, four plant species of concern. Early successional and disturbed habitats within this NHA support **a eupatorium** and **scarlet Indian-paintbrush**, two additional plant species of concern. **Mead's sedge** is plant species of concern that is found in several locations throughout Officers Run NHA. This site also supports **two sensitive species of concern**, not named at the request of the jurisdictional agency overseeing their 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]
Mead's Sedge (*Carex meadii*)		G4G5	S1	TU (PE)	6/5/2005	BC
Scarlet Indian-paintbrush (*Castilleja coccinea*)		G5	S2	TU (PT)	6/5/2005	C
A Eupatorium (*Eupatorium rotundifolia*)		G5	S3	TU (TU)	9/30/2011	E
Stiff Cowbane (*Oxypolis rigidior*)		G5	S2	TU (PT)	10/9/2004	C
Small Globe Beaked-rush (*Rhynchospora recognita*)		G5?	S1	TU (PE)	10/9/2004	B
Eastern Coneflower (*Rudbeckia fulgida*)		G5	S3	N (PT)	10/9/2004	B
Few Flowered Nutrush (*Scleria pauciflora*)		G5	S2	PT (PT)	10/9/2004	BC
Bog Goldenrod (*Solidago uliginosa*)		G4G5	S2	N (PT)	10/9/2004	BC
Sensitive species of concern A[3]	S	---	---	---	10/8/2010	E
Sensitive species of concern B[3]	S	---	---	---	5/21/2009	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.

A variety of open, disturbed habitats are used by a eupatorium, including woodland edge habitat, thickets, and old fields. This species is found from Maine south and west to Florida and Texas. In Pennsylvania, it is found in several southern counties, particularly in the southeast. Habitat loss, succession, and exotic species are major threats. Disturbance is likely necessary to maintain the habitat necessary for this species.

Bog goldenrod is a northerly species found in eastern Canada and in the United States from Maine west to Minnesota and south to Georgia and Alabama, although only a few scattered populations are known south of Pennsylvania. This species is found in several counties scattered throughout the state. Bog goldenrod is found in a number of types of open wetlands and on the shores of rivers and streams.

Eastern coneflower is found from Massachusetts west to Wisconsin and south to Florida and Texas. In Pennsylvania, it is most commonly found in the southeastern and south central regions of the state,

along with some occurrences in western counties. Eastern coneflower can be found in a variety of habitat types, including woodland openings, wet meadows, and rocky ledges.

In the United States, few flowered nutrush is found from New Hampshire to Michigan and south to Florida and Texas. In Pennsylvania, it has been documented in several southeastern counties. This species has been documented in the serpentine barrens found in this area of the state. Succession and competition with invasive species are threats to populations of few flowered nutrush.

Mead's sedge is found in wet meadows, grasslands, and marshes, particularly in areas with serpentine substrate. This species has been found throughout most of eastern and Midwestern United States, as well Arizona. In Pennsylvania, Mead's sedge is found in several southeastern counties and a few location in the western portion of the state. Active management may be necessary to maintain the early successional habitat used by this species.

Scarlet Indian-paintbrush is a biennial flowering herb that produces a rosette in its first year and a showy, red-tipped flower in its second growing season. This species can gather some of its nutrients by parasitizing on the roots of other plant species. Scarlet Indian-paintbrush can be found in wet meadows, grasslands, open woods, and roadsides. It is found from Maine west to Minnesota and south to Florida and Louisiana. In Pennsylvania, this species is found scattered throughout the state.

Small globe beaked-rush is found from New York west to Michigan and south to Florida and Texas, as well as California. In Pennsylvania, this species has been documented in the southeast and southwest. Small globe beaked-rush is found along the edges of lakes and wetlands, especially those with sandy soils.

Stiff cowbane is a plant species in the carrot family. Its range spans from New Jersey west to Minnesota and south to Texas and Florida. It is at the northern edge of its range in Pennsylvania and has mostly been documented in southern counties. Stiff cowbane is found in open, wet habitats.

Threats and Stresses

Alteration of the hydrology of the streams and wetlands within and adjacent to this site would likely alter the condition of the habitat and species composition. Impacts from the surrounding fields and developments threaten the water quality, especially in areas with a minimal riparian buffer.

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

- Degradation of riparian zones within this NHA threatens the integrity of water quality in Officers Run, Valley Creek, and adjacent wetlands. The stormwater runoff from roadways and development should be considered a potential source of significant contamination. Runoff from these sources has significantly higher levels of pollutants than runoff filtered through a natural habitat.
- Natural succession from open, wet meadows to shrub and tree dominated habitats can eliminate suitable open canopied habitats supporting species of concern.
- Forest fragmentation due to development or infrastructure activities could result in habitat loss and degradation of the site.
- Exotic invasive plant species threaten to compete with and displace native species.
- 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 park-like forests in which the native plant understory and vertical stratification are greatly reduced.

Conservation Recommendations

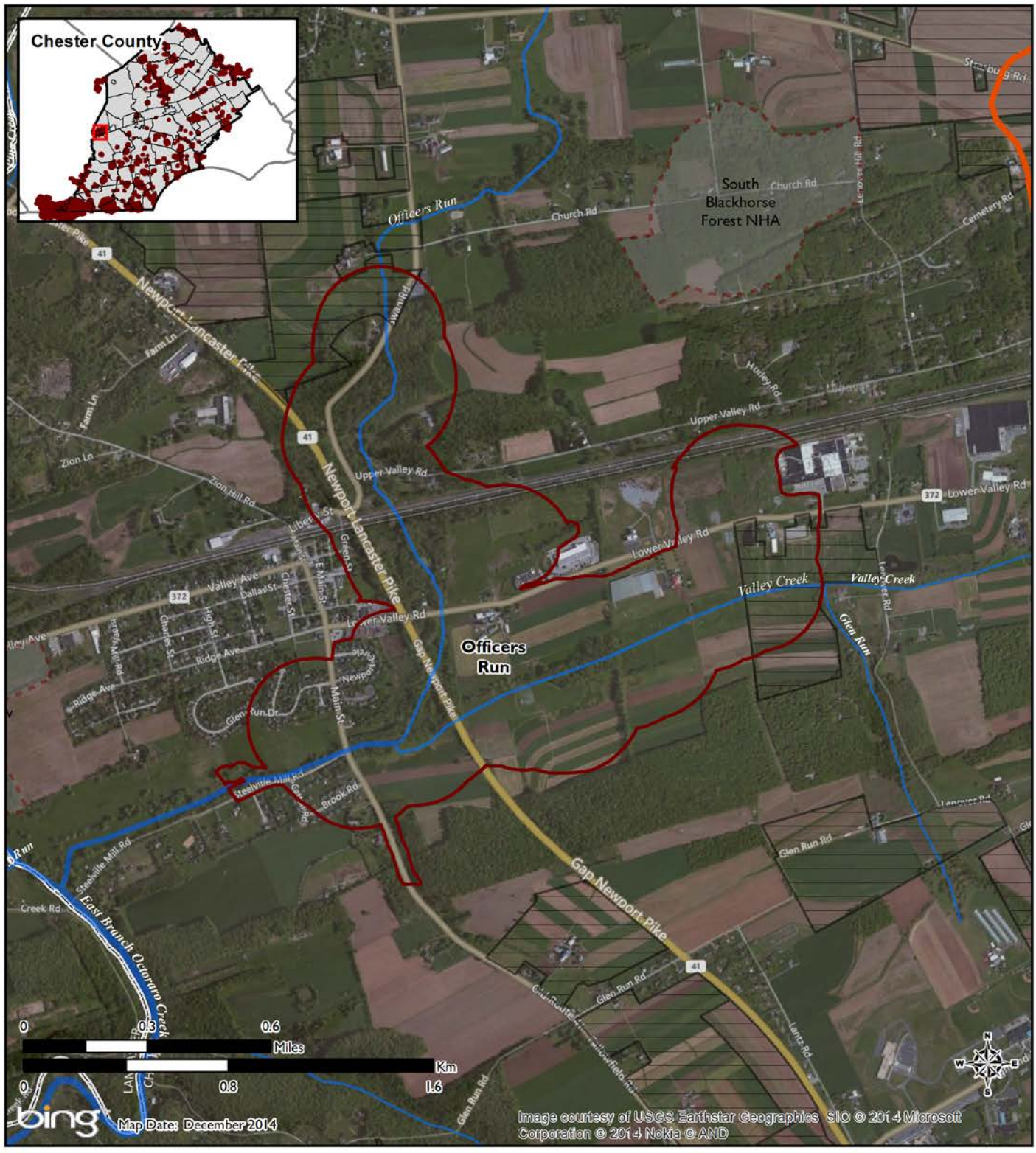
This site will be best protected by maintaining the integrity of vegetative buffers and assuring a consistent hydrologic regime to protect wetlands.

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

- Avoid disrupting the hydrology of the site by draining or filling the wetlands as well as disturbing the surface or groundwater hydrology.
- Maintain open, wet meadow habitats by periodic removal of woody species of plants. This action will temporarily help set back succession to a closed canopy habitat and preserve the open, wet meadow habitat conditions preferred by species of concern.
- Protect the riparian zone and repair others that have been degraded by encouraging the growth of native vegetation. Careful determination is needed to avoid planting trees in floodplains that should remain as open canopied herbaceous wetland habitats. These habitats should be maintained in their current open condition, with tree plantings to occur uphill of areas containing hydric soils.
- Avoid fragmenting the existing forests and wetlands 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.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations. Further disturbance within this habitat will create additional opening for the establishment and spread of invasive species.
- Reduce deer density, then continue to monitor and maintain it at a level that is able to be supported by the landscape.

<u>Location</u>

Municipalities: *West Fallowfield Township, West Sadsbury Township, Atglen Borough*
USGS quads: *Parkesburg*
Previous CNHI reference: *East Branch Octoraro Headwaters*
Associated NHAs: *None*
Overlapping Protected Lands: *Agricultural Easement*



Officers Run
Natural Heritage Area

Wetland and upland habitats support 7 plant species of concern and two sensitive 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***

Old Creek Road NHA

PNHP Significance Rank: *State*

Site Description

Old Creek Road NHA is located along West Branch Big Elk Creek between Elkdale and Maple Grove. This wooded hillside along the creek is part of a larger forested area that is approximately 400 acres in size along East and West Branch Big Elk Creek near the confluence of the two streams. A residential development abuts the NHA. The wooded habitat supports a population of **fringe-tree**, a plant 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]
Fringe-tree (*Chionanthus virginicus*)	G5	S3	N (PT)	5/16/1999	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.

Fringe-tree is a shrub or small tree found from New York and Massachusetts south to Florida and Texas. It is near the northern end of its range in Pennsylvania and has mostly been documented in the southern counties. Most current records are in the southeastern part of the state. Fringe-tree is found in moist woods and along streams. It is threatened by habitat loss, invasive species, and excessive deer browse.

Threats and Stresses

Changes in hydrology along West Branch Big Elk Creek may alter the flow of water into the surrounding forested habitat. Logging and other large scale disturbances will fragment the wooded habitat and provide openings for the establishment of invasive species.

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

- Logging, development, or other major activities can further fragment the existing forest and alter the conditions of the habitat needed by the species of concern. Disturbances will also open areas that may be easily colonized by invasive species.
- Changes in hydrology may make the habitat unsuitable to the species of concern found here.
- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Herbicide and fertilizer use in lawns, fields, and along roads may wash into the forested area and degrade the habitat conditions.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

This area is privately owned, but the proximity to West Branch Big Elk Creek and the steepness of the slope should help protect the immediate area from development. Avoid activities that will fragment the

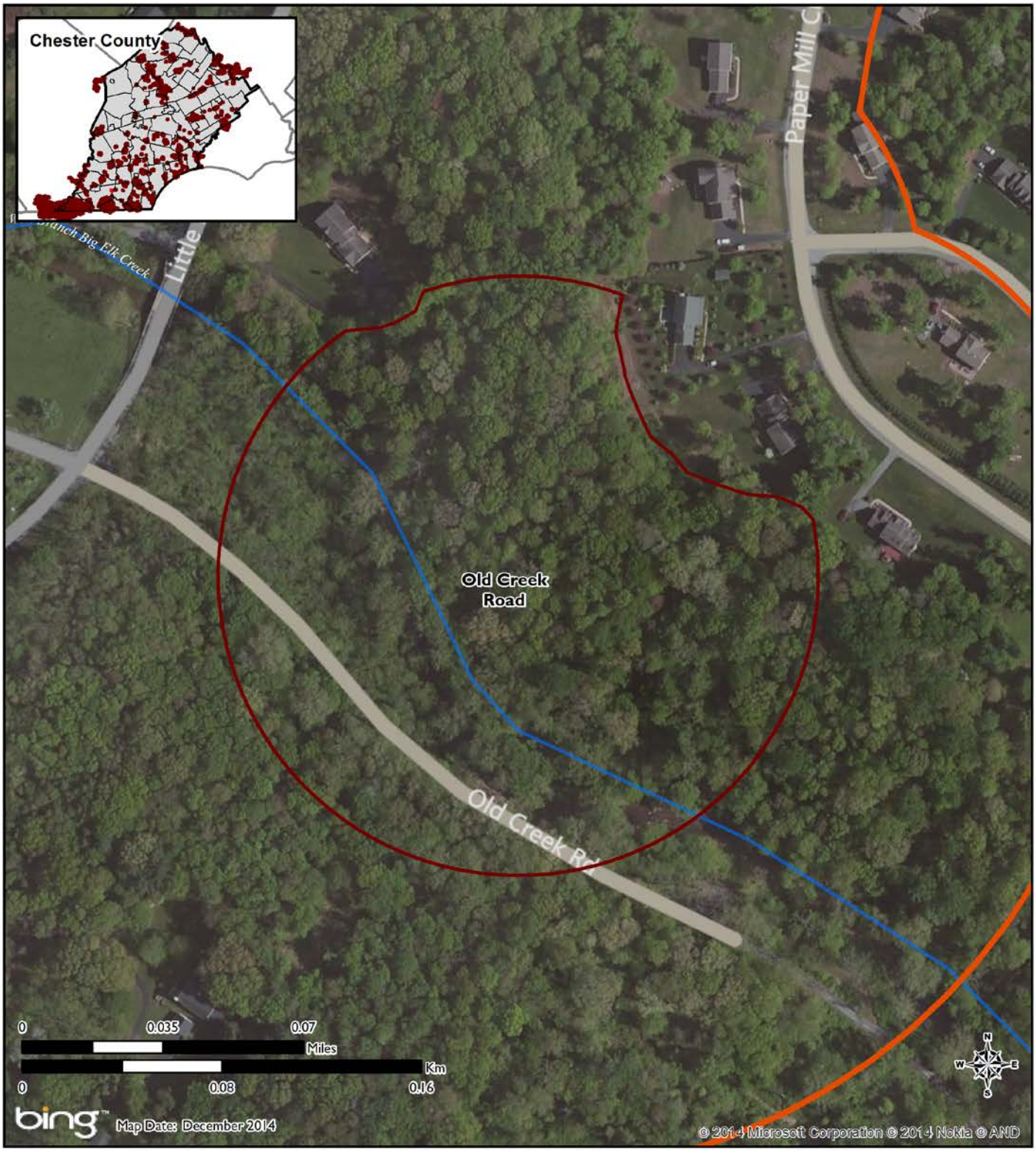
habitat or create other large disturbances. Maintain the existing hydrology of the stream and associated wetlands.

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

- Protect the existing forested areas from logging and other large scale disturbance. Keep the forest as intact as possible to protect the habitat and species within it.
- Maintain the existing hydrology. Any activities that occur near the NHA should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *East Nottingham Township*
USGS quads: *Oxford*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Old Creek Road
Natural Heritage Area

Upland forest provides habitat for a Pennsylvania vulnerable plant, fringe-tree.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

Old Kennett Road NHA

PNHP Significance Rank: *State*

Site Description

A number of agricultural fields and wet meadow habitats between the fields make up Old Kennett Road NHA. Agricultural fields also surround much of the site. A series of man made ponds have been created along the small tributary to East Branch Red Clay Creek that flows through the NHA. The wet meadow habitat supports populations of **horrible thistle** and **swamp lousewort**, two plant species of concern found in early successional habitats.

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]
Horrible Thistle (*Cirsium horridulum*)		G5	S1	PE (PE)	8/10/2002	B
Swamp Lousewort (*Pedicularis lanceolata*)		G5	S1S2	N (PE)	8/10/2002	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.

Horrible thistle is a state endangered plant species that is found throughout the southeastern United States as far west as Texas and Oklahoma and up the Atlantic Coast into New England. In Pennsylvania, horrible thistle has been documented in several southeastern counties. This species is found in a variety of open habitats and disturbed areas.

Swamp lousewort has a range from southern New England west into the Dakotas and south into Arkansas and Georgia. In Pennsylvania, it occurs mostly in the southern and northwestern counties, where it grows in calcareous wetlands, including boggy meadows, marshes, swamps, and fens. The known occurrences of swamp lousewort and its habitat type will be enhanced by creating buffers around its habitat, removal of invasive species, and protection of wetland hydrology. Excessive deer browsing may be a threat in some locations.


Denise Watts, PNHP
Swamp lousewort (*Pedicularis lanceolata*)

Threats and Stresses

Succession is a major threat to the habitats at this site. Lack of maintenance will allow woody species to alter the habitat conditions. Excessive mowing will also impact the conditions at this site. Additional changes in hydrology along the stream may eliminate the wet meadow habitat along the edges of the fields.

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

- Succession of the open grassy fields may cause the habitat used by the species of concern to become overgrown and shaded by woody species.
- Changes in the currently hydrology could significantly alter the habitat for the plant species of concern by making conditions either too wet or too dry to be able to persist at this site.

- Herbicides, fertilizers, and sediment from lawns, right-of-ways, and roads may wash into the forested area and degrade the habitat conditions.
- Invasive species are found throughout this site and may displace native vegetation, including species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

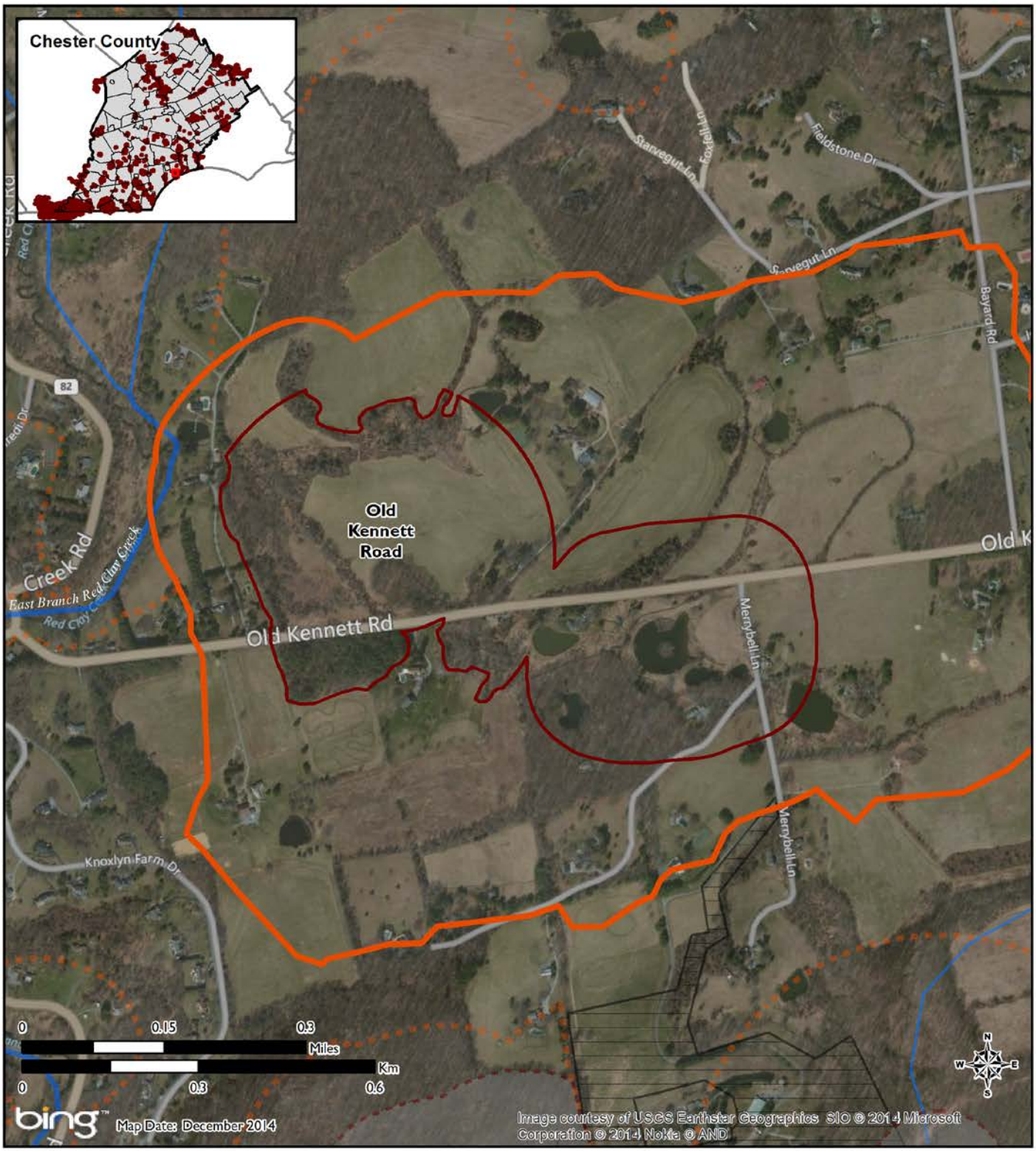
This NHA is privately owned, which offers no formal protection to the habitat. Avoid development or create other infrastructure within the NHA that would fragment the habitat. Conduct maintenance in early successional habitat outside of the growing season and limit the use of herbicides.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Maintain the existing hydrology. Any activities that occur near the NHA should be conducted with a consideration for the impact to the flow of water into the wetlands below.
- Remove woody species and maintain the grassy habitat openings for species of concern and other early successional species. Perform periodic maintenance, such as mowing, outside of the growing season to prevent woody species from taking over the area. The needs of the species of concern should be considered when planning the timing and frequency of maintenance.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Kennett Township*
USGS quads: *Kennett Square*
Previous CNHI reference: *Old Kennett Road Site*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Old Kennett Road Natural Heritage Area

This site supports populations of two plant species of concern: swamp lousewort and horrible thistle.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Oxford Airport Barrens NHA

PNHP Significance Rank: *Global*

Site Description

A small serpentine bedrock influenced habitat occurs within the context of active agriculture and scattered woodlots. This is one of the smaller serpentine habitats that make up the State Line Serpentine Barrens, an ecologically unique system occurring in scattered, mostly small patches along this part of the PA/MD border. The serpentine habitats are often referred to as grasslands, and these herbaceous openings can have a strong representation of warm season grasses and grass-like plants, but they often also contain a good diversity of other plant species, many uncommon at the state and global levels.

Rocky Gleason (PNHP)

Lion's-foot (*Prenanthes serpentaria*)

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]
Common Roadside Skipper (*Amblyscirtes vialis*)		G4	S2	N (N)	5/21/1995	E
Falcate Orangetip (*Anthocharis midea*)		G4G5	S3	N (N)	5/14/1997	E
Dusted Skipper (*Atrytonopsis hianna*)		G4G5	S2	N (N)	5/23/1994	C
A Geometrid Moth (*Apodrepanulatrix liberaria*)		G3	S1S3	N (N)	9/27/1996	CD
Dot-lined White Moth (*Artace cribraria*)		G5	S1	N (N)	7/9/1996	C
Southern Pine Looper Moth (*Caripeta aretaria*)		G4	S1S2	N (N)	8/30/1996	C
Umber Underwing Moth (*Catocala umbrosa*)		G5	S1	N (N)	7/23/1998	C
Packard's Lichen Moth (*Cisthene packardii*)		G5	S1S3	N (N)	6/20/1996	C
Broad-lined Erastria Moth (Erastr*ia coloraria*)		G3G4	S1	N (N)	7/2/1998	CD
Barrens Buckmoth (*Hemileuca maia*)		G5	S1S2	N (N)	10/25/1996	C
Joyful Holomelina Moth (*Holomelina laeta*)		G4	S1S2	N (N)	8/16/1989	BC
Esther Moth (*Hypagyrtis esther*)		G5	S2S3	N (N)	6/20/1996	C
Black-waved Flannel Moth (*Lagoa crispata*)		G5	S1	N (N)	7/2/1998	C
An Owlet Moth (*Macrochilo hypocritalis*)		G4	SU	N (N)	7/23/1998	E
A Borer Moth (*Papaipema marginidens*)		G4	SU	N (N)	9/13/1996	E
A Renia Moth (*Renia* sp. 1 nr. *discoloralis*)		G4	S1?	N (N)	8/30/1996	C
A Moth (*Sutyna privata teltowa*)		G5T4	S1	N (N)	9/18/1998	C
Tolype Moth (*Tolype notialis*)		G4G5	S1	N (N)	7/2/1998	C
Southern Variable Dart Moth (*Xestia elimata*)		G5	S2S3	N (N)	9/27/1997	C
A Zale Moth (*Zale curema*)		G3G4	S1	N (N)	5/14/1997	C
Oblique Zale Moth (*Zale obliqua*)		G5	S1	N (N)	7/2/1998	C
A Zale Moth (*Zale squamularis*)		G4	S2S3	N (N)	7/23/1998	C
A Zale Moth (*Zale submediana*)		G4	S2	N (N)	5/14/1997	C
Pine Barrens Zanclognatha (*Zanclognatha martha)*		G4	S1S2	N (N)	7/2/1998	C
Arrow-feathered Three-awn (*Aristida*		G5	S2	PT (PT)	10/15/2008	B

Species or Natural Community Name		PNHP Rank[1] Global	State	PA Legal Status[1]	Last Seen	Quality[2]
purpurascens)						
Fringe-tree (*Chionanthus virginicus*)		G5	S3	N (PT)	5/6/2007	E
Heller's Witchgrass (*Dichanthelium oligosanthes*)		G5	S3	N (PT)	6/3/2007	B
American Holly (*Ilex opaca*)		G5	S2	PT (PT)	7/10/1992	C
Plain Ragwort (*Packera anonyma*)		G5	S2	PR (PR)	7/23/1996	C
Lion's-foot (*Prenanthes serpentaria*)		G5	S3	N (PT)	5/6/2007	E
Southern Red Oak (*Quercus falcata*)		G5	S1	PE (PE)	10/15/2008	C
Few Flowered Nutrush (*Scleria pauciflora*)		G5	S2	PT (PT)	9/21/1996	B
Spring Ladies'-tresses (*Spiranthes vernalis*)		G5	S1	PE (PE)	7/25/1992	C
Serpentine Aster (*Symphyotrichum depauperatum*)		G2	S2	PT (PT)	9/21/1996	A
Sensitive species of concern A[3]	S	---	---	---	5/6/2007	E
Sensitive species of concern B[3]	S	---	---	---	5/20/2009	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.

Most of the butterfly and moth species of concern (Lepidoptera) documented at this location are limited in distribution in Pennsylvania to serpentine and other grassland habitats, which are often set in a matrix of open oak and pine woodlands. Conservation of these species requires protection of the habitat they use during all stages of their life cycles. Maintaining a mosaic of grassland, oak, and pine areas at serpentine barrens sites and the surrounding area will create a diverse and healthy habitat capable of supporting the rare butterfly and moth species listed above. Creation of corridors between barrens sites could also encourage movement of species between sites and help create more secure populations. Pesticide application, especially for the control of gypsy moths, can have a devastating effect on populations of moth species of concern and should not be used in this area.

Many of the plant species of concern found within this Natural Heritage Area are found primarily within the strongly serpentine influenced small herbaceous openings or within the adjacent thin woodlands. Among these include arrow-feathered three-awn, Heller's witchgrass, plain ragwort, lion's-foot, few flowered nutrush, spring ladies'-tresses, and serpentine aster. In the past, natural disturbance, such as wild fires, would have helped to keep these areas in an open condition. With the relatively recent suppression of fire, the open areas have gradually closed due to natural succession. An active restoration effort to restore the serpentine openings will be necessary to ensure the continued existence of these habitats and the species they contain. Other plants within this area are not specifically adapted to the open habitats, but are more closely associated with wooded and forested habitats. These include fringe-tree, American holly, and southern red oak. Efforts to restore serpentine openings should take into account the presence of these species and avoid disturbing the habitat where they occur.

Serpentine aster is a species of plant that deserves special mention based on its potential for global extinction due to its extremely limited global population. This species is predominantly known to occur in the eastern serpentine barrens of Pennsylvania and Maryland, with a few far flung outliers in Virginia and North Carolina (Gustafson 2005; Kartesz 2013). This extremely limited distribution has given this species the status of G2 – globally imperiled. Serpentine aster is found in the more open areas of serpentine barrens, suggesting that fire or other active management may be needed to remove woody overgrowth and maintain this preferred habitat.

John Kunsman (PNHP)

Serpentine Aster
(*Symphyotrichum depauperatum*)

Threats and Stresses

Historically, wildfires likely helped to maintain the open aspect of these habitats. Early accounts record the intentional setting of fire by Native Americans to help open areas for greater potential hunting success. Because of the past prevalence of intentional or accidental wildfires, this habitat was historically less dominated by woody trees and shrubs, but recent fire suppression has favored the expansion of wooded habitats at the expense of herbaceous openings. Invasion of serpentine herbaceous openings by woody trees and shrubs can influence the surrounding habitat. As woody vegetation encroaches on the openings, they tend to trap more organic debris and allow deeper soils to accumulate. As deeper soils occur on the site, they succeed to more common woodland and forest types. Fire disturbances had maintained these herbaceous openings in the past. In the absence of fire, active woody vegetation removal will be necessary to maintain these openings.

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

- The lack of natural fire disturbance or active management poses one of the greatest threats to this habitat. In the absence of disturbance events, most of the open serpentine barrens habitats will gradually succeed to more common woody vegetation such as junipers, pines and oaks.
- Residential development occurs along one edge of the serpentine habitat. Increased conversion of this habitat to suburban development decreases the long term viability of this habitat.
- Invasive species of plants can displace native species of plants.
- Over browsing by white-tailed deer is a serious threat to the overall plant diversity.

Conservation Recommendations

These serpentine habitats occur in isolated patches along this section of the Pennsylvania / Maryland border as the bedrock material, serpentinite, is exposed at the surface of the ground in a scattered fashion much like an archipelago chain of islands. Each habitat has a slightly different species composition, largely due to the slightly different environmental conditions found at each distinct location. A long range goal for these isolated habitats is to recognize them as a single system and plan for their ecological needs. Natural habitat corridors between the barrens will help keep the genetic flow between the isolated populations of species in circulation.

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

- There appears to be no specific management plan for this Natural Heritage Area, and the site would benefit from a thorough review of the site-specific goals and procedures for management here. In the interim, general goals and actions could be gleaned from other serpentine management plans such as the Goat Hill Management Plan (Furedi 2008); Unionville Serpentine Barrens Restoration and Management Plan (Latham 2012); Pink Hill Serpentine Barrens Restoration and Management Plan (Latham 2008).

- These systems may be best maintained in an agricultural or rural setting. Residential development near or between these barrens should be strongly discouraged. Adjacent residential development can conflict with or greatly reduce the options for management using prescribed fire. A priority for the security of these globally rare habitats should be to establish protection for the core habitats as well as to provide for the landscape context in which natural process can be maintained. Focus conservation efforts on protection of parcels that exhibit serpentine barren potential. Transfer of development rights, conservation easements and fee simple acquisition are all appropriate tools for securing the conservation status of the parcels of varying ecological significance.

Rocky Gleason (PNHP)

Active woody plant removal is necessary to maintain herbaceous openings.

- The plants that characterize these habitats are adapted to the dry, nutrient poor soils and periodic fire events. Active stewardship of these habitats is necessary. In the absence of natural fire disturbance, or active vegetation removal, these habitats will succeed into woodlands and forests, replacing the globally rare habitat with a more common type.
- Habitat restoration activities should strive to establish a mosaic of habitat types to accommodate the variety of organisms and their diverse habitat preferences. While some of these plants will only thrive in the open on thin soils, or even bare bedrock conditions, others need the limited shelter of scattered trees or even the deep shade provided by a mature forest. Some of the insect species require conifers during part of their life cycle while others need deciduous trees or specific shrubs or wildflower host plants. There is no "one-size-fits-all" management recommendation for this habitat other than to provide for a mosaic of habitat diversity. "It's essential in restoring and maintaining disturbance-dependent ecosystems to vary the intensity and frequency of the disturbance in patchwork fashion, so that there is always a mosaic of patches of differing disturbance history. …the patchy landscape produced by random variation in disturbance history from one patch to another is essential to sustain the diversity of habitats and organisms that make up the total ecosystem." (Roger Latham, personal communication November 7th, 2014)
- Management activities should be coordinated with long-term habitat monitoring. "Analysis of desired conditions, inventory of existing conditions, and long-term monitoring of an array of key indicators is essential to know whether restoration and management efforts are accomplishing all of the goals or if some of the threatened or endangered species whose recovery is first and foremost among those goals might be inadvertently falling by the wayside." (Roger Latham, personal communication November 7th, 2014)
- Expand herbaceous openings as needed on convex landscapes by removing trees and other woody plants. Focus woody plant removal on areas of pines and junipers, which tend to indicate drier, thinner soils. The establishment of hardwoods should be taken as an indicator of deeper, moister soils. Where deeper soils occur, soil organic matter reduction may be necessary to establish thin soils over serpentine bedrock. "Soil organic matter reduction has proven effective in restoring serpentine grassland vegetation where it has been fully displaced by forest succession, as long as intact grassland adjoins the treated area to serve as a seed source. SOM reduction consists of skimming the surface organic horizons from the soil profile using a backhoe or front-end loader and transporting the material offsite by dump truck. It is particularly effective in restoring serpentine grassland where it has been invaded by a dense

thicket of common greenbrier (Smilax rotundifolia)." (Roger Latham, personal communication November 18th, 2014)

- Educate the adjacent landowners on the significance of the globally rare habitat and the need for ongoing management activities.
- Suppress the spread of invasive species of plants to prevent native species from being crowded out of the habitat. Removal of invasive plants in the immediately vicinity of the species of concern can help these populations compete for space against much more aggressive species. Invasive species management should be coordinated by individuals familiar with the rare species as well as the invasive species present. Continual invasive species monitoring and control will be necessary.
- Reduce deer herd density to suitable levels to prevent overbrowsing of sensitive species.

Location

Municipalities: *East Nottingham Township, West Nottingham Township*
USGS quads: *Kirkwood, Bay View, Rising Sun*
Previous CNHI reference: *Nottingham Serpentine Barrens, Nottingham Woodlot, Oxford Airport Barrens*
Associated NHAs: *None*
Overlapping Protected Lands: *Goat Hill Serpentine Barrens, Valley Forge State Forest, Nottingham Serpentine Barrens, Octoraro Creek Greenway, Brandywine Conservancy Easement*

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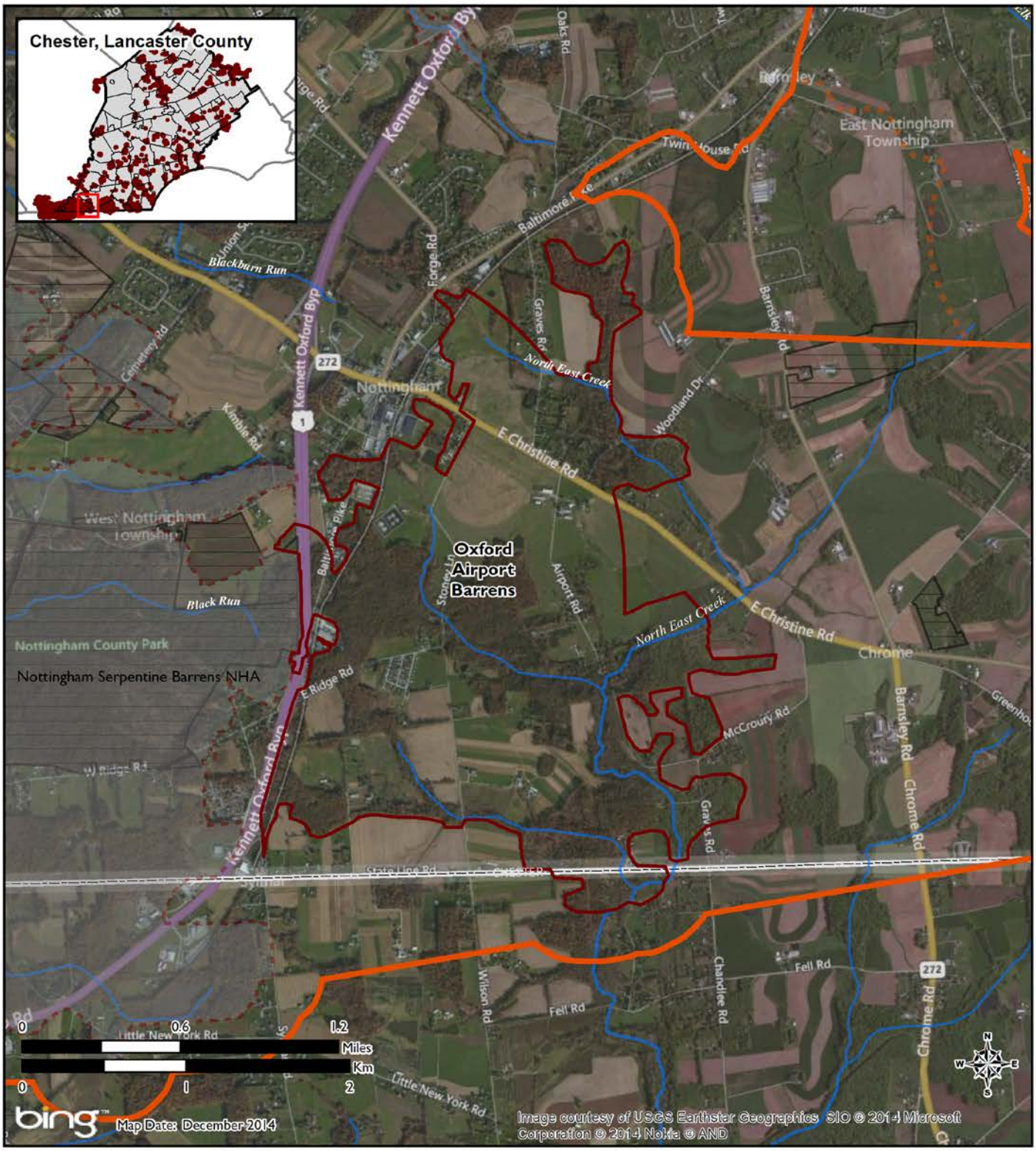


Oxford Airport Barrens Natural Heritage Area

Serpentine barren and upland forest provide habitat for 35 species of concern, comprised of moths, butterflies, and plants.

Significance Rank:
GLOBAL

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Oxford Commons NHA

PNHP Significance Rank: *Regional*

Site Description

The Oxford Commons NHA encompasses a landscape composed of mixed forested and wetland habitats and surrounds a portion of a headwater tributary to Leech Run. Wetlands at this site originate from springs and seeps upslope of the manmade pond and continue downslope into the tussock sedge dominated wetlands. These conditions provide suitable habitat for a **sensitive species of concern** that is not named 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**	---	---	---	5/27/2005	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.

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

Threats and Stresses

Major threats to this site include loss of suitable habitat through development and degradation of water quality from storm water runoff.

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 storm water runoff from roadways, suburban development and agriculture should be considered a potential source of significant contamination. Runoff from these sources have significantly higher levels of sediment, nutrients, pesticides, herbicides and other pollutants than runoff filtered through a natural habitat.
- Draining or flooding of the tussock sedge wetlands and forested wetland habitats can eliminate suitable habitat for the species of concern.
- Fragmentation due to development or infrastructure activities can result in habitat loss and degradation of the site.
- Exotic invasive plant species threaten to compete with and displace native species.
- Over-browsing by white-tailed deer is a serious threat to the overall plant diversity and forest regeneration.

Conservation Recommendations

This site will be best protected by maintaining the integrity of the remaining natural landscape and insuring a consistent hydrologic regime for wetland habitats.

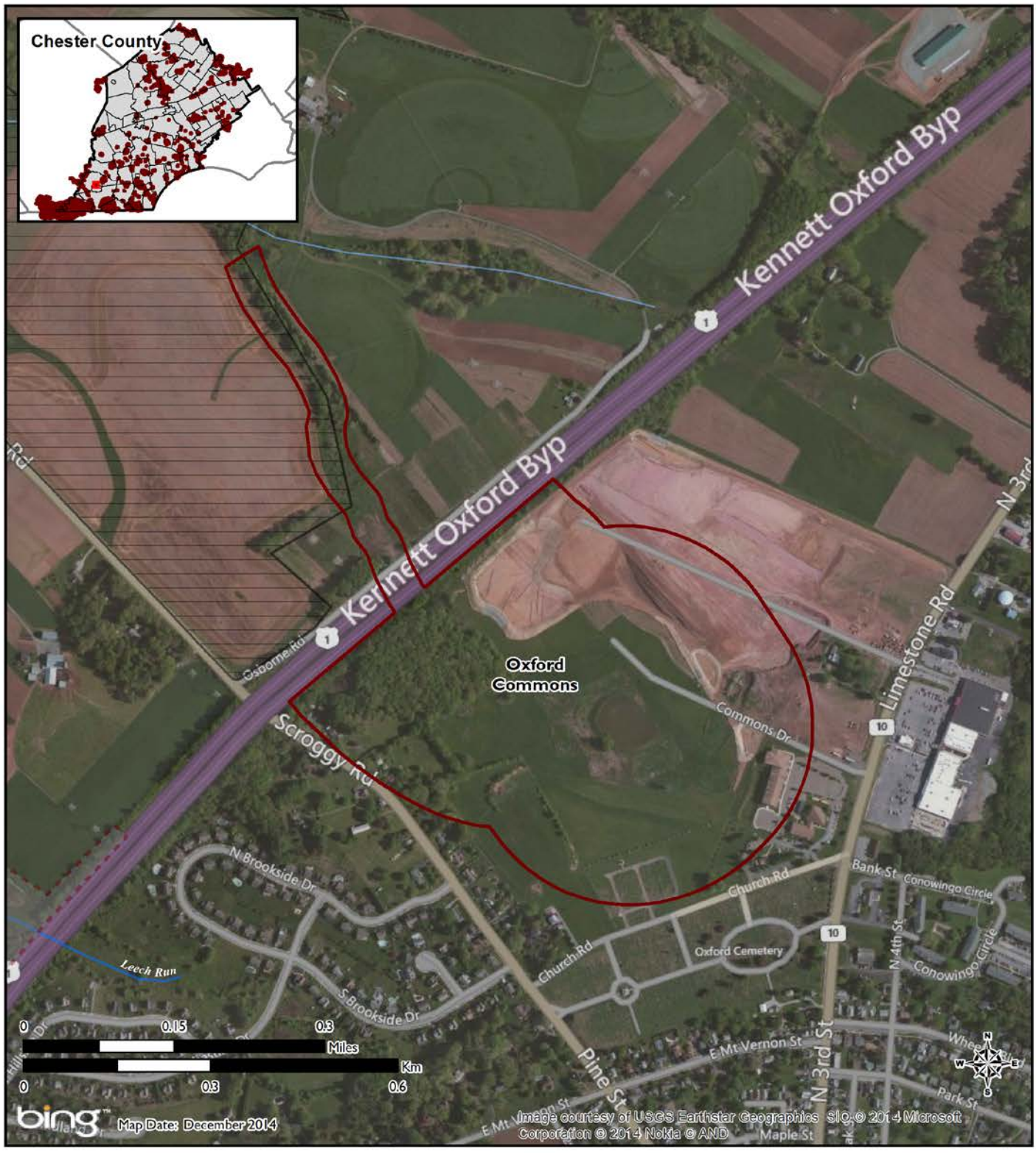
The following steps are recommended to ensure the persistence of these species at this site:

- Avoid disrupting the hydrology of the site by draining or filling the wetlands, or disturbing the surface or groundwater hydrology.

- Protect remaining portions of the forested riparian zone and repair others that have been degraded, by encouraging the growth of native vegetation. Careful determination is needed to avoid planting trees in floodplains that should remain as open canopied herbaceous wetland habitats. These habitats should be maintained in their current open condition, with tree plantings to occur uphill of areas containing hydric soils.
- Storm water management measures such as the creation of detention basins or vegetated swales should be implemented to decrease the unfiltered flow down the slopes into the creek floodplain.
- 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 population of species of concern, the natural landscape also helps to protect water quality of the stream that drains through this NHA.
- Control invasive species of plants to prevent native species from being crowded out by introduced species. 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 and repair a heavily infested habitat. Invasive species management should be coordinated by individuals familiar with the rare species as well as the invasive species present. Continual invasive species monitoring and control will be necessary.
- Reduce the deer density in the area. Uncommon species of native plants are particularly susceptible to deer herbivory.

Location

Municipalities: *Lower Oxford Township*
USGS quads: *Oxford*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Agricultural Easement*



Oxford Commons
Natural Heritage Area

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***

Oxford Meadow NHA

PNHP Significance Rank: *State*

Site Description

Oxford Meadow NHA is open, wet habitat that occurs to the north of Route 1. This site is surrounded by agricultural fields and residential development that occurs south of the highway. The headwaters of a small tributary to Leech Run begin in the development to the south of Oxford Meadow NHA, then flows through the site. A powerline right-of-way parallels Route 1 to the north. Management of this area has created the wet, early successional habitat that makes up the southern end of this NHA. This mowed habitat supports a population of a **sensitive species of concern**, not named at the request of the jurisdictional agency overseeing its protection. The upper half of this site is the narrow, riparian wooded habitat along the stream.

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**	---	---	---	10/5/1997	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.

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

Threats and Stresses

Succession is a major threat to the habitat conditions at this site, but continued maintenance along the right-of-way should keep woody species from becoming established. Being adjacent to the highway will allow sediment and chemicals to enter into the stream and surrounding wetland habitat in runoff.

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

- Invasive species are found in this NHA and may displace native vegetation, including species of concern.
- Succession of the wet meadow habitat may cause the area used by the species of concern to become overgrown and shaded by woody species.
- Herbicides sprayed on the powerline right-of-way may cause direct mortality to species of concern and other native species.
- Runoff of sediment and pollutants from the adjacent road may degrade the quality of the wetland needed to support the species of concern.
- Changes in the currently hydrology could significantly alter the habitat by making conditions either too wet or too dry for some species to be able to persist at this site.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

Management is needed to maintain the early successional habitat found at this site. Mowing done outside of the growing season is likely the best option to prevent succession and protect the native species.

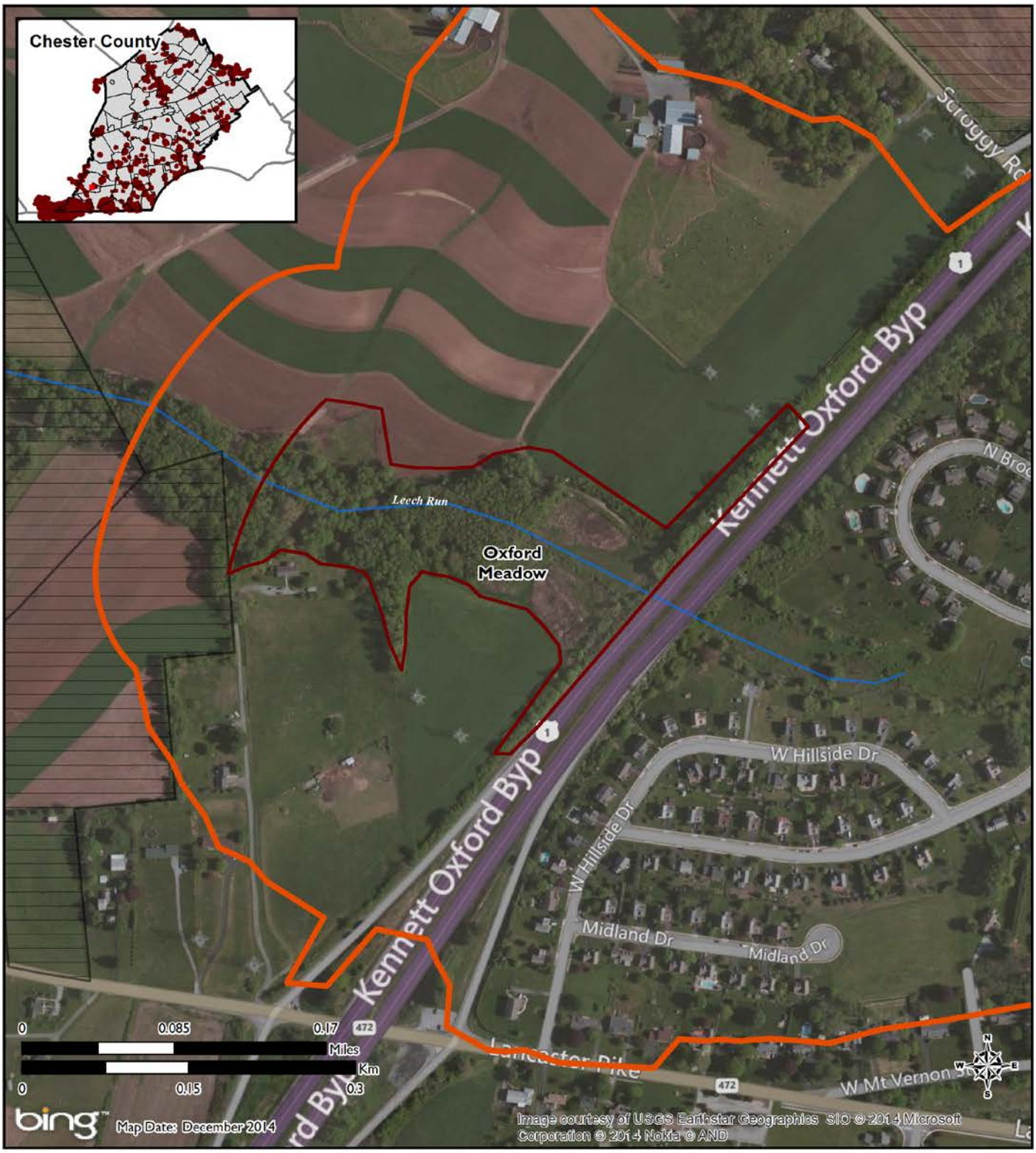
Herbicides should not be used in this area to prevent mortality of native species and degradation of the stream and wetland.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- The species of concern requires open habitat that needs to be maintained with mowing or other methods of disturbance. Maintenance should be done in the winter, when there is less impact to the native species found here.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Maintain the existing hydrology. Any activities that occur along the right-of-way and highway should be conducted with consideration for the impact to the flow of water into the nearby wetlands.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Lower Oxford Township, Oxford Borough*
USGS quads: *Oxford*
Previous CNHI reference: *Oxford Meadow*
Associated NHAs: *None*
Overlapping Protected Lands: *Agricultural Easement*



Oxford Meadow
Natural Heritage Area

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 Supporting Landscape***

Oxford Woods NHA

PNHP Significance Rank: *Regional*

Site Description

Oxford Woods NHA is approximately 200 acres in size and is located along a tributary to West Branch Big Elk Creek south of Hayesville. The headwaters of the tributary begin at the northern end of the NHA above Route 1. Most of the NHA below Route 1is delineated around a small woodlot. Agricultural fields and residential developments are found within the NHA and in the surrounding habitat. Oxford Woods NHA supports populations of several species of concern. The early successional areas and woodland edges provide habitat for **downy lobelia**, **Elliot's beardgrass**, and **stiff cowbane**, three plant species of concern. **Umbrella magnolia** is another plant species of concern found in the wooded habitat within this NHA.

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]
Elliott's Beardgrass (*Andropogon gyrans*)		G5	S3	N (PR)	1/31/2001	C
Downy Lobelia (*Lobelia puberula*)		G5	S1	PE (PE)	9/11/1999	D
Umbrella Magnolia (*Magnolia tripetala*)		G5	S2	PT (PR)	7/23/1989	BC
Stiff Cowbane (*Oxypolis rigidior*)		G5	S2	TU (PT)	5/19/2002	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.

Downy lobelia is a state endangered species that ranges from New Jersey to Illinois and south into Florida and Texas. In Pennsylvania, it is considered a southerly species and has been documented historically in the southeastern counties. It grows in moist clearings and openings, grasslands, woodland borders, and rights-of-way.

Elliot's beardgrass is at the northern edge of its range in Pennsylvania and has only been documented in a few southeastern counties. It spans from New Jersey to Illinois, south from Texas to Florida. This species needs open, early successional habitat in order to persist.

Stiff cowbane is a plant species in the carrot family. Its range spans from New Jersey west to Minnesota and south to Texas and Florida. It is at the northern edge of its range in Pennsylvania and has mostly been documented in southern counties. Stiff cowbane is found in open, wet habitats.

Umbrella magnolia is found from Massachusetts west to Indiana and south to Florida and Oklahoma. This species is more common in the southern portions of its range and is found along the Appalachian Mountains in the northern part of its range. It is most commonly found in the eastern and southeastern regions of the state with a few scattered occurrences in other areas. It is found in moist woods in partially shaded or shaded habitats.

Threats and Stresses

Disturbances along the highways and fields may create runoff that can degrade the quality of the wetland habitat and adjacent stream. Logging, development, and other large disturbances within the woodland can fragment that habitat and impact the existing conditions and can introduce invasive species. Establishment of woody species in the early successional habitat will modify the existing conditions and species composition.

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

- Logging, development, or other major activities will further fragment the habitats and alter the conditions needed by the species of concern. Disturbances will also open areas that can be easily colonized by invasive species.
- Runoff and sedimentation from the surrounding agricultural and residential areas may degrade the water quality of stream and surrounding wetlands, especially given the limited riparian areas upstream of this site.
- Draining or flooding of wet meadow and forested wetland habitats can eliminate suitable habitat for the species of concern.
- Succession that is not controlled by mowing or other methods of disturbance will likely cause the habitat to become unsuitable for the species of concern to be able to persist at this site.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Invasive species can take over portions of the habitat currently used by the species of concern and other native species.

Conservation Recommendations

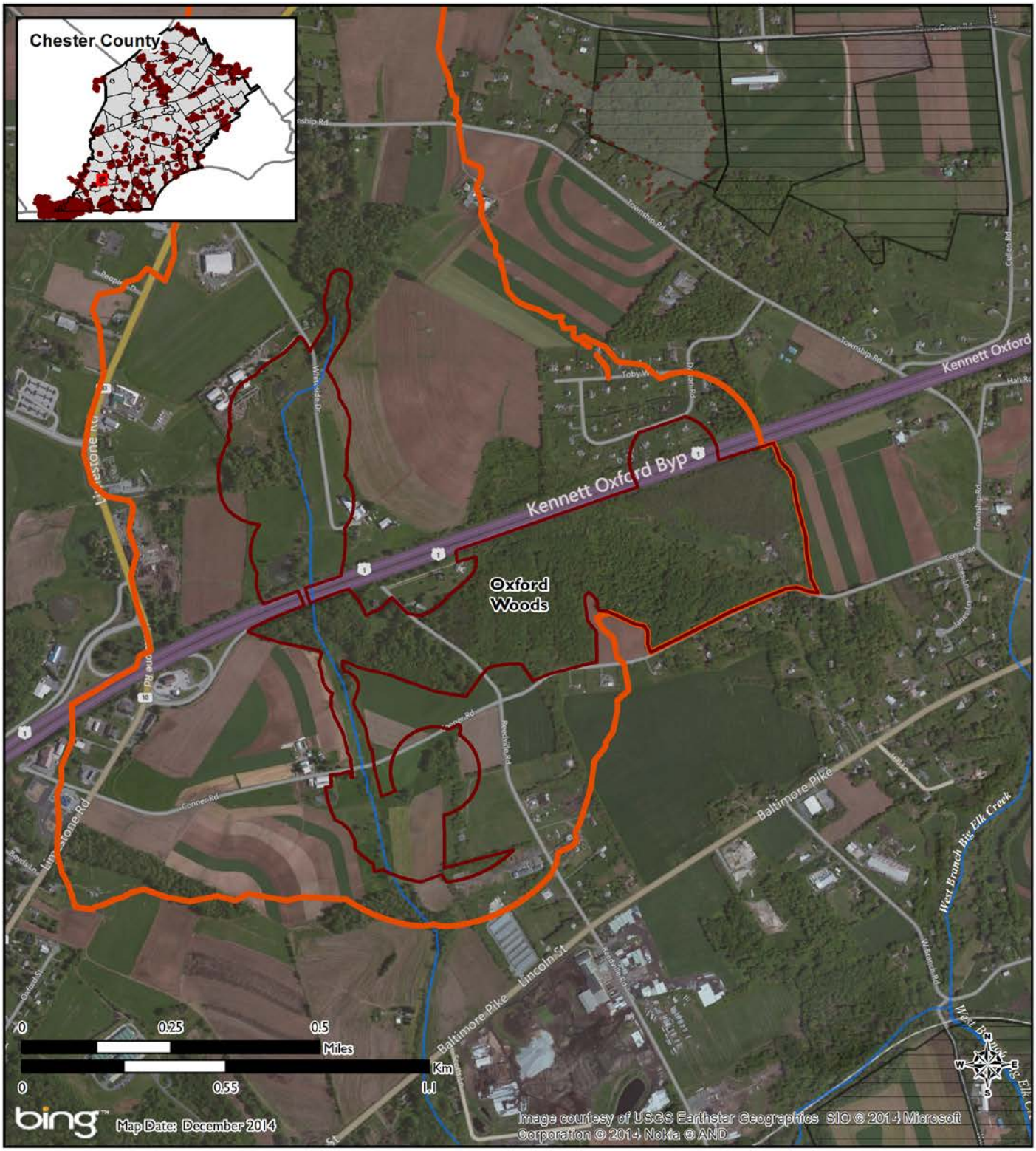
This NHA is entirely privately owned, which offers no formal protection from disturbances. Avoid activities within the NHA, such as logging and development, which will fragment the habitats and create openings for the establishment and spread of invasive species. Perform periodic maintenance in the early successional habitat in order to preserve the existing conditions. This should be done outside of the growing season to lessen the impact on native species.

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

- Protect the existing habitats from logging and other large scale disturbance. Keep the forest as intact as possible to protect the habitat and species within it.
- Avoid alteringthe current hydrology of the site, including draining or filling the wetlands and altering the flow of surface water. Consider potential changes to the flow of water when doing any activities within and around this NHA.
- Widen the native vegetated buffer along Ways Run. A width of 100 meters is ideal, but any increase will benefit the stream and adjacent wetlands.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Elliot's beardgrass requires open habitat that needs to be maintained. The needs of this species should be considered when planning the timing and frequency of maintenance in the open habitat.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.

Location

Municipalities: *Lower Oxford Township*
USGS quads: *Oxford*
Previous CNHI reference: *Oxford Woods*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Oxford Woods
Natural Heritage Area

Forest and wetland habitats support populations for five species of concern. Among these are Pennsylvania imperiled plants such as umbrella magnolia and stiff cowbane.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Parkersville Road NHA

PNHP Significance Rank: *State*

Site Description

Parkersville Road NHA is forested habitat adjacent to Route 1near Hamorton. Much of the surrounding forested area has been fragmented by residential development. A small stream flows through the site that begins in a series of small ponds to the west of the NHA. The forested streamside habitat supports a **sensitive species of concern**, not named 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**	---	---	---	5/6/2001	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

Disturbances to the forest, such as logging and development, could destroy the existing habitat. Invasive species would also likely colonize any newly disturbed areas. Chemicals applied to nearby areas may wash into the NHA and cause mortality to native species and degrade water quality.

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

- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Logging can further fragment the existing forest and alter the conditions of the habitat needed by the species of concern.
- Herbicides, fertilizers, and sediment from lawns and roadways may wash into the forested area and degrade the habitat conditions.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

Avoid further fragmention of the existing forest in order to protect the habitat structure and species composition. Avoid the use of herbicides and fertilizers along the road and on lawns as they may impact the forested habitat and degrade the quality of the stream.

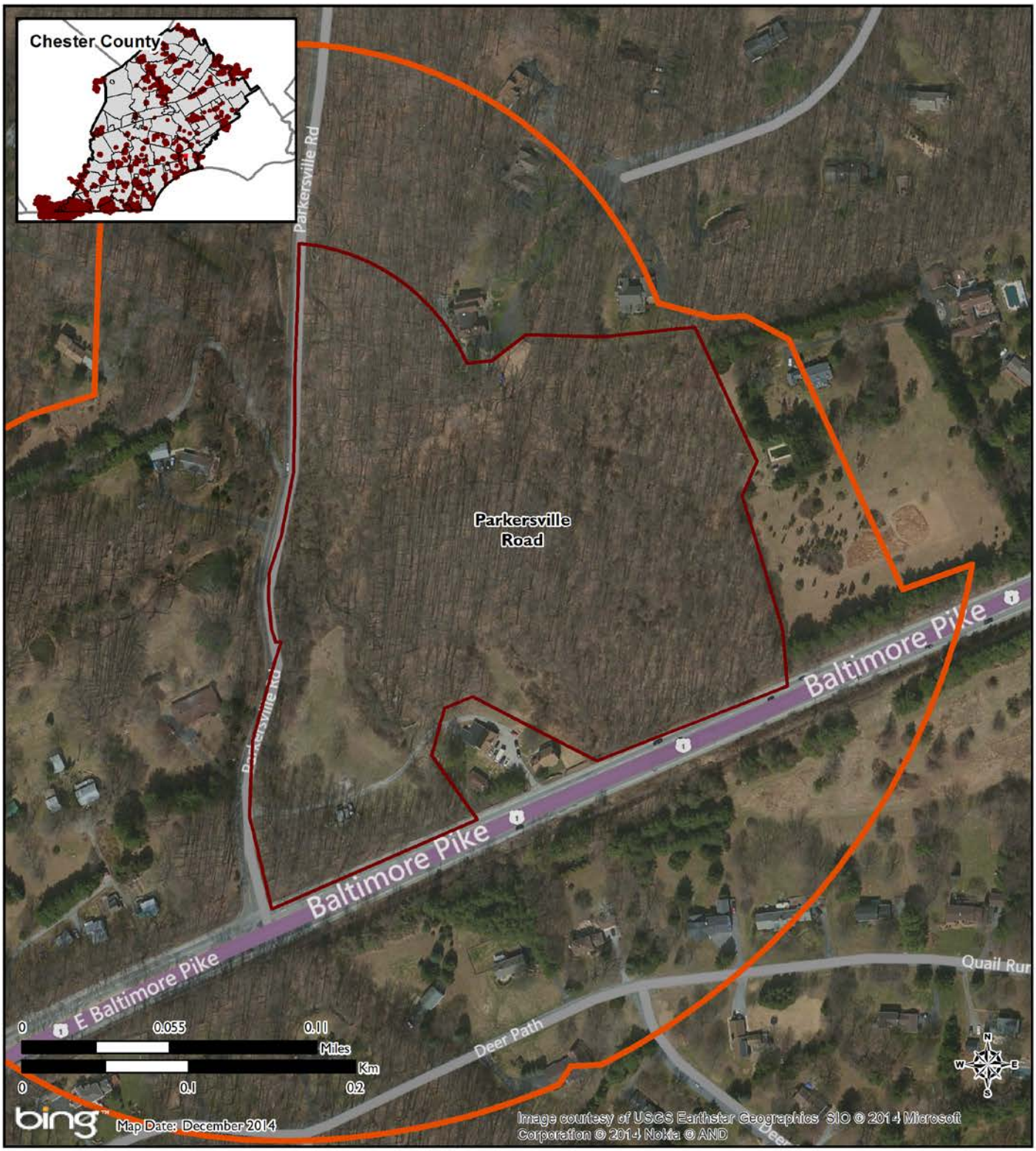
The following steps are recommended to ensure the persistence of these species at this site:

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.

- Protect the existing forested areas from logging. Avoid further fragmentation of the habitat with roads, houses, or other disturbances in order to preserve habitat for as many species as possible.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Pennsbury Township*
USGS quads: *Kennett Square, Unionville*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Parkersville Road
Natural Heritage Area

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 Supporting Landscape***

Pennock Bridge Road NHA

PNHP Significance Rank: *State*

Site Description

Pennock Bridge Road NHA is located near Kelton along the confluence of two tributaries to West Branch White Clay Creek. Agricultural fields surround most of the NHA. White oak and tulip poplar dominate the wooded areas of the site. Open wetlands also occur in some areas along the stream and are dominated by red maple saplings and sedges. The more heavily wooded habitat supports a population of **fringe-tree**, a plant species of concern. The wetland openings provide habitat for two additional plant species of concern, **possum-haw** and **stiff cowbane**. Riparian habitat also supports a population of 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]
Fringe-tree (*Chionanthus virginicus*)		G5	S3	N (PT)	11/4/2006	B
Stiff Cowbane (*Oxypolis rigidior*)		G5	S2	TU (PT)	9/15/2007	C
Possum-haw (*Viburnum nudum*)		G5	S1	PE (PE)	9/15/2007	C
Sensitive species of concern A[3]	S	---	---	---	5/1/2008	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.

Fringe-tree is a shrub or small tree found from New York and Massachusetts south to Florida and Texas. It is near the northern end of its range in Pennsylvania and has mostly been documented in the southern counties. Most current records are in the southeastern part of the state. Fringe-tree is found in moist woods and along streams. It is threatened by habitat loss, invasive species, and excessive deer browse.

Possum-haw has a mostly coastal range from New York west and south into Texas and Florida. In Pennsylvania, it represents a southerly species and has been documented in a few southeastern counties. It grows in wetlands, particularly swamps, wet thickets, and the margins of ponds. Fewer than 10 populations, most of them with only a few individuals, are known from the state.

Stiff cowbane is a plant species in the carrot family. Its range spans from New Jersey west to Minnesota and south to Texas and Florida. It is at the northern edge of its range in Pennsylvania and has mostly been documented in southern counties. Stiff cowbane is found in open, wet habitats.

Threats and Stresses

Changes in hydrology are the major threat to the wetland habitats at this site. Mowing along the habitat edge may impact the native species that are found there. Invasive species are common through some portions of this site and may spread throughout the wetland, altering habitat conditions and species composition.

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

- Logging, development, or other major activities can further fragment the existing wooded habitat and alter the conditions needed by the species of concern. Disturbances will also open areas that can be easily colonized by invasive species.
- Changes in the currently hydrology could significantly the habitat for the plant species of concern by making conditions either too wet or too dry to be able to persist at this site.
- Succession of red maple and other woody species in the herbaceous wetland habitat may shade the wetland and create drier conditions that may make it unsuitable for some species of concern to persist.
- Invasive species can take over portions of the habitat currently used by the species of concern and other native species.
- Herbicide and fertilizer use in fields and along roads may wash into the NHA and degrade the habitat conditions and cause direct mortality.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

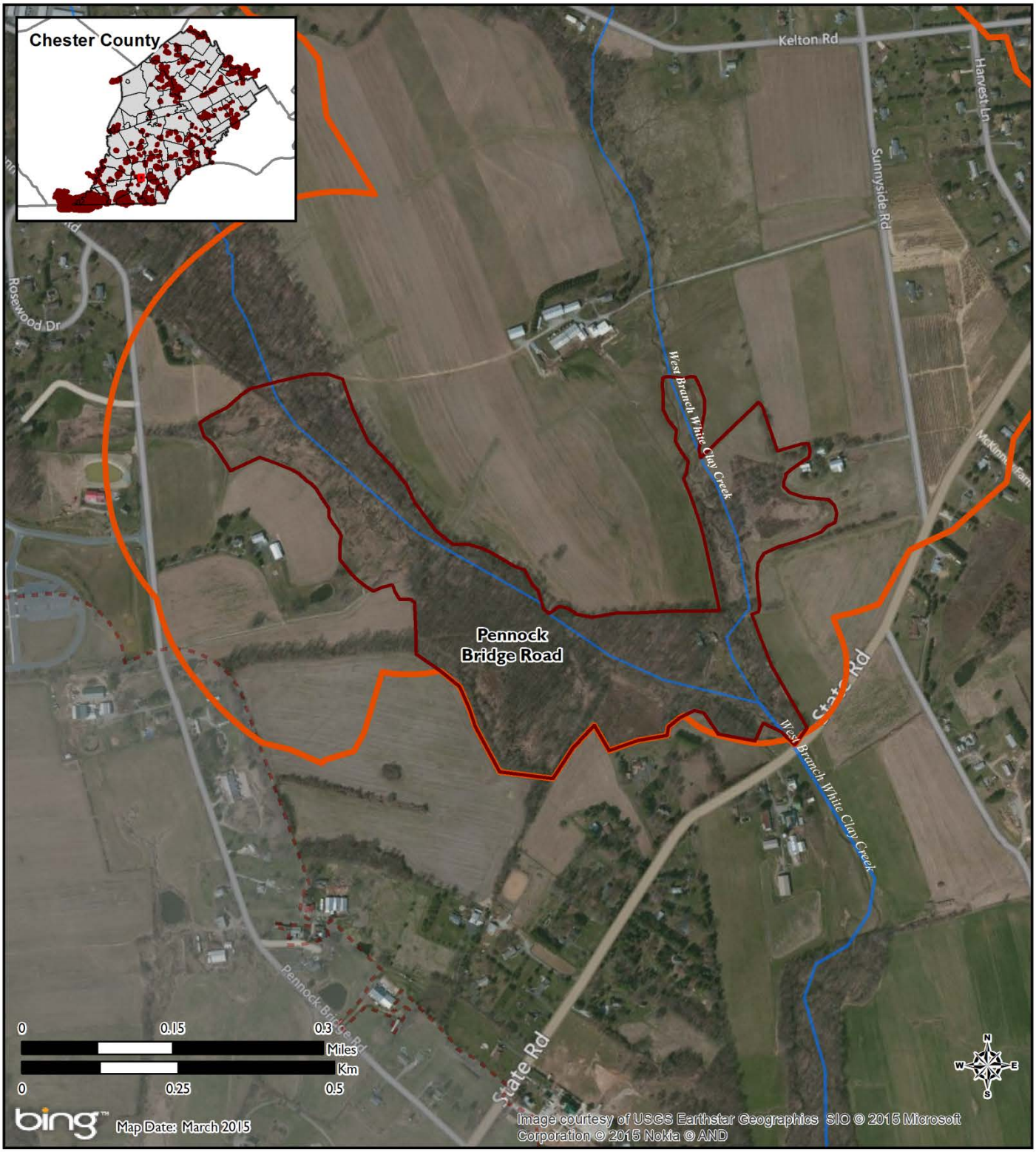
Maintain the habitat conditions and improve the vegetated buffer along the stream and wetlands within the NHA and along the rest of the stream. Avoid mowing the native vegetation along the edge of the wooded habitat.

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

- Protect the existing wooded areas from logging and other large scale disturbance. Keep the forest as intact as possible to protect the habitat and species within it.
- Widen the native vegetated buffer along stream, especially where the stream passes through agricultural fields. A width of 100 meters is ideal, but any increase will benefit the stream and adjacent wetlands.
- Maintain the existing hydrology. Any activities that occur along the roads and other areas surrounding the NHA should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.
- Remove woody species from the open wetland habitat using a minimally invasive method to protect the habitat quality.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Penn Township, New London Township*
USGS quads: *West Grove*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Pennock Bridge Road Natural Heritage Area

Riparian forests and associated wetlands support populations of several plants species of concern and 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***

Pennsgrove Road Wetland NHA

PNHP Significance Rank: *State*

Site Description

A number of small woodlots are scattered throughout the agricultural landscape in this area. Pennsgrove Road Woods NHA is a young, wet red maple woods near the headwaters of West Branch Big Elk Creek that is approximately 10 acres in size. This wooded area is located just north of Route 1 between Hayesville and Forestville. The small patch of wooded wetland is surrounded by agricultural fields and residential development. This habitat supports a population of **stiff cowbane**, a plant 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]
Stiff Cowbane (*Oxypolis rigidior*)	G5	S2	TU (PT)	7/5/1999	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.

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

Stiff cowbane is a plant species in the carrot family. Its range spans from New Jersey west to Minnesota and south to Texas and Florida. It is at the northern edge of its range in Pennsylvania and has mostly been documented in southern counties. Stiff cowbane is found in open, wet habitats.

Threats and Stresses

Due to the small size of this NHA, any disturbances to the surrounding area may have a large effect on the species found here. Fertilizers, herbicides, and sediment from the surrounding fields and lawns may wash into the wetland and degrade the water quality. Invasive species may also spread quickly through the habitat. Succession will continue to alter the habitat conditions found within this NHA.

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

- Continued succession of the young woodlot will likely alter the hydrology of the site and shade the remaining early successional habitat.
- Herbicides, fertilizers, and sediment from agricultural fields may wash into the wetland area and degrade the habitat conditions.
- Invasive species are present at this site and may displace native vegetation, including species of concern.
- Changes in hydrology may make the habitat unsuitable to the species of concern found here.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

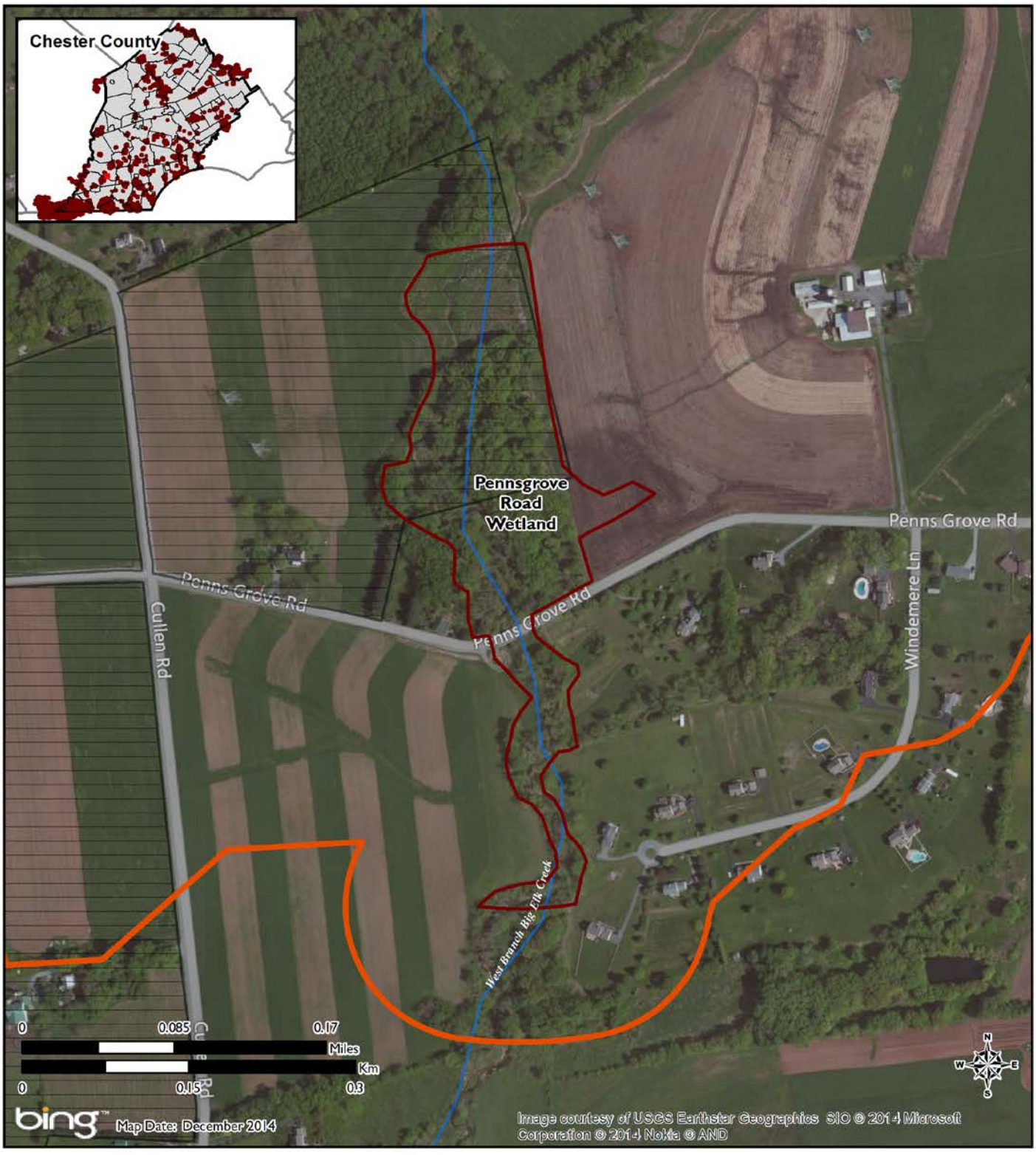
Increase the forested buffer along West Branch Big Elk Creek to protect the water quality of the stream and surrounding wetlands. Limit the use of chemicals on the fields to prevent them entering into the stream in the runoff.

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

- Maintain some areas of early successional and shrubby habitat along the edges of the red maple woods to provide habitat for stiff cowbane.
- Limit herbicide use to situations where it is necessary, such as to control invasive species. Create a sufficient vegetated buffer along the stream in order to filter sediment and chemicals from runoff. A buffer of 100 meter is ideal, but any increase will help to protect the water quality.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Maintain the existing hydrology. Any activities that occur in the fields and along roads should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Lower Oxford Township, Upper Oxford Township*
USGS quads: *Oxford*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Agricultural Easement*



Pennsgrove Road Wetland Natural Heritage Area

Forested wetland at this site supports a population of a Pennsylvania imperiled plant, stiff cowbane.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

Pickering Creek Tributary NHA

PNHP Significance Rank: *State*

Site Description

Pickering Creek Tributary NHA is located along Route 29 north of the Pennsylvania Turnpike. Two tributaries come together at Aldham before entering into Pickering Creek. The riparian habitat within the NHA is primarily wooded, but the surrounding area has been fragmented by agriculture and residential development. A quarry is also found along the southeastern edge of this site. This site supports a population of a **sensitive species of concern**, not named 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**	--	--	--	8/1/2007	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

Degradation of water quality and loss of natural habitat are critical threats to this site. Runoff from surrounding residential and industrial areas, roads, and agricultural fields can have a significant impact on the quality of the streams and surrounding wetlands.

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 storm water runoff from roadways, suburban development and agriculture should be considered a potential source of significant contamination. Runoff from these sources have significantly higher levels of sediment, nutrients, pesticides, herbicides and other pollutants than runoff filtered through a natural habitat.
- Fragmentation of the riparian vegetation due to development or infrastructure activities can result in habitat loss and degradation of the site.
- Exotic invasive plant species threaten to compete with and displace native species.
- Over-browsing by white-tailed deer is a serious threat to the overall plant diversity and forest regeneration.

Conservation Recommendations

This site will be best protected by maintaining the integrity of vegetative buffers and assuring a consistent hydrologic regime to protect streams and wetlands.

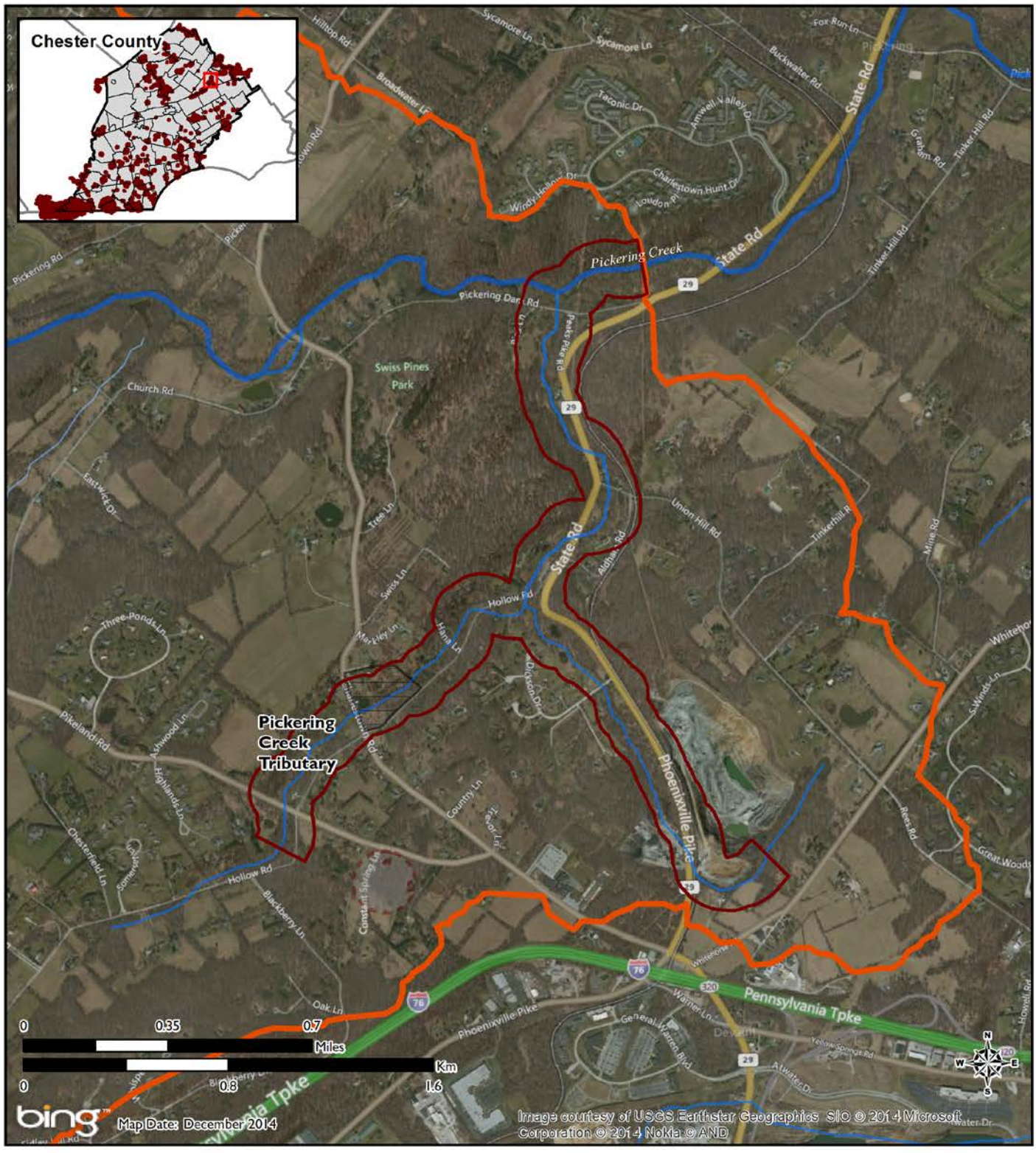
The following steps are recommended to ensure the persistence of these species at this site:

- Avoid disrupting the hydrology of the site by draining or filling the wetlands, or disturbing the surface or groundwater hydrology.

- Protect remaining portions of the forested riparian zone and repair others that have been degraded, by encouraging the growth of native vegetation. A width of at least 100 meters is ideal, but any increase will help to improve the water quality.
- Avoid fragmenting the existing wooded 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 population of species of concern, the natural landscape also helps to protect water quality of the streams that drain through this NHA.
- Control invasive species of plants to prevent native species from being crowded out by introduced species.
- Reduce the deer density in the area. Uncommon species of native plants are particularly susceptible to deer herbivory.

Location

Municipalities: *Charlestown Township*
USGS quads: *Malvern*
Previous CNHI reference: *Pickering Creek*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Pickering Creek Tributary Natural Heritage Area

Aquatic and riparian 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***
- ***Conservation Lands***

Pocopson Creek NHA

PNHP Significance Rank: *State*

Site Description

This NHA is near Corinne along Pocopson Creek and areas to the north. Much of this site is composed of open fields that support several occurrences of two plant species of concern, **Elliot's beardgrass** and **Heller's witchgrass**. Most of the occurrences of these two species have been documented along roadsides, but may be present in the larger grassy openings as well. Small woodlots and residential areas are mixed throughout the site. A sensitive species of concern, not named at the request of the jurisdictional agency overseeing its protection, was also documented at this location. Much of the area immediately surrounding the NHA has been made into housing developments.

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]
Elliott's Beardgrass (*Andropogon gyrans*)		G5	S3	N (PR)	5/31/2007	B
Heller's Witchgrass (*Dichanthelium oligosanthes*)		G5	S3	N (PT)	5/31/2007	BC
Sensitive species of concern A[3]	S	---	---	---	6/20/2012	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.

Elliot's beardgrass is at the northern edge of its range in Pennsylvania and has only been documented in a few southeastern counties. It spans from New Jersey to Illinois, south from Texas to Florida. Heller's witchgrass is located throughout North America. It has a wider distribution in Pennsylvania than Elliot's beardgrass, but the majority of the occurrences are located in the southeast. Both species needs open, early successional habitat in order to persist.

Threats and Stresses

Succession is a major threat to the many open pastures scattered throughout this NHA. Development may also be an issue, given the large number of surrounding housing developments.

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

- Succession threatens the grass species located at this site. Allowing woody species to take over the open, grassy areas will threaten the persistence of the species of concern.
- Development of areas within the NHA will likely destroy habitat used by species of concern.
- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Herbicide use, especially along the roads, may have a major impact on the species of concern found at this site.

Conservation Recommendations

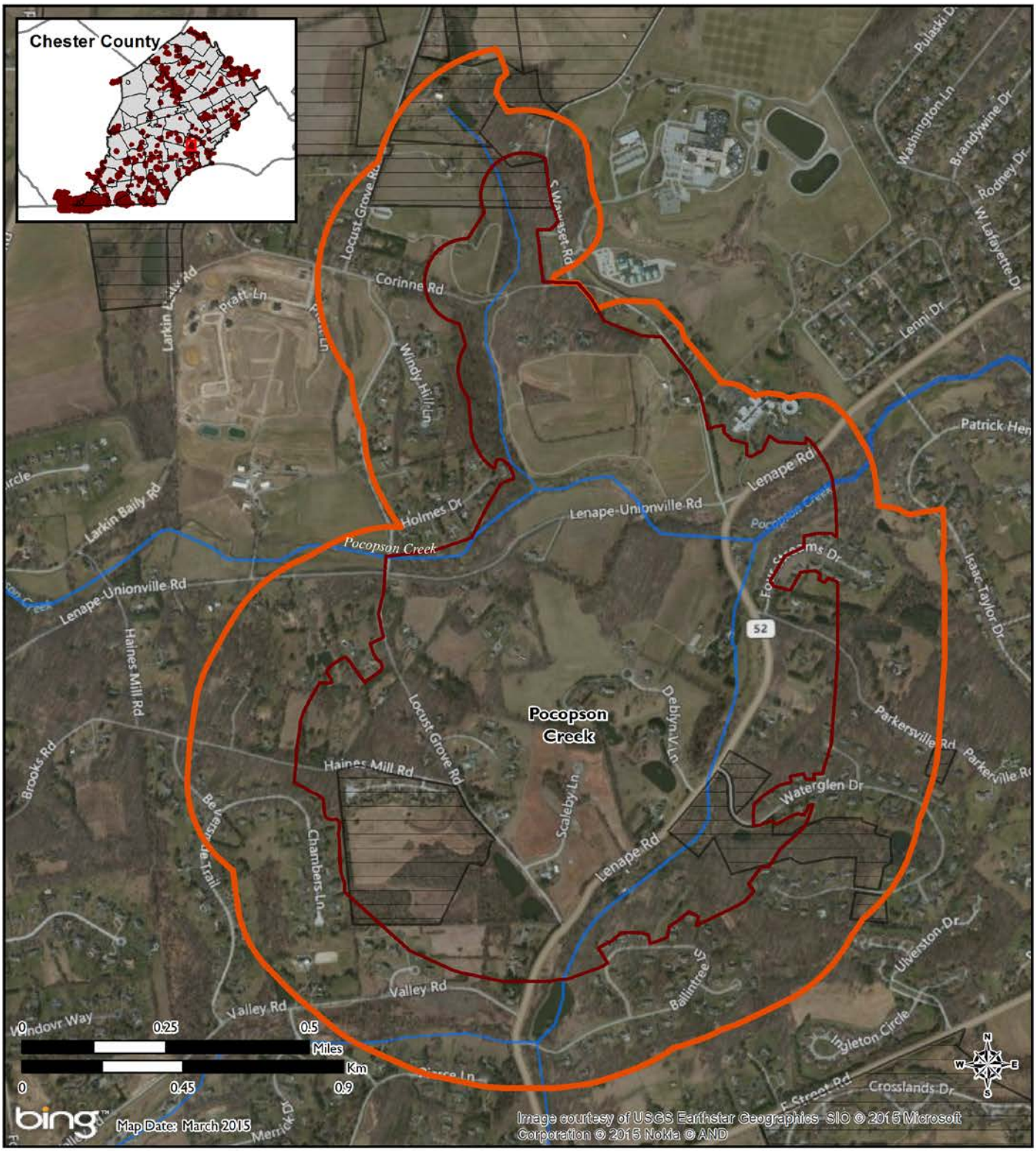
As with most early successional habitats, active management is needed to preserve the habitat and prevent the growth of woody species. Forested habitats should be protected to prevent further degradation that may impact species of concern and other native species.

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

- Maintain the grassy habitat by mowing or grazing often enough to prevent the establishment of woody species.
- Protect the existing forested areas from logging and disturbance along the forest edge. Maintaining intact habitats will help to preserve habitat for as many native species as possible.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations. Further disturbance within this habitat will create additional opening for the establishment and spread of invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Limit herbicide use, especially along roads that may support species of concern.

Location

Municipalities: *Pocopson Township*
USGS quads: *Unionville*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Easement*



Pocopson Creek Natural Heritage Area

This site supports populations of two plant species of concern in Pennsylvania: Elliott's beardgrass, Heller's witchgrass, and an additional sensitive species of concern.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Radley Run NHA

PNHP Significance Rank: *State*

Site Description

Located in southeastern Chester County, this NHA includes riparian and wetland habitats along Radley Run, a tributary to Brandywine Creek at the town of Pocopson. Wetland, riparian forest and aquatic habitats support a **sensitive species of concern**. This species cannot be named 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**	---	---	---	2/26/2013	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 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 sensitive species of concern at this site relies on good water quality, and is vulnerable to siltation and chemical pollution.

Conservation Recommendations

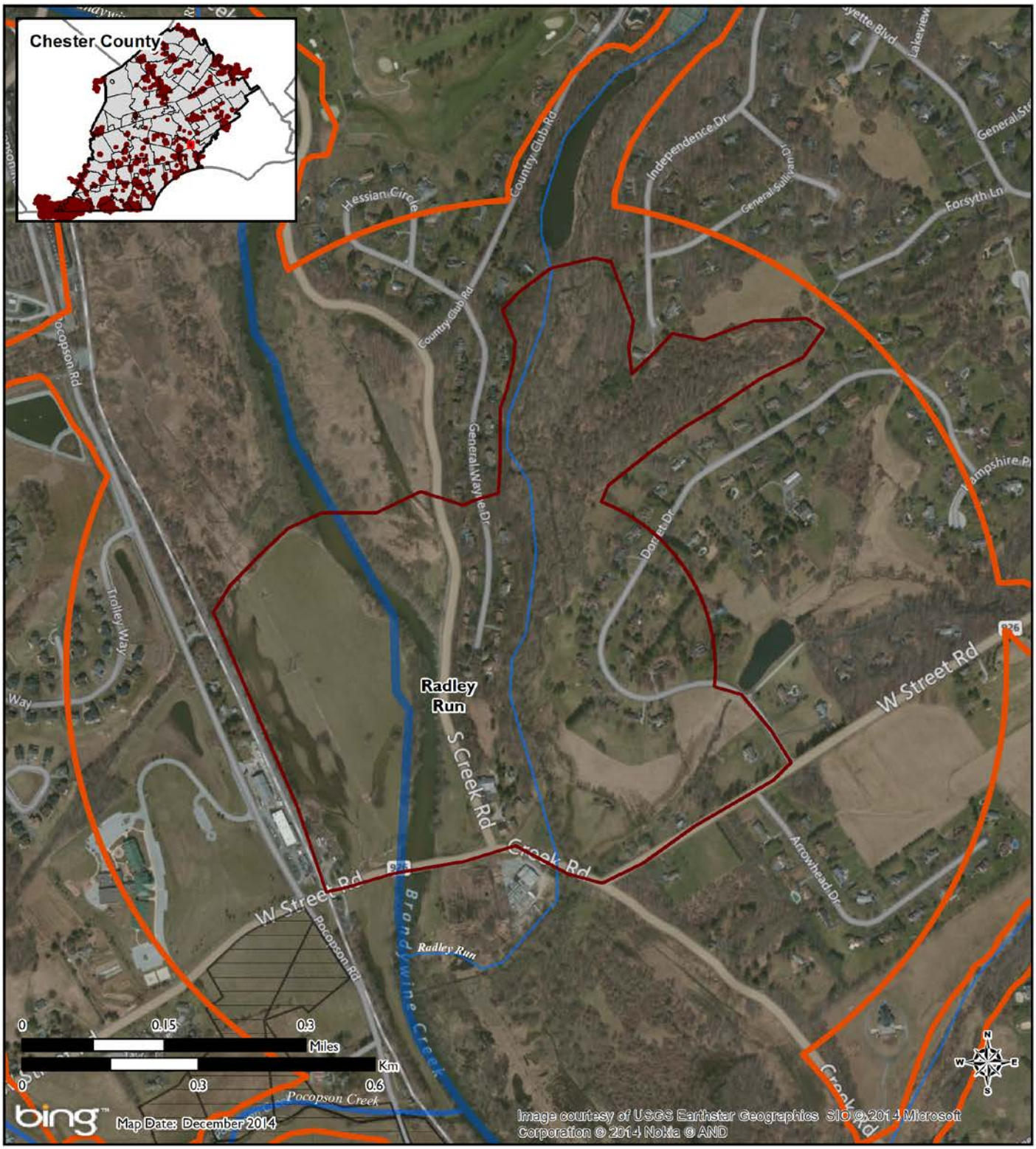
The entire site is privately owned and landowners in the Core Habitat should be aware that the species is sensitive to disturbance.

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

- Avoid disturbance from human activities within the Core Habitat during the breeding season (December – July).
- Additional development within the Core Habitat should be avoided to protect the sensitive species of concern.
- 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.
- 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.
- 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 are. Maintaining high quality aquatic habitat is important to this species.

Location

Municipalities: *Birmingham Township, Pocopson Township*
USGS quads: *West Chester, Unionville*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Radley Run
Natural Heritage Area

This site supports a sensitive species of concern.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Red Clay Creek West Branch NHA

PNHP Significance Rank: *State*

Site Description

Located in central Chester County, this NHA includes riparian forested wetlands along the West Branch of Red Clay Creek just east of Byrd Road. Riparian forests and wetlands at this site 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	---	---	---	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.

Threats and Stresses

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

- 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 of concern at this site rely on good water quality, and are vulnerable to siltation and chemical pollution.

Conservation Recommendations

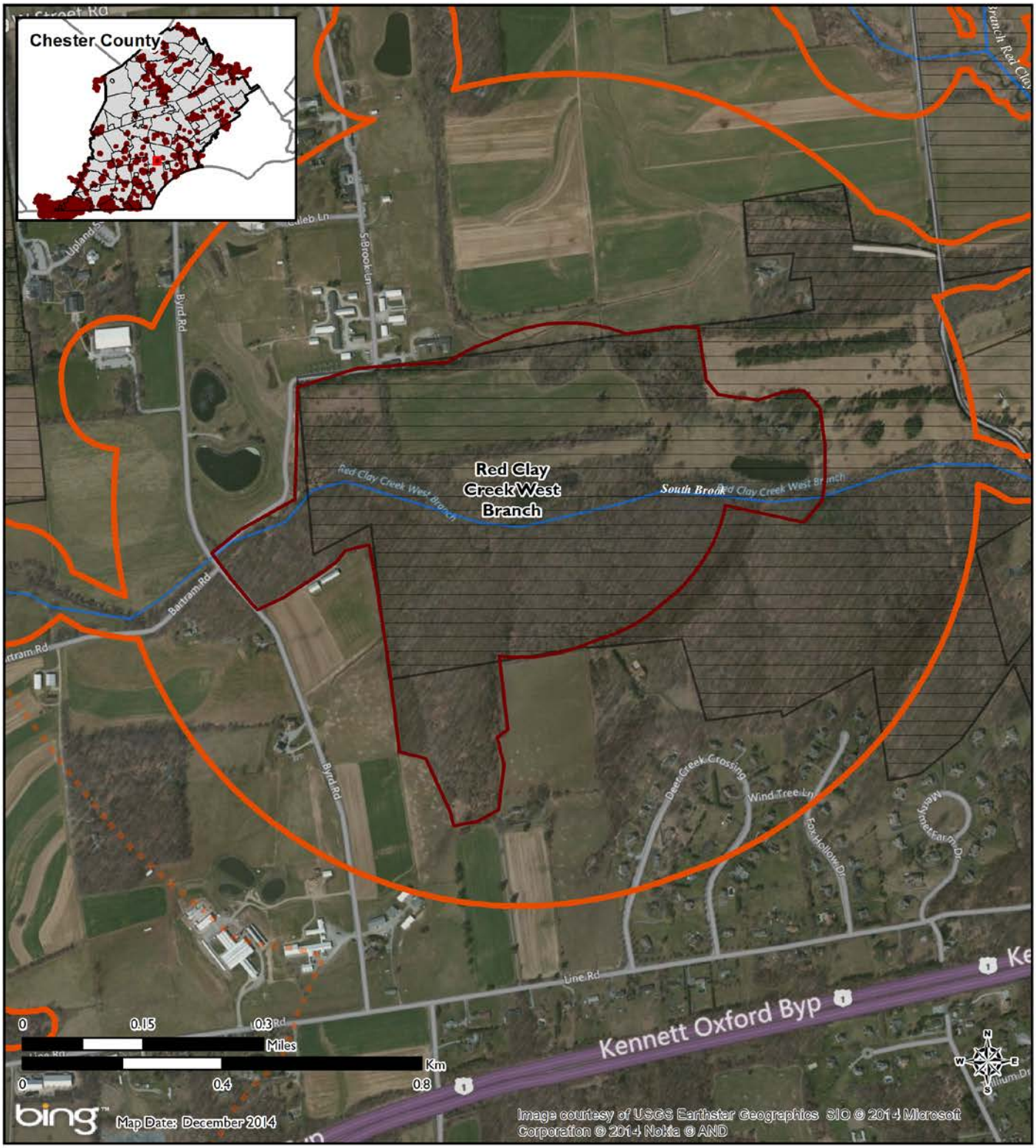
Additional development within the Core Habitat should be avoided to protect the sensitive species of concern. Disturbance within the Core Habitat should not be a problem for this species if it occurs during non-breeding season (August – May).

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 June through July breeding season.
- Maintain at least a 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: *East Marlborough Township*
USGS quads: *Kennett Square, West Grove*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Easement*



Red Clay Creek West Branch Natural Heritage Area

Aquatic and forested wetland habitats support 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 Supporting Landscape***
- ***Conservation Lands***

Ridley Creek Headwaters NHA

PNHP Significance Rank: *State*

Site Description

Most of Ridley Creek Headwaters NHA is in Delaware County near Willistown. The northern portions of this NHA that extend into Chester County are delineated around Hunters Run and other small tributaries to Ridley Creek. The section along Hunters Run continues north of Route 3, but most of the site is to the south. This site has been heavily disturbed and consists mostly of residential development with some small agricultural fields and woodlots. A serpentine forest once existed in part of this NHA that has now been developed. Despite the significant changes to the landscape, this area still provides habitat for several species of concern. **Tiger spiketail**, a dragonfly species of concern, was identified at this site. An open, seasonally wet pond dominated by rice cut grass supports a population of **tooth-cup**, a plant species of concern found growing on open muddy habitat. This NHA also provides habitat for a sensitive species of concern, not named 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]
Tiger Spiketail (*Cordulegaster erronea*)		G4	S3	N (N)	8/19/2010	E
Tooth-cup (*Rotala ramosior*)		G5	S3	PR (PR)	8/6/2000	B
Sensitive species of concern A[3]	S	---	---	---	6/21/1997	E
Sensitive species of concern B[3]	S	---	---	---	6/21/1997	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.

Tiger spiketail has been documented from Massachusetts west to Wisconsin and south to Georgia and Mississippi, although many of these are older records. It has been documented in several counties throughout Pennsylvania. This dragonfly is found in forested streams and seeps.

Tooth-cup grows in exposed, wet habitats. This species has a wide range covering most of the United States and into Canada. In Pennsylvania it is most commonly seen along the Susquehanna River, and has been documented in southeastern counties as well.

Threats and Stresses

Further development within this NHA can destroy the small amounts of remaining habitat. Changes in the existing hydrology may alter the wetland habitats. Runoff from lawns and along roads carry sediment, herbicides, and fertilizers into the streams and wetlands, degrading the water quality.

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

- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Logging can further fragment the existing forest and alter the conditions of the habitat needed by the species of concern.

- Degradation of water quality or quantity can have a negative impact on the habitat supporting the species of concern found at this location. Runoff from industrial and residential development, agricultural fields, and roads have significantly higher levels of sediment, nutrients, pesticides, herbicides and other pollutants than runoff filtered through a natural habitat.
- Draining or flooding of wet meadow and forested wetland habitats can eliminate suitable habitat for the species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

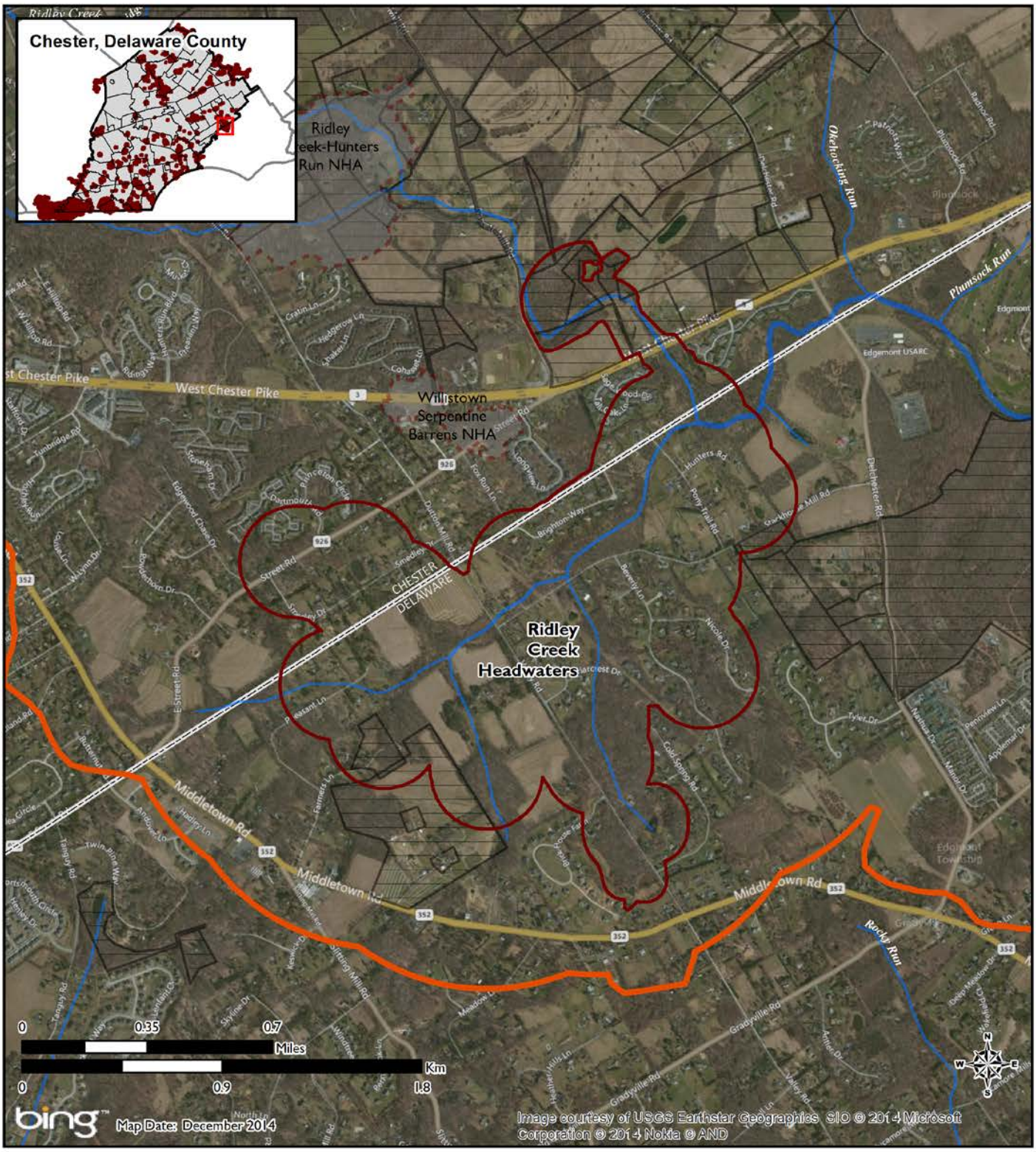
This NHA is almost entirely privately owned. The large number of landowners within this site will make conservation actions difficult to implement. Avoid further alterations to this habitat and maintain the current hydrologic conditions. Increase buffers of native vegetation along streams and wetlands. A width of 100 meters is ideal, but expansion will help to improve the water quality.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Protect remaining portions of the forested riparian zone and repair others that have been degraded, by encouraging the growth of native vegetation. Careful determination is needed to avoid planting trees in floodplains that should remain as open canopied herbaceous wetland habitats. These habitats should be maintained in their current open condition, with tree plantings to occur uphill of areas containing hydric soils.
- Storm water management measures such as the creation of detention basins or vegetated swales should be implemented to decrease the unfiltered flow down the slopes into the creek floodplain.
- Avoid disrupting the hydrology of the site by draining or filling the wetlands or disturbing the surface or groundwater hydrology.
- Avoid fragmenting the existing wooded 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 population of species of concern, the natural landscape also helps to protect water quality of the streams that drain through this NHA.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Willistown Township, Edgmont Township, Westtown Township*
USGS quads: M*edia, West Chester*
Previous CNHI reference: *Willistown Serpentine Barrens*
Associated NHAs: *None*
Overlapping Protected Lands: *Willistown Conservation Trust Easement, Brandywine Conservancy Easement, Agricultural Easement*



Ridley Creek Headwaters Natural Heritage Area

Wetlands that form the headwaters to Ridley Creek support populations of tooth-cup, a state rare plant, and tiger spiketail, a state rare dragonfly, 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 Core Habitat***
- ***Other Supporting Landscape***
- ***Conservation Lands***

Ridley Creek-Hunters Run NHA

PNHP Significance Rank: *State*

Site Description

Ridley Creek – Hunters Run NHA is located near Dutton Mill at the confluence of the two streams and includes other small tributaries. The wooded habitat within this NHA is dominated by shagbark hickory and red maple. It has been fragmented with several houses and is surrounded by agricultural fields and other small woodlots. Several small man made ponds are found within the NHA and Ridley Creek has been dammed in locations upstream from this site. The floodplain and streamside habitat in this NHA supports populations of **autumn bluegrass** and **Yadkin River panic-grass**, two plant 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]
Yadkin River Panic-grass (*Dichanthelium yadkinense*)		G4Q	S1	TU (PE)	6/16/2002	BC
Autumn Bluegrass (*Poa autumnalis*)		G5	S1	PE (PE)	6/6/2007	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.

In Pennsylvania, autumn bluegrass has been documented in several southwestern counties and is typically found along stream banks and in moist woods. It is more common in the southern portions of its range, which spans from New Jersey west into Michigan and south to Florida and Texas. Autumn bluegrass is considered critically imperiled in Pennsylvania due to the small number of known populations in a small geographical area.

Yadkin River panic-grass is found from Pennsylvania to Illinois and south to Georgia and Louisiana. In Pennsylvania, this species is found in the southeastern corner of the state. Yadkin River panic-grass is most often found growing in wet, sandy soil along shaded streams. It has been classified as critically imperiled due to the small number of populations documented in Pennsylvania.

Threats and Stresses

Invasive species are abundant throughout this site, especially along the edge habitat and are the biggest threat to the site and the native species found within it. Fragmentation of the remaining wooded habitat and further alteration of the hydrology may impact habitat conditions found at this site.

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

- Further fragmentation of the small patch of existing forest may alter the structure of the habitat and allow an increase in invasive species.
- Changes in the currently hydrology could significantly alter the habitat for the plant species of concern by making conditions either too wet or too dry to be able to persist at this site.
- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.

- Herbicides, fertilizers, and sediment from lawns, right-of-ways, and roads may wash into the forested area and degrade the habitat conditions.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

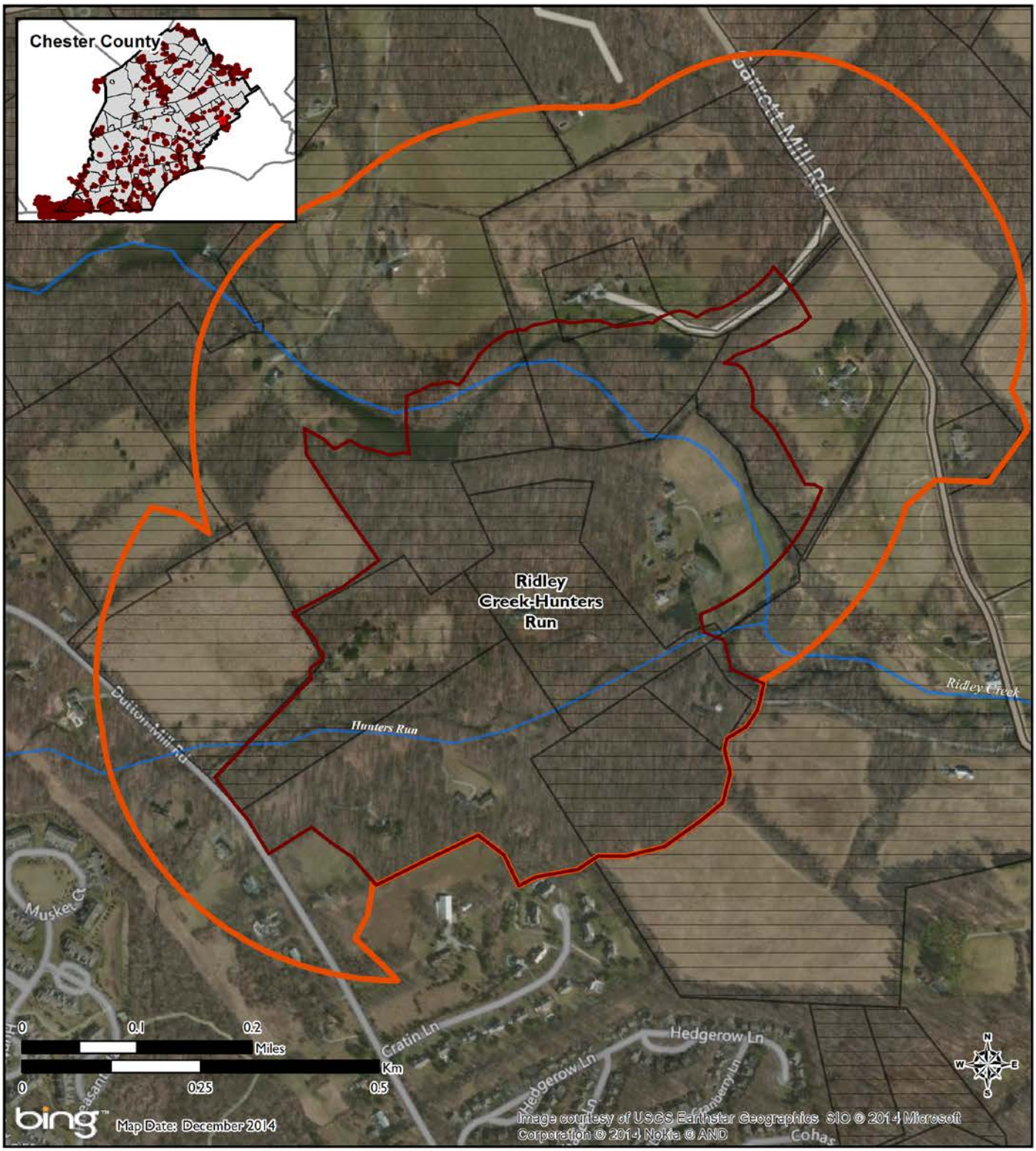
Minimize disturbance to the remaining forest. Maintain the forested buffer along the stream and improve it wherever possible. Control invasive species in order to preserve the native species found in this NHA. Maintain the existing hydrology of the streams and wetlands and consider restoring the natural flow of Ridley Creek and other dammed areas.

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

- Protect the existing forested areas from logging and other large scale disturbance. Keep the forest as intact as possible to protect the habitat and species within it.
- Maintain the existing hydrology. Any activities that occur near the NHA should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Willistown Township*
USGS quads: *Media, West Chester*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Willistown Conservation Trust Easement*



Ridley Creek-Hunters Run Natural Heritage Area

Upland and floodplain forest at this site support two plant species of concern: Yadkin River panic-grass and Autumn bluegrass.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Robert B. Gordon Natural Area NHA

PNHP Significance Rank: *State*

Site Description

Robert B. Gordon Natural Area NHA is part of a protected area owned by West Chester University. The natural area is managed to protect the habitat and for use in research projects. Recreational trails have also been created through the area. The wooded habitat is surrounded by residential development and the university's athletic fields. This NHA is a mixed hardwood forest that is approximately 70 acres in size and is dominated by tulip poplar and red maple. This wooded habitat supports a population of **autumn bluegrass**, a plant species of concern. It also provides habitat for a **sensitive species of concern**, not named 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]
Autumn Bluegrass (*Poa autumnalis*)		G5	S1	PE (PE)	5/30/2007	C
Sensitive species of concern A[3]	S	---	---	---	5/22/2007	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.

In Pennsylvania, autumn bluegrass has been documented in several southwestern counties and is typically found along stream banks and in moist woods. It is more common in the southern portions of its range, which spans from New Jersey west into Michigan and south to Florida and Texas. Autumn bluegrass is considered critically imperiled in Pennsylvania due to the small number of known populations in a small geographical area.

Threats and Stresses

Fragmentation of the wooded habitat would alter species composition and allow for the introduction and expansion of invasive species Deer density in this area is high and has significantly impacted the habitat structure.

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

- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- High intensity recreation may cause erosion along trails and disturb other portions of the habitat.
- Further fragmentation of the small patch of existing forest may alter the structure of the habitat and allow an increase in invasive species.

Conservation Recommendations

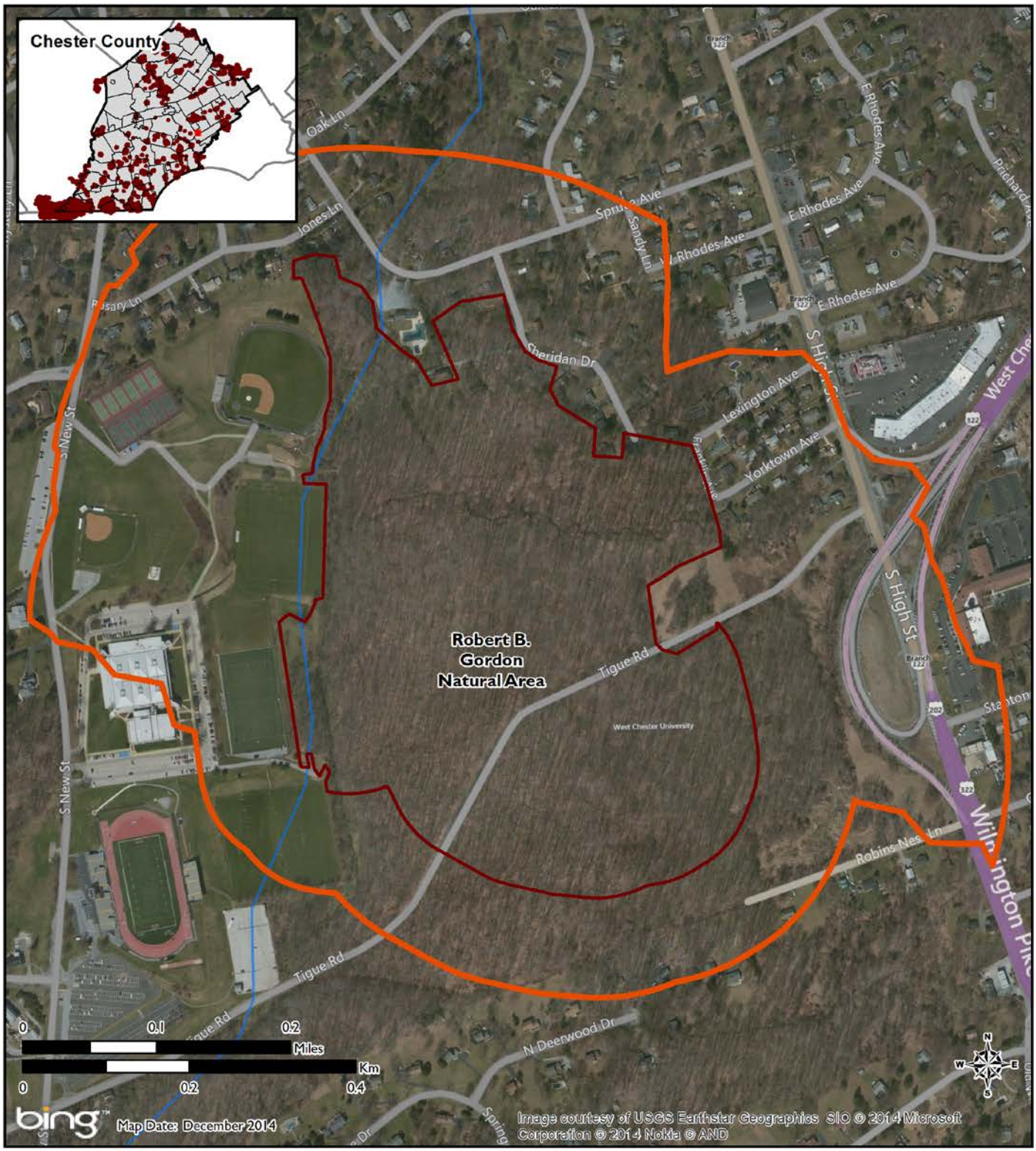
Maintaining this habitat for conservation and research should help to preserve the conditions at this site. Limit recreation to low intensity activities, and avoid createing additional trails or other disturbances that may increase erosion or spread invasive species of plants. Reduce deer density to lessen the impact of deer browse on the habitat.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations. Further disturbance within this habitat will create additional opening for the establishment and spread of invasive species.
- Reduce deer density, then continue to monitor and maintain it at a level that is able to be supported by the landscape.
- Limit recreational activities to those that will have minimal impact on the surrounding habitat. Maintain the existing trails to prevent erosion and do not create additional openings in the wooded habitat.
- Protect the existing wooded areas from logging and disturbance along the woodland edge. Maintaining as many intact habitats as possible, given the location within a residential area, will help to preserve habitat for as many species as possible.

Location

Municipalities: *West Goshen Township, Westtown Township*
USGS quads: *West Chester*
Previous CNHI reference: *RB Gordon Natural Area*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Robert B. Gordon Natural Area
Natural Heritage Area

Mixed hardwood forest at this site supports a population of state endangered Autumn bluegrass and a sensitive species of concern.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

Rochambeau Drive Swale NHA

PNHP Significance Rank: *State*

Site Description

Rochambeau Drive Swale is an open area within a housing development situated between Mount Misery and the Pennsylvania Turnpike. A number of residential areas surround this NHA. This site is made up of lawns, shrubby habitat, and a wet open meadow. The wet habitat supports a population of **grass-leaved rush**, a plant 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]
Grass-leaved Rush (*Juncus biflorus*)	G5	S2	TU (PT)	7/24/2004	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.

Grass-leaved rush has been documented from Massachusetts west to Michigan and south to Florida and Arizona. This species is found in open wet habitats throughout the state, but most populations occur in the southeastern counties.

Threats and Stresses

Succession of the grassy, open habitats with shrubs and other woody species will alter the existing habitat conditions. Many species rely on this early successional habitat to persist at this site. Invasive species can significantly alter the species composition.

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

- Succession that is not controlled by mowing or other methods of disturbance will likely cause the habitat to become unsuitable for the species of concern to be able to persist at this site.
- Changes in hydrology may make the habitat unsuitable to the species of concern found here.
- Herbicides used along the road and right-of-ways may cause direct mortality to the species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Invasive species can take over portions of the habitat currently used by the species of concern and other native species.

Conservation Recommendations

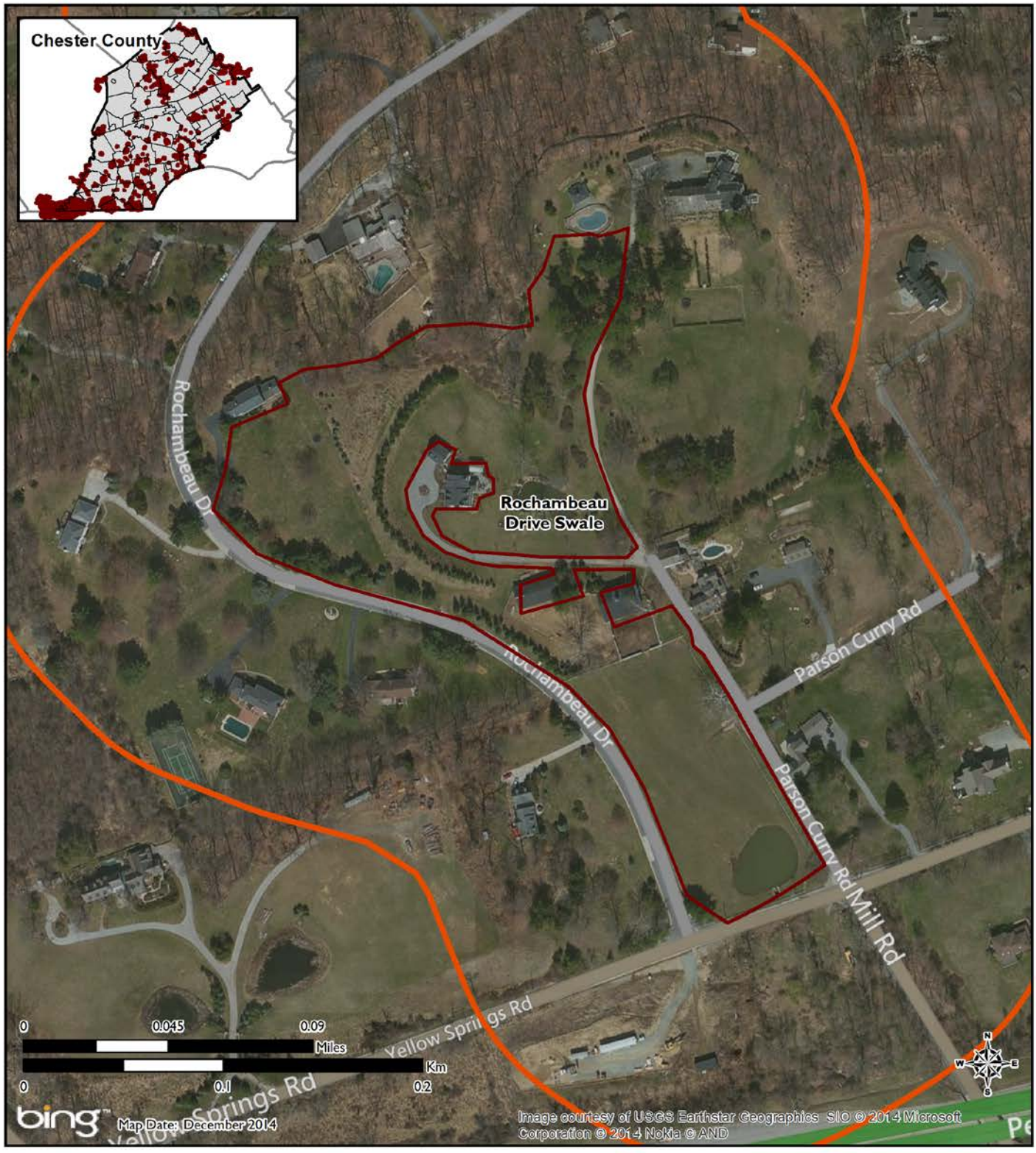
Perform periodic maintenance in the early successional openings, preferably done outside of the growing season. Maintain the existing hydrology of the wet area. Remove invasive species to preserve habitat conditions for as many native species as possible.

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

- The species of concern at this site require open habitat that needs to be maintained. The needs of this species should be considered when planning the timing and frequency of maintenance.
- Avoid alteration of the current wetland hydrology or areas downstream.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.

Location

Municipalities: *Tredyffrin Township*
USGS quads: *Valley Forge*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Rochambeau Drive Swale Natural Heritage Area

A wet swale wetland supports a population of grass-leaved rush, an imperiled plant species in Pennsylvania.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

Rock Run Railroad Woods NHA

PNHP Significance Rank: *State*

Site Description

A bend of West Branch Brandywine Creek creates the eastern and southern border of Rock Run Railroad Woods NHA. The forested area sits between Route 30 and Route 82 near Rock Run. A railroad runs to the north of West Branch Brandywine Creek. The steep hillside rock outcrop above the tracks supports a population of **wild kidney bean**, a plant 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]
Wild Kidney Bean (*Phaseolus polystachios*)	G5	S1S2	N (PE)	10/2/1993	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.

Wild kidney bean is distributed across most of the eastern United States. Its range stretches from New York west to Michigan and south to Florida and Texas. In Pennsylvania it has a scattered distribution, with the majority of occurrences in the southeastern counties. Wild kidney bean can be found in a variety of habitats, including open woods, thickets, banks, and slopes.

Threats and Stresses

Fragmentation within the NHA would alter the conditions of the forested habitat and species composition by increasing the edge habitat. Invasive species threaten to outcompete native species, especially in disturbed areas.

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

- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Herbicides and fertilizers used along railroad, roads, and on lawns may wash into the forested area and degrade the habitat or cause direct mortality.
- Succession of the shrubby habitat may shade the area too much for the wild kidney bean to persist.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

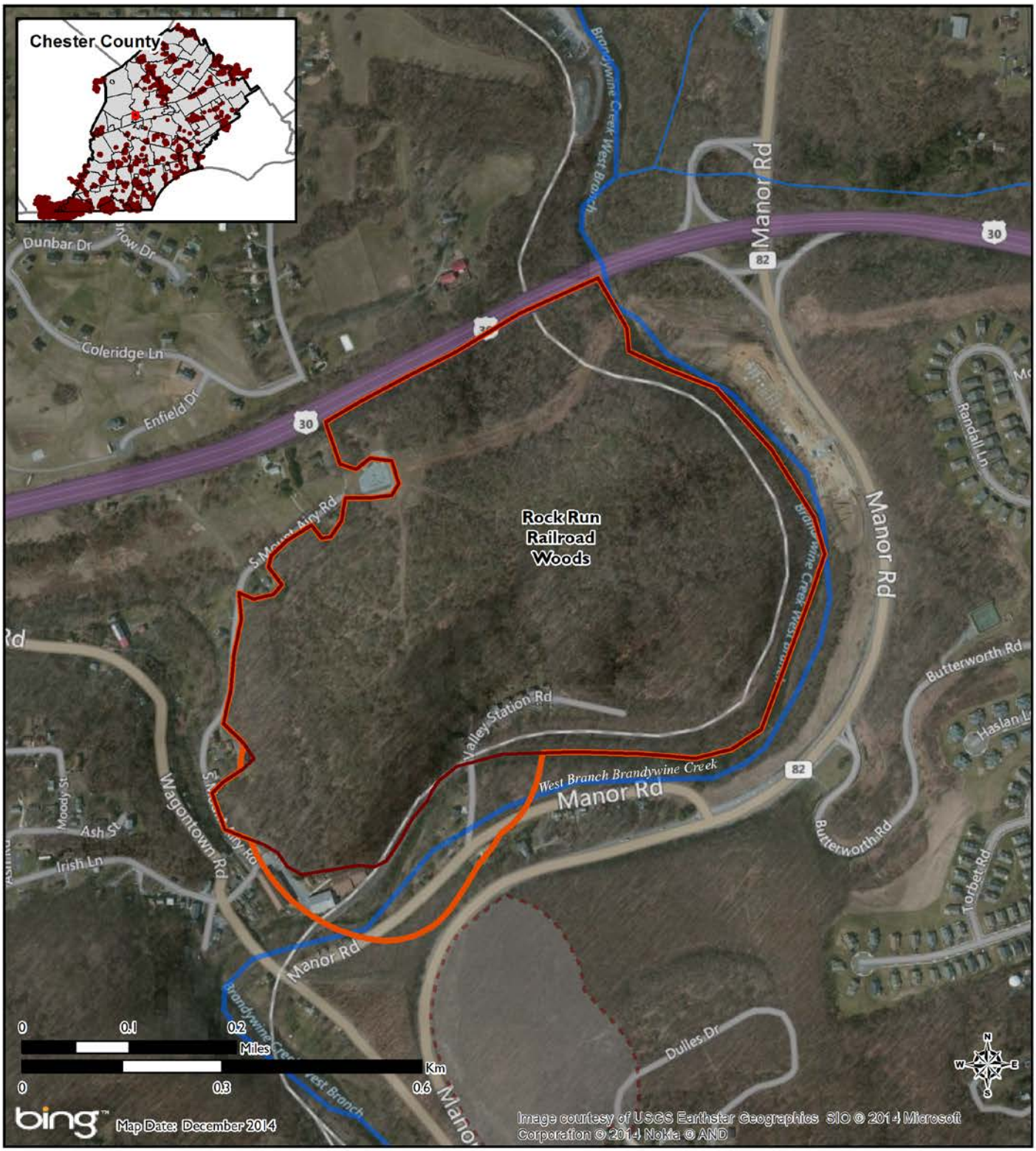
Remove invasive species where possible, especially the Japanese honeysuckle along the rock outcrop. Avoid further fragmentation of the forested habitat with additional roads, houses, or other infrastructure.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Limit the application of chemicals within the NHA and surrounding areas in order to protect the quality of the habitat.
- Periodically cut woody vegetation to maintain the current habitat conditions. Time maintenance with consideration to limit disturbance of wild kidney bean.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Coatesville City, Valley Township*
USGS quads: *Wagontown, Coatesville*
Previous CNHI reference: *Rock Run Railroad Site*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Rock Run Railroad Woods Natural Heritage Area

A rocky outcrop provides habitat for a population of the wild kidney bean, an imperiled 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***

Rock Run Thicket NHA

PNHP Significance Rank: *State*

Site Description

This NHA is located just east of Harmonyville in northern Chester County and includes about a one and a half mile stretch of oak forests and wetlands along Rock Run. These riparian forested habitats support a population of **sweet bay magnolia**, a state threatened tree species, and a **sensitive species of concern,** which cannot be named 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]
Sweet Bay Magnolia (*Magnolia virginiana*)		G5	S2	PT (PT)	10/12/1992	D
Sensitive species of concern A[3]	S	---	---	---	6/5/2006	E
Sensitive species of concern B[3]	S	---	---	---	6/5/2006	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.

Sweet bay magnolia is predominately found along the Atlantic Coast and southern United States, from Massachusetts and New York south and west to Florida and Texas. It is more common in the southern portion of its range. Sweet bay magnolia is near the northern end of its range in Pennsylvania and has been documented in several southern counties. This species is found in wet woods and swamps. It is also planted as an ornamental species, which may make identifying native populations difficult.

Threats and Stresses

Degradation of water quality and loss of natural forest and wetland habitat are critical threats to this site.

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

- Degradation of riparian zones within this NHA threatens the integrity of water quality in Rock Run and its adjacent wetlands. The storm water runoff from roadways and rural development should be considered a potential source of significant contamination. Runoff from these sources has significantly higher levels of pollutants than runoff filtered through a natural habitat.
- Natural succession from open, wet meadow floodplains to shrub and tree dominated habitats can eliminate suitable open canopied habitats supporting the sensitive species of concern.
- Forest fragmentation due to development or infrastructure activities could result in habitat loss

Matthew Herron, iNaturalist

Sweet Bay Magnolia

and degradation of the site. Forest habitat should be maintained to preserve the population of sweet bay magnolia.
- Exotic invasive plant species threaten to compete with and displace native species.

Conservation Recommendations

The majority of this NHA is privately owned. Additional development within the Core Habitat should be avoided to protect sweet bay magnolia and the sensitive species of concern. This site will be best protected by maintaining the integrity of riparian buffers with native vegetation and assuring a consistent hydrologic regime to protect wetlands.

The following steps are recommended to ensure the persistence of these species at this site:
- Avoid disrupting the hydrology of the site by draining or filling the wetlands, as well as disturbing the surface or groundwater hydrology.
- Maintain open, wet meadow habitats by periodic removal of woody species of plants. This action will temporarily help set back succession to a closed canopy habitat and preserve the open, wet meadow habitat conditions preferred by the species of concern.
- Protect the riparian zone and repair others that have been degraded by encouraging the growth of native vegetation. Careful determination is needed to avoid planting trees in floodplains that should remain as open canopied herbaceous wetland habitats. These habitats should be maintained in their current open condition, with tree plantings to occur uphill of areas containing hydric soils.
- Avoid fragmenting the existing forests and wetlands 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.
- 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 and 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.

Location

Municipalities: *South Coventry Township, Warwick Township, North Coventry Township*
USGS quads: *Pottstown*
Previous CNHI reference: *Rock Run Thicket*
Associated NHAs: *None*
Overlapping Protected Lands: *Agricultural Easement*

Rock Valley Woods NHA

PNHP Significance Rank: *State*

Site Description

Valley Hills is a stretch of wooded habitat north of Coatesville. Several residential developments have been built in this area, fragmenting the habitat. Rock Valley Woods NHA is a remnant wooded area east of Route 82 above West Branch Brandywine Creek. Recreational trails are found throughout this area that have created openings in the canopy. The canopy is dominated by sassafras and bigtooth aspen. The less dense areas of the woodland provide habitat for **a eupatorium** and **stagger-bush**, two plant species of concern found in open woods.

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]
A Eupatorium (*Eupatorium rotundifolium*)		G5	S3	TU (TU)	8/25/2005	C
Stagger-bush (*Lyonia mariana*)		G5	S1	PE (PE)	8/3/2006	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.

A variety of open, disturbed habitats are used by a eupatorium, including woodland edge habitat, thickets, and old fields. This species is found from Maine south and west to Florida and Texas. In Pennsylvania, it is found in several southern counties, particularly in the southeast. Habitat loss, succession, and exotic species are major threats. Disturbance is likely necessary to maintain the habitat necessary for this species.

Stagger-bush is most commonly found along the Atlantic Coast and has also been documented in the southern United States as well. In Pennsylvania, this species is listed as endangered due to the limited range that spans several southeastern counties. Stagger-bush is often found in swamps and forests on sandy soils.

Threats and Stresses

High intensity recreation, mostly through ATV use, has created many disturbances through the habitat. These areas can create openings where invasive species can more easily colonize. Further development of the area will continue to isolate the wooded habitat that has become scattered.

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

- Succession of the open wooded habitat may cause the area used by the species of concern to become overgrown and shaded by woody species.
- ATV use may directly damage species of concern or create disturbances that cause erosion and other negative impacts on the habitat.
- Invasive species can take over portions of the habitat currently used by the species of concern and other native species.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

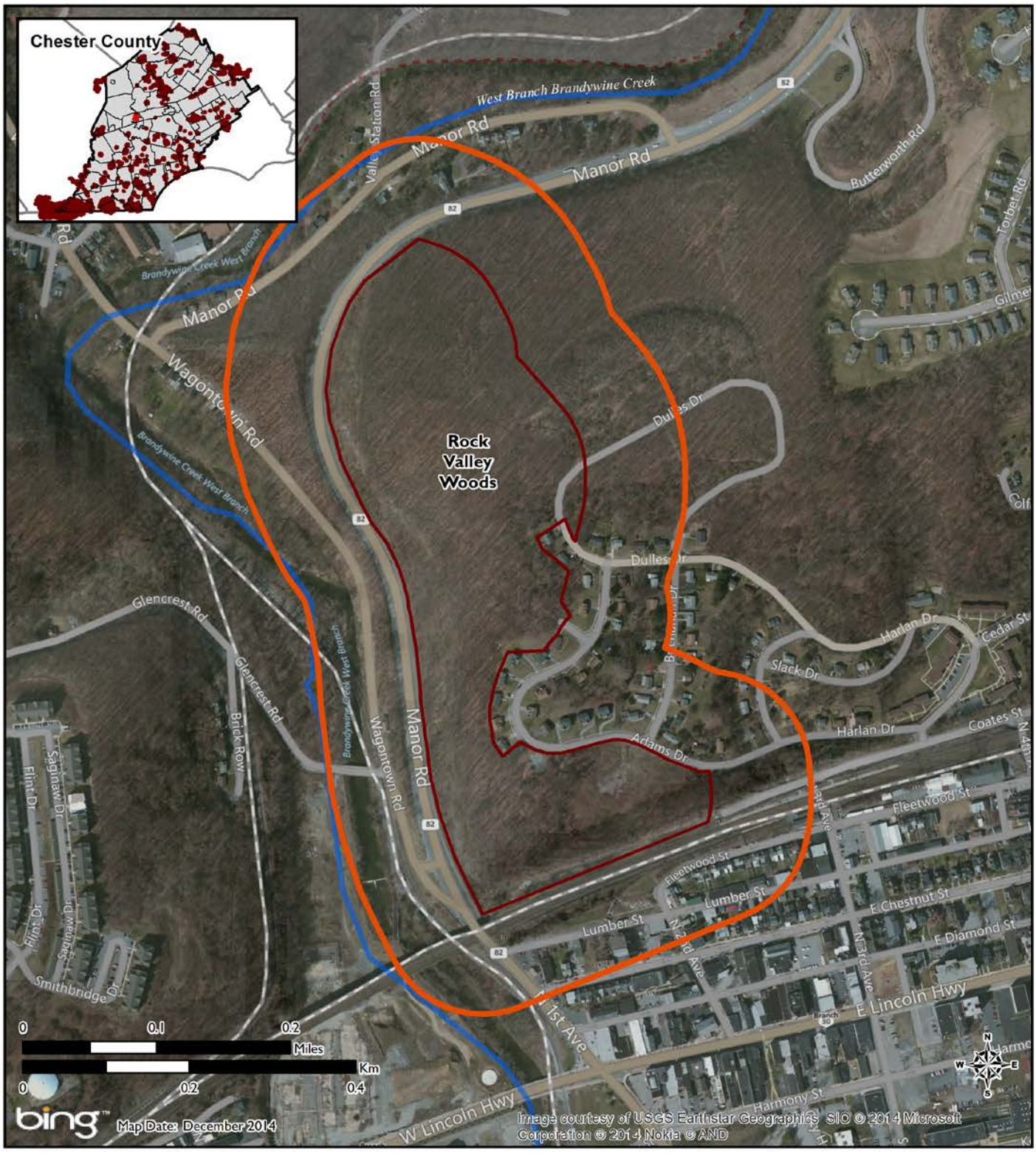
Avoid fragmenting the remaining wooded area, but some removal of woody species may be necessary to maintain the canopy openings.

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

- Periodically clear woody species from the openings that support species of concern. Maintenance should be done outside of the growing season, and these areas should be monitored to prevent invasive species from overtaking newly created openings. The needs of the species of concern should be considered when planning the timing and frequency of maintenance.
- Prohibit or limit ATV use in this area in order to protect the habitat currently used by the species of concern at this site.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Coatesville City, Valley Township*
USGS quads: *Coatesville*
Previous CNHI reference: *Rock Valley Woods*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Rock Valley Woods Natural Heritage Area

Upland forest supports populations of two plant species of concern: stagger-bush and Eupatorium.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Rosedale-Bayard Roads NHA

PNHP Significance Rank: *State*

Site Description

Rosedale-Bayard Road NHA consists of open meadow and forest habitat along a tributary to East Branch Red Clay Creek. Housing developments surround much of this NHA. The open forested wetlands and early successional habitat supports a population of **grass-leaved rush**, a plant 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]
Grass-leaved Rush (*Juncus biflorus*)	G5	S2	TU (PT)	7/12/2002	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.

Grass-leaved rush has been documented from Massachusetts west to Michigan and south to Florida and Arizona. This species is found in open, wet habitats throughout the state, but most populations occur in the southeastern counties.

Threats and Stresses

Invasive shrub species are present throughout this NHA. If they are not controlled, they may outcompete native species and contribute to succession of the meadow. Succession and excessive mowing can both affect the species composition of the habitat in the grassy areas.

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

- Succession that is not controlled by mowing or other methods of disturbance will likely cause the habitat to become unsuitable for the species of concern to be able to persist at this site.
- Invasive species can take over portions of the habitat currently used by the species of concern and other native species.
- Herbicide use along the road may cause direct mortality to the species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

Periodic maintenance is needed to prevent succession of the meadow. A balance needs to be achieved so that the disturbance is enough to slow the growth of woody species but still allows native early successional species to flourish.

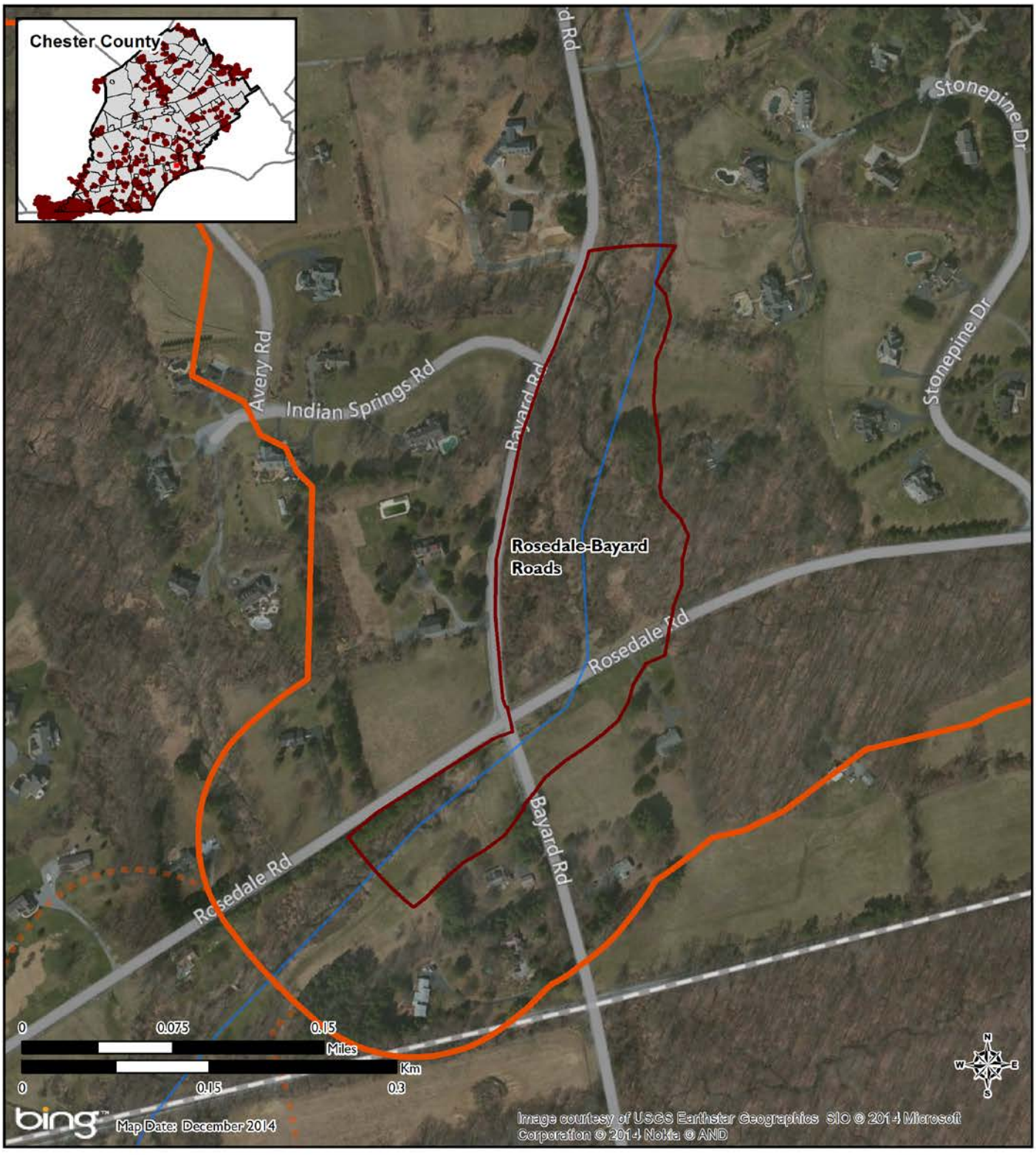
The following steps are recommended to ensure the persistence of these species at this site:

- The species of concern at this site require open habitat that needs to be maintained. The needs of this species should be considered when planning the timing and frequency of maintenance.

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Reduce the current deer density, and continue to monitor and maintain the population at a level that is able to be supported by the landscape.

Location

Municipalities: *Kennett Township*
USGS quads: *Kennett Square*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Rosedale-Bayard Roads Natural Heritage Area

Meadows along these two roads support a population of grass-leaved rush, an imperiled plant species in PA.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

Ross Fording-Homeville NHA

PNHP Significance Rank: *State*

Site Description

Located in West Fallowfield Township in Chester County, this NHA includes a small patch of forest and adjacent agricultural lands between Homeville and Ross Fording Roads. This patch of forest and nearby riparian and aquatic habitats support a **sensitive species of concern**. This species cannot be named 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	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 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 sensitive species of concern at this site relies on good water quality, and is vulnerable to siltation and chemical pollution.

Conservation Recommendations

The entire site is privately owned and landowners in the Core Habitat should be aware that the species is sensitive to disturbance.

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

- Avoid disturbance from human activities within the Core Habitat during the breeding season (December – July).
- Additional development within the Core Habitat should be avoided to protect the sensitive species of concern.
- 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.
- 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.
- 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 are. Maintaining high quality aquatic habitat is important to this species.

Location

Municipalities: *West Fallowfield Township*
USGS quads: *Parkesburg*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*

Ross Fording-Homeville Natural Heritage Area

This site provides habitat for a sensitive species of concern.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

Route 282 Wetlands NHA

PNHP Significance Rank: *State*

Site Description

Route 282 Wetlands NHA is located along East Branch Brandywine Creek near Glenmoore. This NHA also includes a small tributary to East Branch Brandywine Creek. The site is wooded habitat that has been fragmented by agricultural fields and utility right-of-ways. Some areas within this NHA also contain wooded and early successional wetlands. The habitats found in Route 282 Wetlands NHA support populations of **two sensitive species of concern**, not named at the request of the jurisdictional agencies overseeing their 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**	---	---	---	2006	BC
Sensitive species of concern B[3]	**S**	---	---	---	6/10/2008	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

Further development within this NHA can destroy the small amounts of remaining wooded habitat. Changes in the existing hydrology may alter the wetland habitats. Runoff from fields, lawns, rights-of-way, and along roads will carry sediment, herbicides, and fertilizers into the streams and wetlands, which can degrade the water quality.

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

- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Logging can further fragment the existing forest and alter the conditions of the habitat needed by the species of concern.
- Degradation of water quality or quantity can have a negative impact on the habitat supporting the species of concern found at this location. Runoff from industrial and residential development, agricultural fields, and roads have significantly higher levels of sediment, nutrients, pesticides, herbicides and other pollutants than runoff filtered through a natural habitat.
- Herbicides sprayed on the pipeline right-of-way may cause direct mortality to the species of concern and other native species.
- Draining or flooding of wet meadow and forested wetland habitats can eliminate suitable habitat for the species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

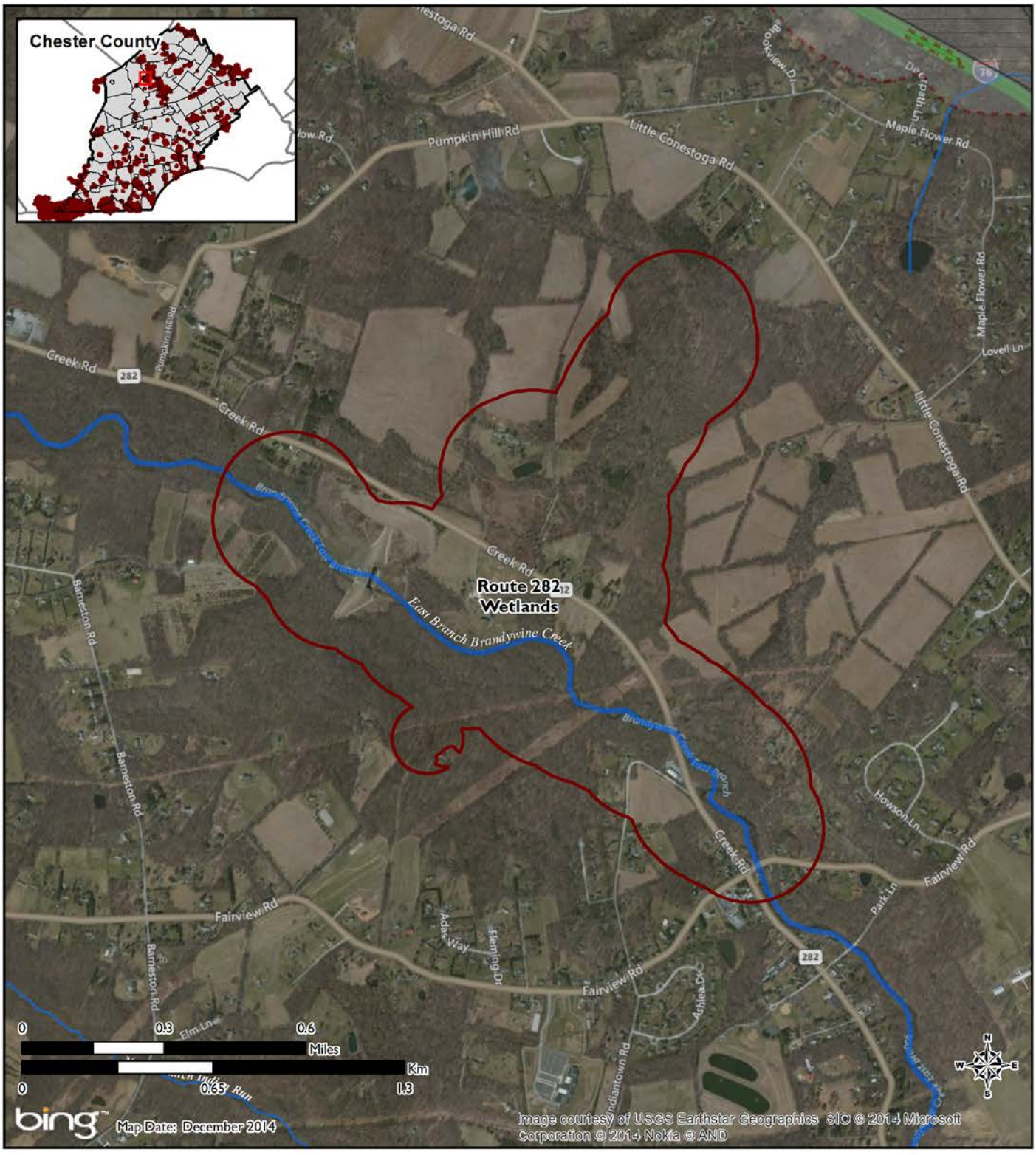
This NHA is almost entirely privately owned. The large number of landowners within this site will make conservation actions difficult to implement. Avoid further alterations to this habitat and maintain the current hydrologic conditions. Increase buffers of native vegetation along streams and wetlands. A width of 100 meters is ideal, but expansion will help to improve the water quality.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Protect remaining portions of the forested riparian zone and repair others that have been degraded, by encouraging the growth of native vegetation. Careful determination is needed to avoid planting trees in floodplains that should remain as open canopied herbaceous wetland habitats. These habitats should be maintained in their current open condition, with tree plantings to occur uphill of areas containing hydric soils.
- Stormwater management measures such as the creation of detention basins or vegetated swales should be implemented to decrease the unfiltered flow down the slopes into the creek floodplain.
- Limit herbicide use to situations where it is necessary, such as to control invasive species. Be especially cautious using herbicides near wetland areas.
- Avoid disrupting the hydrology of the site by draining or filling the wetlands or disturbing the surface or groundwater hydrology.
- Avoid fragmenting the existing wooded 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 population of species of concern, the natural landscape also helps to protect water quality of the streams that drain through this NHA.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Wallace Township, West Nantmeal Township*
USGS quads: *Pottstown, Wagontown*
Previous CNHI reference: *None*
Associated NHAs: *None*



Route 282 Wetlands Natural Heritage Area

This site supports two 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***
- ***Conservation Lands***

Saginaw Road Woods NHA

PNHP Significance Rank: *State*

Site Description

Saginaw Road Woods is part of the steep wooded habitat that remains along Big Elk Creek near Maple Grove. Agricultural fields surround much of this section of wooded habitat outside of the riparian area. The steep hillside is dominated by oaks and provides habitat for **fringe-tree**, a plant species of concern. A portion of the hillside within the NHA to the east of Big Elk Creek has been cleared. The edge habitat between the fields and woods supports populations of two additional plant species of concern, **sand blackberry** and **wild bean**.

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]
Fringe-tree (*Chionanthus virginicus*)		G5	S3	N (PT)	8/1/1999	C
Sand Blackberry (*Rubus cuneifolius*)		G5	S1	TU (PE)	8/1/1999	B
Wild Bean (*Strophostyles umbellata*)		G5	S2	N (N)	8/1/1999	CD

[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.

Fringe-tree is a shrub or small tree found from New York and Massachusetts south to Florida and Texas. It is near the northern end of its range in Pennsylvania and has mostly been documented in the southern counties. Most current records are in the southeastern part of the state. Fringe-tree is found in moist woods and along streams. It is threatened by habitat loss, invasive species, and excessive deer browse.

Sand blackberry is most commonly found along the Atlantic Coast from New Hampshire and New York south and west to Florida and Louisiana. Most occurrences for this species have been documented in southeastern counties, with a few in the central part of the state as well. Sand blackberry is found in early successional habitats, including meadows, fields, and other disturbed openings.

Wild bean is found from Rhode Island and New York south and west to Florida and Texas. This species is near the northern end of its range in Pennsylvania and most documented occurrences are found in a few southeastern counties. Wild bean is often found along wooded slopes and thickets.

Threats and Stresses

Clearing the riparian forest for agriculture and development has fragmented the habitat and reduced the buffer that helps to protect the quality of the stream and wetlands. Chemicals and sediments from surrounding areas can more easily degrade the aquatic habitat without a sufficient riparian buffer. Logging within the remaining wooded habitat will further fragment the habitat and create openings that can allow invasive species to become established.

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

- Logging, development, or other major activities will further fragment the existing forest and alter the conditions of the habitat needed by the species of concern. Disturbances will also open areas that will be easily colonized by invasive species.
- Invasive species can take over portions of the habitat currently used by the species of concern and other native species.
- Herbicides and fertilizers from within the NHA and surrounding lawns, fields, and roads may wash into the wooded areas and degrade habitat conditions.
- Growth of woody species in the early successional and edge habitats may cause the area used by sand blackberry and wild bean to become overgrown and shaded.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

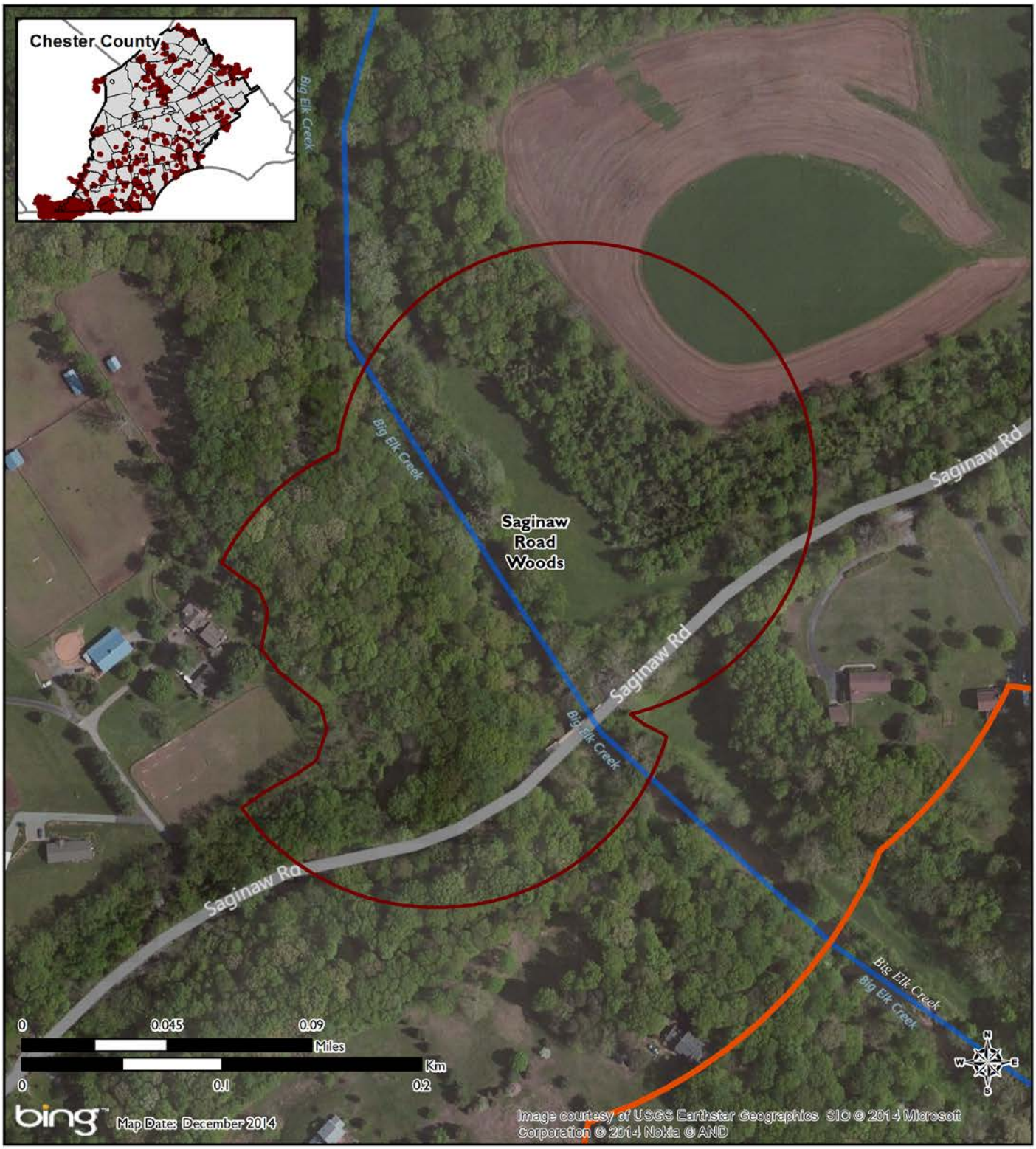
Saginaw Road Woods NHA is privately owned, which will not offer formal protection for the habitat. Do not clear additional wooded habitat and expand the riparian buffer where possible. Continue to maintain the early successional habitats with periodic maintenance to limit the growth of woody species.

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

- Protect the existing forested areas from logging and other large scale disturbance. Keep the forest as intact as possible to protect the habitat and species within it.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Limit herbicide use to situations where it is necessary, such as to control invasive species. Create a sufficient vegetated buffer along the stream in order to filter sediment and chemicals from runoff. A buffer of 100 meter is ideal, but any increase will help to protect the water quality.
- Some species of concern require open habitat that needs to be maintained. The needs of these species should be considered when planning the timing and frequency of maintenance.
- Maintain deer density at a level that is able to be supported by the landscape.

Location

Municipalities: *East Nottingham Township, New London Township*
USGS quads: *Oxford*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Saginaw Road Woods Natural Heritage Area

Upland forest at this site supports three plant species of concern: wild bean, sand blackberry, and fringe-tree.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

Saw Mill Road Pond NHA

PNHP Significance Rank: *State*

Site Description

Saw Mill Road Pond is located on the edge of a residential development south of Downingtown, along a tributary to East Branch Brandywine Creek. A small artificial pond was created in this area. Red maple dominated woods occur around the pond. The surrounding habitat is a wooded area that has been fragmented by a number of housing developments. The wooded area within this NHA provides habitat for a small population of **netted chainfern**, a plant 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]
Netted Chainfern (*Woodwardia areolata*) 	G5	S2	N (PT)	8/1/1995	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.

Netted chainfern is a wetland species that is found scattered throughout Pennsylvania. Its entire range spans from Nova Scotia south to Florida and west to Texas. It is more common in the southern portion of its range. Loss of wetland habitat is the major threat to netted chainfern populations.

Threats and Stresses

Disturbances, such as logging, may threaten the integrity of this NHA by increasing the number of invasive species and altering the hydrology that currently maintains the pond, stream, and wetland habitats present. Proximity to the road may cause excessive runoff that may reduce water quality.

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

- Changes in the currently hydrology could significantly alter the habitat for the plant species of concern by making conditions either too wet or too dry to be able to persist at this site.
- Invasive species are present in this site and may displace native vegetation, including species of concern.
- Herbicide and fertilizer used in lawns and along the road may wash into the forested area and degrade the habitat conditions.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Logging will further fragment the existing forest and alter the conditions of the habitat needed by the species of concern.

Conservation Recommendations

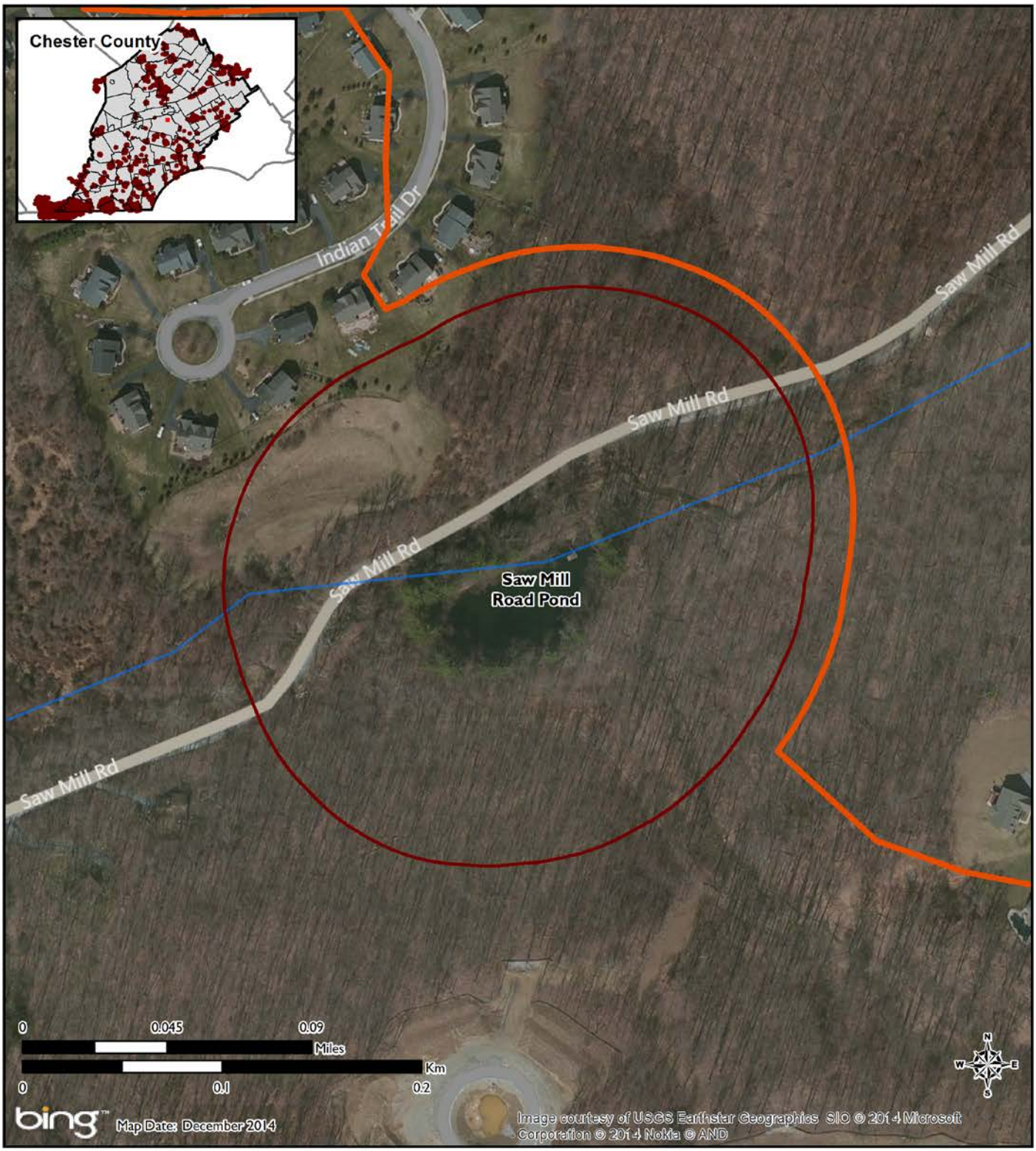
Avoid further development of the area, or logging of the wooded habitat. Maintain the vegetation along the road to help filter pollutants from runoff.

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

- Maintain the existing hydrology. Any activities that occur near the NHA should be conducted with a consideration for the impact to the flow of water into the wetlands below.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations. Further disturbance within this habitat will create additional opening for the establishment and spread of invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Protect the existing forested areas from logging and disturbance along the forest edge. Maintaining as many intact habitats as possible, given the location within a residential area, will help to preserve habitat for as many species as possible.

Location

Municipalities: *West Bradford Township*
USGS quads: *Unionville*
Previous CNHI reference: *Saw Mill Road Pond*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Saw Mill Road Pond
Natural Heritage Area

This human-made pond supports a population of netted chainfern, a plant species that is imperiled in Pennsylvania.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

Schuykill River – Port Providence NHA

PNHP Significance Rank: *State*

Site Description

The Schuykill River – Port Providence NHA has been delineated around a stretch of the river from Pheonixville downstream through Valley Forge National Historic Park. This area has been highly developed, with a narrow strip of riparian forest remaining along the floodplain. Channels and man-made wetlands are found in some areas in this NHA.

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]
Northern Myotis (*Myotis septentrionalis*)		G4	S1	N (CR)	8/4/2005	E
Spreading Rockcress (*Arabis patens*)		G3	S2	N (PT)	5/11/1993	CD
Wild Kidney Bean (*Phaseolus polystachios*)		G5	S1S2	N (PE)	10/6/1994	E
Tooth-cup (*Rotala ramosior*)		G5	S3	PR (PR)	10/11/2006	B
Sensitive species of concern A[3]	S	---	---	---	2013	E
Sensitive species of concern B[3]	S	---	---	---	6/15/2011	C
Sensitive species of concern C[3]	S	---	---	---	3/31/2010	E
Sensitive species of concern D[3]	S	---	---	---	7/23/1993	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

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

- Degradation of riparian zones within this NHA threatens the integrity of water quality in the Schuylkill River and its adjacent wetlands. The stormwater runoff from roadways and development should be considered a potential source of significant contamination. Runoff from these sources has significantly higher levels of pollutants than runoff filtered through a natural habitat.
- Natural succession from open, wet meadows to shrub and tree dominated habitats can eliminate suitable open canopied habitats supporting species of concern.
- Forest fragmentation due to development or infrastructure activities could result in habitat loss and degradation of the site.
- Exotic invasive plant species threaten to compete with and displace native species.
- 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 park-like forests in which the native plant understory and vertical stratification are greatly reduced.

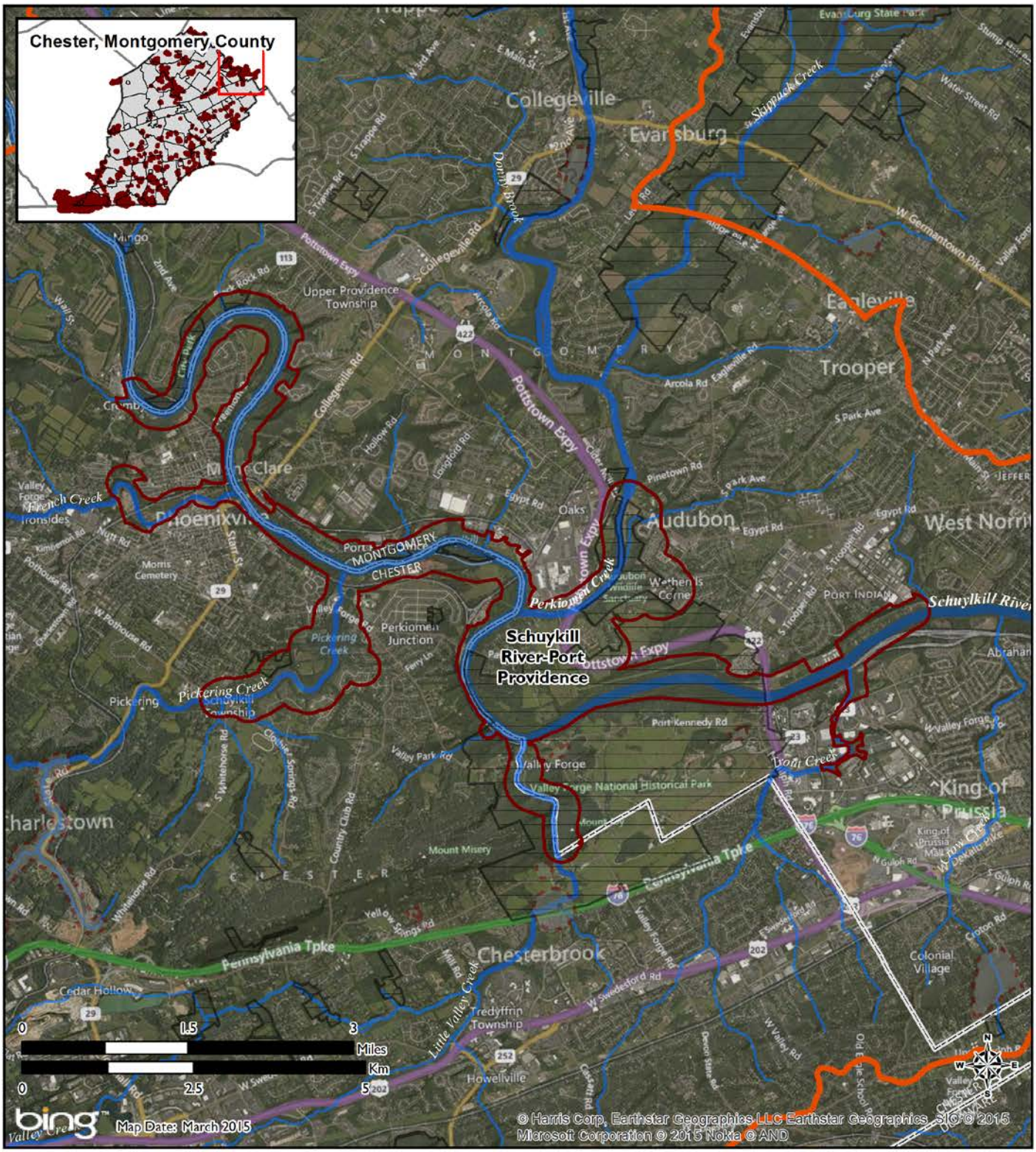
Conservation Recommendations

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

- Avoid disrupting the hydrology of the site by draining or filling the wetlands as well as disturbing the surface or groundwater hydrology.
- Maintain open, wet meadow habitats by periodic removal of woody species of plants. This action will temporarily help set back succession to a closed canopy habitat and preserve the open, wet meadow habitat conditions preferred by species of concern.
- Protect the riparian zone and repair others that have been degraded by encouraging the growth of native vegetation. Careful determination is needed to avoid planting trees in floodplains that should remain as open canopied herbaceous wetland habitats. These habitats should be maintained in their current open condition, with tree plantings to occur uphill of areas containing hydric soils.
- Avoid fragmenting the existing forests and wetlands 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.
- 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 and 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.
- Reduce the deer density in the area. Uncommon species of native plants are particularly susceptible to deer herbivory.

Location

Municipalities: *Schuylkill Township, West Norriton Township, Phoenixville Borough, Upper Merion Township, Tredyffrin Township, East Pikeland Township, Upper Providence Township*
USGS quads: *Collegeville, Phoenixville, Valley Forge, Malvern*
Previous CNHI reference: *Black Rock Tunnel, Valley Forge NHP - SP547*
Associated NHAs: *None*
Overlapping Protected Lands: *Audubon Wildlife Sanctuary*



Schuykill River-Port Providence Natural Heritage Area

Diverse habitats at this site support several species of concern, including a number of sensitive species.

Significance Rank:
REGIONAL

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Schuylkill River - Kenilworth NHA

PNHP Significance Rank: *State*

Site Description

Schuylkill River – Kenilworth NHA has been delineated around a stretch of the river that is more than eight miles long from just above Manatawny Creek to Sprogles Run. This area has been highly developed, with a narrow strip of riparian forest remaining along the floodplain. Channels and man-made wetlands are found in some areas in this NHA. The habitat in the Schuylkill River and the surrounding wetlands support a population of a **sensitive species of concern**, not named 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]
Pizzini's Cave Amphipod (*Stygobromus pizzinii*)		G3G4	S1	N (N)	2/20/1973	H
Sensitive species of concern A[3]	**S**	---	---	---	7/17/2009	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

Changes in hydrology to the river, tributaries, and associated wetlands can alter the habitat available for native species. Runoff from adjacent industrial and residential areas can have a significant impact on the water quality in these areas.

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

- Degradation of riparian zones within this NHA threatens the integrity of water quality in the Schuylkill River and its adjacent wetlands. The stormwater runoff from roadways and development should be considered a potential source of significant contamination. Runoff from these sources has significantly higher levels of pollutants than runoff filtered through a natural habitat.
- Natural succession from open, wet meadows to shrub and tree dominated habitats can eliminate suitable open canopied habitats supporting species of concern.
- Forest fragmentation due to development or infrastructure activities could result in habitat loss and degradation of the site.
- Exotic invasive plant species threaten to compete with and displace native species.
- 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 park-like forests in which the native plant understory and vertical stratification are greatly reduced.

Conservation Recommendations

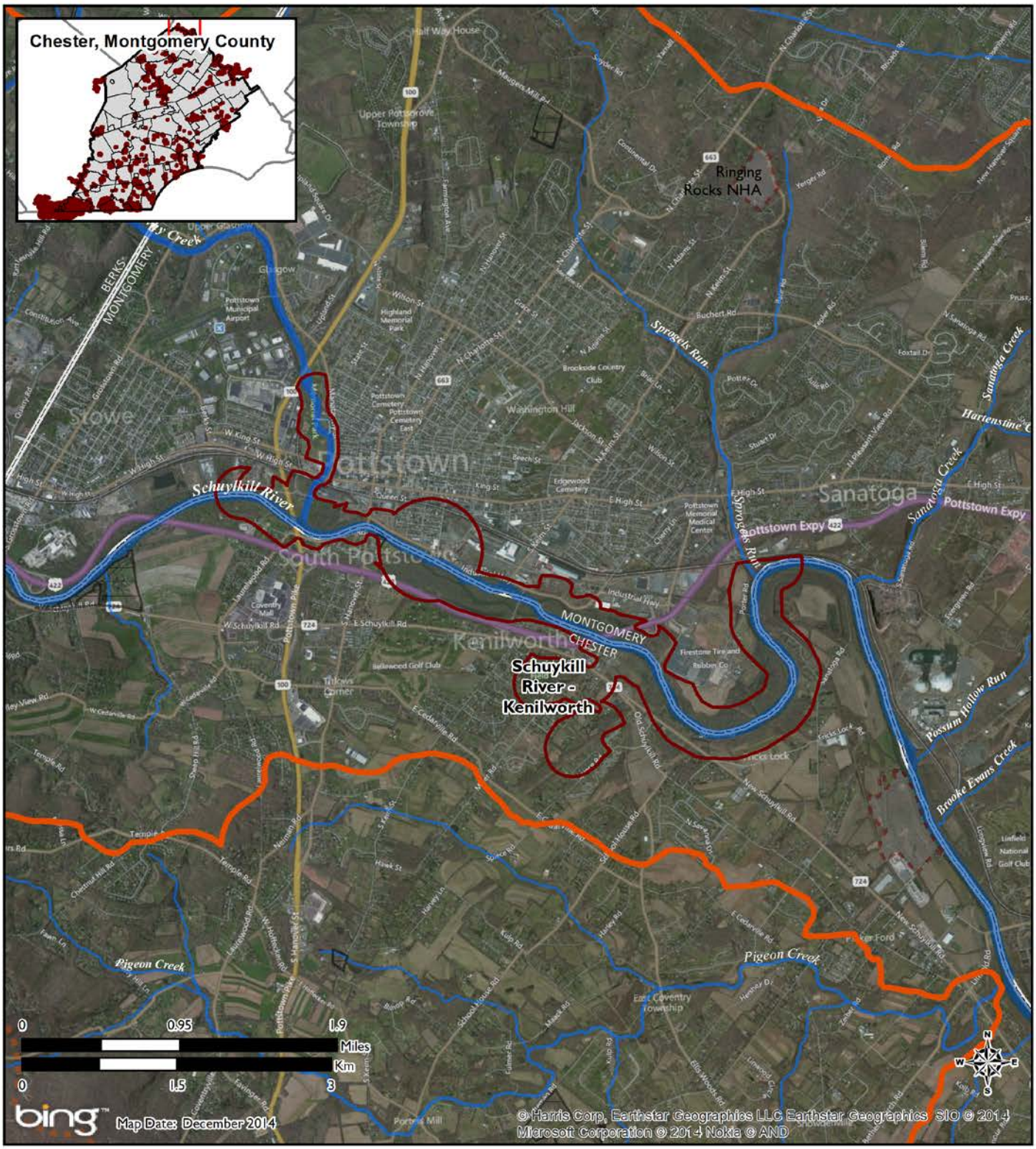
This site will be best protected by maintaining the integrity of vegetative buffers and assuring a consistent hydrologic regime to protect wetlands.

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

- Avoid disrupting the hydrology of the site by draining or filling the wetlands as well as disturbing the surface or groundwater hydrology.
- Maintain open, wet meadow habitats by periodic removal of woody species of plants. This action will temporarily help set back succession to a closed canopy habitat and preserve the open, wet meadow habitat conditions preferred by species of concern.
- Protect the riparian zone and repair others that have been degraded by encouraging the growth of native vegetation. Careful determination is needed to avoid planting trees in floodplains that should remain as open canopied herbaceous wetland habitats. These habitats should be maintained in their current open condition, with tree plantings to occur uphill of areas containing hydric soils.
- Avoid fragmenting the existing forests and wetlands 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.
- 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 and 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.
- Reduce the deer density in the area. Uncommon species of native plants are particularly susceptible to deer herbivory.

<u>Location</u>

Municipalities: *East Coventry Township, Lower Pottsgrove Township, Pottstown Borough, North Coventry Township*
USGS quads: *Boyertown, Phoenixville, Pottstown*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *South Pottstown Access*



Schuykill River - Kenilworth Natural Heritage Area

Aquatic habitat at this site supports a sensitive species of concern and wells on the Pottstown side of the river were historically known to support the northern most population of Pizzini's cave amphipod.

Significance Rank:
REGIONAL

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Silbury Hill NHA

PNHP Significance Rank: *State*

Site Description

Silbury Hill HNA is a small forested area that sits between several housing developments and other residential areas south of Route 30 near Thorndale. A small tributary to Valley Run flows through the forest. A narrow flat area along the stream is dominated by skunk cabbage and surrounded by steep forested slopes. A population of a **sensitive species of concern**, not named at the request of the jurisdictional agency overseeing its protection, was documented at this site prior to the creation of the development on the northern end of the NHA.

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**	---	---	---	5/2002	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

A newly created housing development has removed a large part of the forested habitat that once occurred in this area. The remaining forest may be subject to increased sedimentation and erosion from construction and disturbance along the steep slope. Recreational use within the NHA may also increase.

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

- Invasive species are present in many areas of this site and may displace native vegetation and alter the habitat required by the species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Logging may disturb the small amount of remaining habitat, as well as cause changes in hydrology and allow for the introduction of additional invasive species.
- Runoff and other sources of water pollution from the surrounding area threaten to degrade the water quality of streams and seeps.

Conservation Recommendations

The steep slopes and wetlands that encompass most of Silbury Hill NHA should protect this area from further development. Other disturbances to this habitat, including logging and recreation, should be limited to prevent erosion on the hillsides.

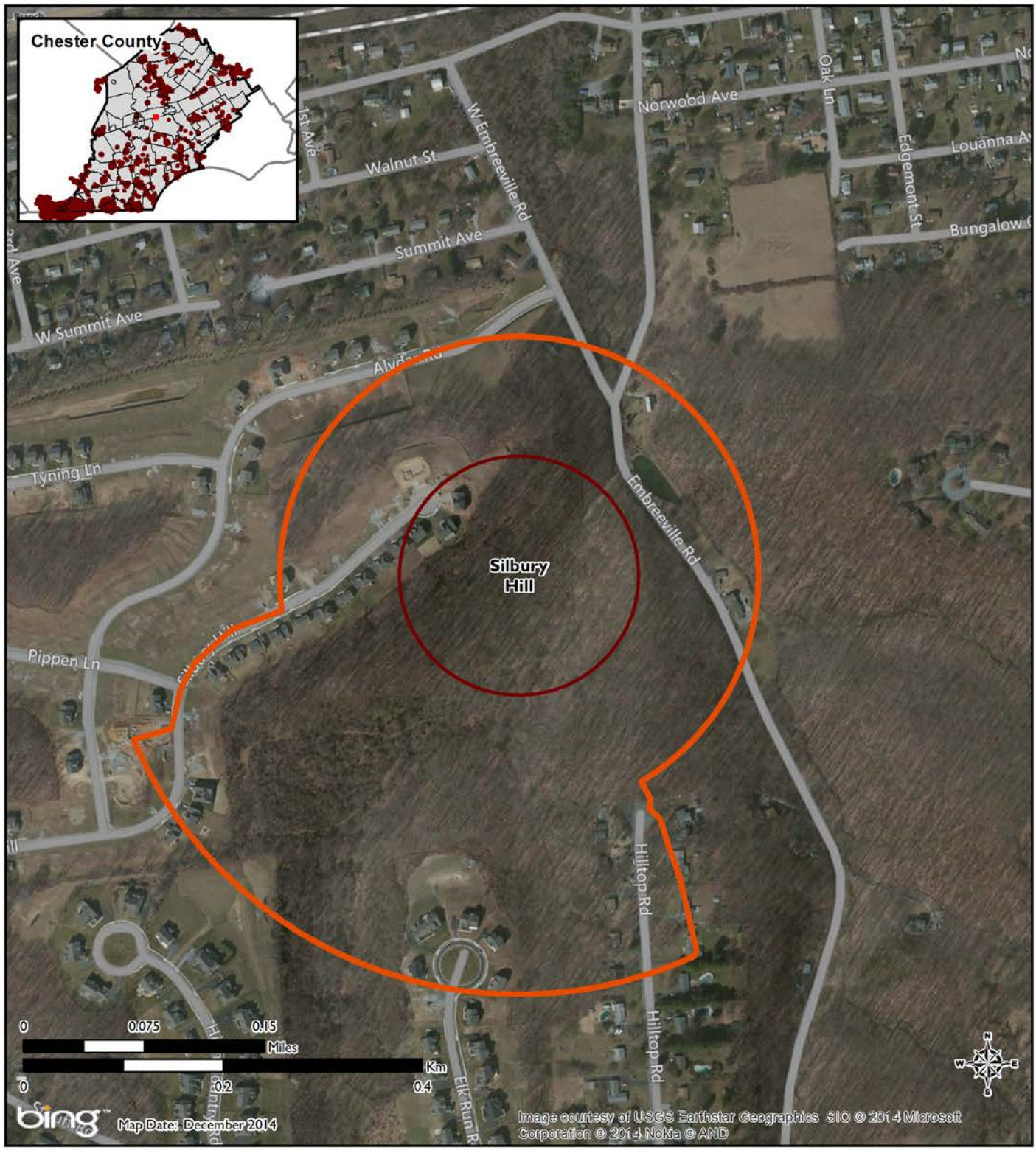
The following steps are recommended to ensure the persistence of these species at this site:

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

- Protect the existing forested areas from logging and other large scale disturbance. Keep the forest as intact as possible to protect the habitat and species within it.
- Maintain a vegetated buffer along the roads and limit the use of pesticides and herbicides used along the road and fields to protect the water quality.

Location

Municipalities: Caln Township
USGS quads: Coatesville
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Silbury Hill
Natural Heritage Area

This forested 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 Supporting Landscape***

Sills Mill Road Meadow NHA

PNHP Significance Rank: *State*

Site Description

Sills Mill Road Meadow NHA is a roadside site located near Rosedale. This field is dominated by grasses and is mowed regularly during the growing season. The area surrounding this meadow has been fragmented by a number of residential developments. The grassy meadow habitat within the NHA supports a population of **Elliot's beardgrass**, a plant 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]
Elliott's Beardgrass (*Andropogon gyrans*)	G5	S3	N (PR)	1/13/2001	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.

Elliot's beardgrass is at the northern edge of its range in Pennsylvania and has only been documented in a few southeastern counties. It spans from New Jersey to Illinois, south from Texas to Florida. This species needs open, early successional habitat in order to persist.

Threats and Stresses

Frequent mowing during the growing season affects the ability of species to reproduce. Further development of the area will fragment the meadow and can destroy habitat used by native species.

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

- Succession of the open grassy fields may cause the habitat used by Elliot's beardgrass to become overgrown and shaded by woody species.
- Mowing during the growing season of Elliot's breadgrass will affect its ability to reproduce and may alter species composition of the habitat.
- Further development or other activities that will fragment the habitat can destroy the small patch of remaining habitat.
- Herbicides used along the road may cause direct mortality to the species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

Periodic maintenance is needed to prevent succession, but excessive mowing will affect the existing habitat conditions. Perform maintenance outside of the growing season to best preserve the habitat. Avoid further fragmentation of the meadow with additional development or other disturbances.

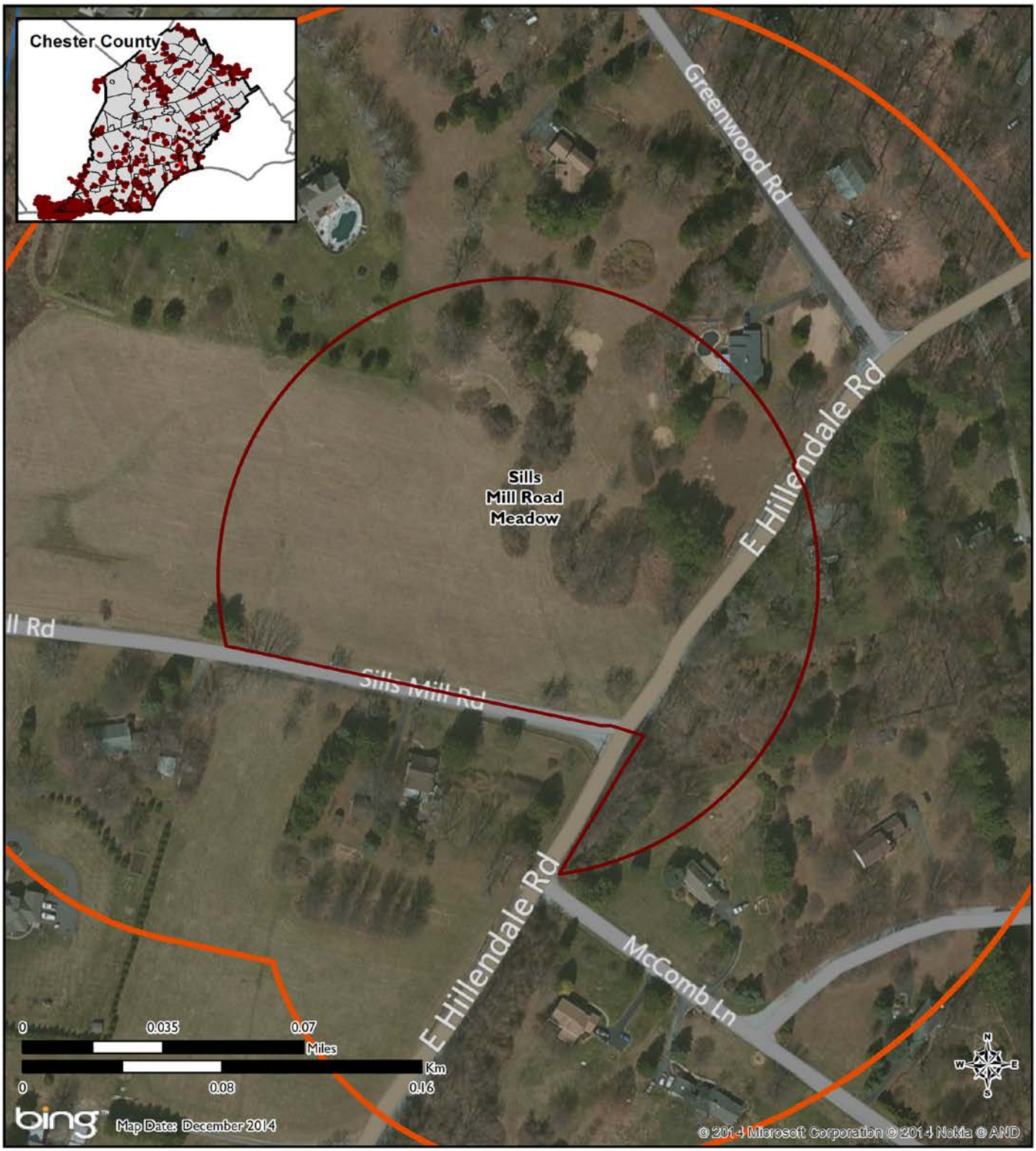
The following steps are recommended to ensure the persistence of these species at this site:

- Remove woody species and maintain the grassy habitat openings for early successional species. Perform periodic maintenance, such as mowing, to prevent woody species from taking over the

area. Elliot's beardgrass requires open habitat that needs to be maintained. The needs of this species should be considered when planning the timing and frequency of maintenance.
- Avoid the construction of additional houses or infrastructure in the area where Elliot's beardgrass is known to occur.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Kennett Township*
USGS quads: *Kennett Square*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Sills Mill Road Meadow Natural Heritage Area

This meadow provides habitat for Elliott's beardgrass, a vulnerable plant species in PA.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

Smith's Bridge Floodplain NHA

PNHP Significance Rank: *State*

Site Description

A large bend in Brandywine Creek near Cossart is the location of Smith's Bridge Floodplain NHA. This site spans Chester and Delaware Counties near the border with the state of Delaware. The area south of Brandywine Creek is a mowed meadow in the floodplain with a man-made pond. The open, wet habitat provides habitat for **tooth-cup**, a plant species of concern. The northern end of this NHA is a forested slope along a tributary. The forested habitat supports a population of another plant species of concern, **puttyroot**.

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]
Puttyroot (*Aplectrum hyemale*)		G5	S3	PR (PR)	1/2002	D
Elephant's Foot (*Elephantopus carolinianus*)		G5	S4	PE (Watch)	11/3/1985	C
Tooth-cup (*Rotala ramosior*)		G5	S3	PR (PR)	8/11/2001	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.

In Pennsylvania, puttyroot is most commonly found in the southeastern counties and grows in moist woodlands and on forested slopes and streambanks. Puttyroot produces leaves that are visible through the fall and winter. The leaves wither in late spring and the plant flowers in May and June.

Tooth-cup grows in exposed, wet habitats. This species has a wide range covering most of the United States and into Canada. In Pennsylvania, it is most commonly seen along the Susquehanna River, and has been documented in southeastern counties as well.

Threats and Stresses

Changes in hydrology in the early successional habitat can alter the current habitat conditions. Succession will change the species composition if not controlled by mowing or some other periodic disturbance. Logging or other fragmentation of the forested habitat can negatively impact this area.

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

- Invasive species are a major threat to the native species present at this site. Invasive species can out compete native ones and change the habitat structure.
- Succession that is not controlled by mowing or other methods of disturbance will likely cause the habitat to become unsuitable for many of the species of concern to be able to persist at this site. Logging can further fragment the existing forest and alter the conditions of the habitat needed by the species of concern.
- Modifications to the hydrology, including draining and damming, will likely cause unfavorable changes to the habitat and negatively impact the species of concern.
- Over-browsing by white-tailed deer can significantly impact plant species of concern and other native vegetation, as well as the structure of the habitat.

Conservation Recommendations

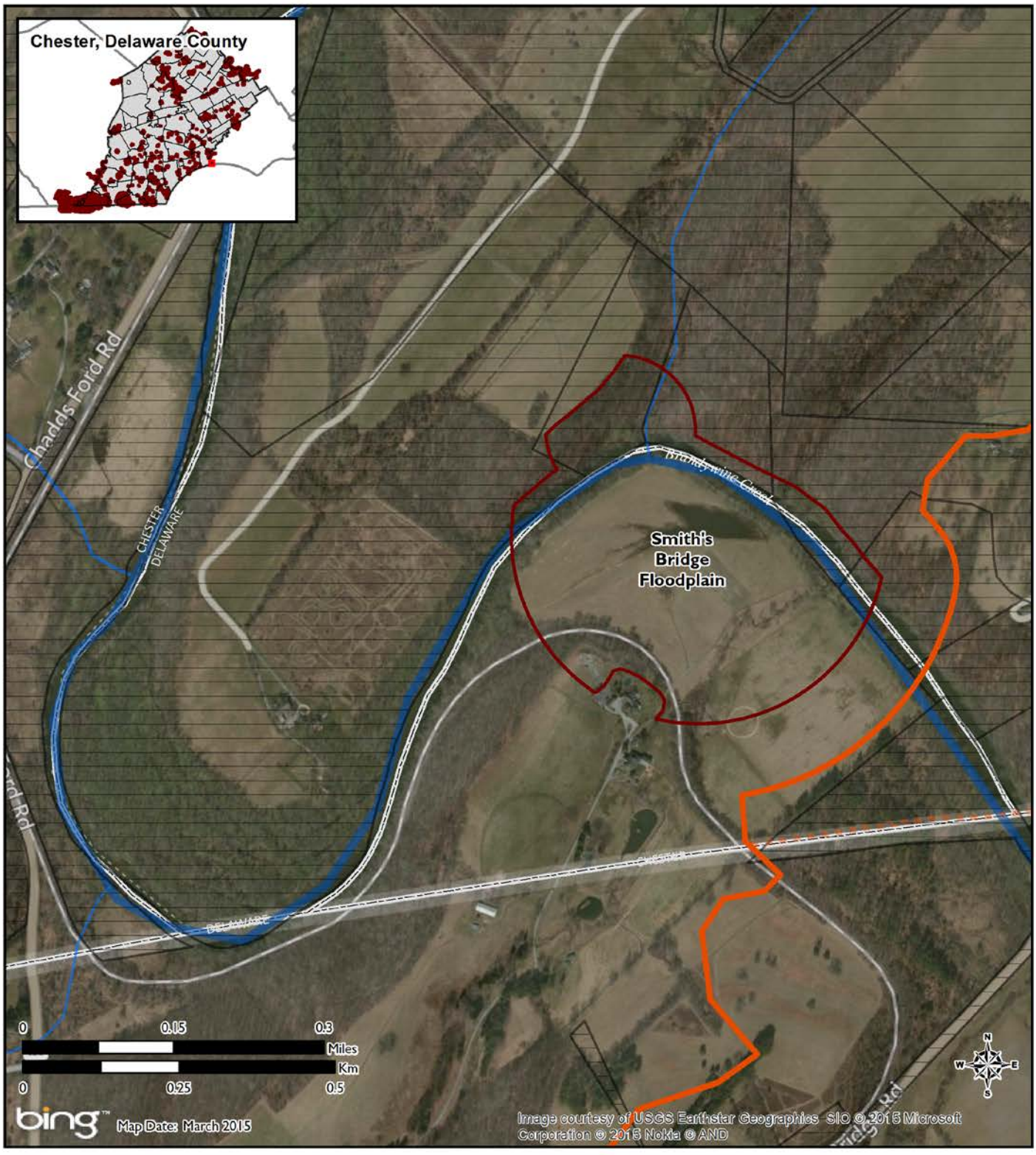
Maintain the existing hydrology of Brandywine Creek and wetlands at this site and protect the existing vegetated buffer. Improve the forested buffer where possible to improve water quality. Maintenance is necessary to prevent succession in the wet meadow habitat. Avoid fragmenting the existing forested habitat.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations. Further disturbance within this habitat will create additional opening for the establishment and spread of invasive species.
- Use disturbance, such as mowing, to slow succession and preserve habitat for species of concern. Consider the needs of tooth-cup when planning the timing of maintenance.
- Protect the existing forested areas from logging and disturbance along the forest edge. Maintaining as many intact habitats as possible will help to preserve the habitat and species found within it.
- Maintain the existing hydrology of Brandywine Creek and the adjacent wetlands. Any activities that occur in nearby areas should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Chadds Ford Township, Pennsbury Township*
USGS quads: *Wilmington North*
Previous CNHI reference: *Smith Bridge Woods*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Easement*



Smith's Bridge Floodplain Natural Heritage Area

Populations of two plant species of concern, tooth-cup and puttyroot, are found at this site.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

South Blackhorse Forest NHA

PNHP Significance Rank: *State*

Site Description

Located in western Chester County, this NHA includes a small patch of forest north of Lenover and east of Parkesburg along Church Road. This patch of forest and nearby riparian and aquatic habitats supports a **sensitive species of concern**. This species cannot be named 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**	---	---	---	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

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

- 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 sensitive species of concern at this site relies on good water quality, and is vulnerable to siltation and chemical pollution.

Conservation Recommendations

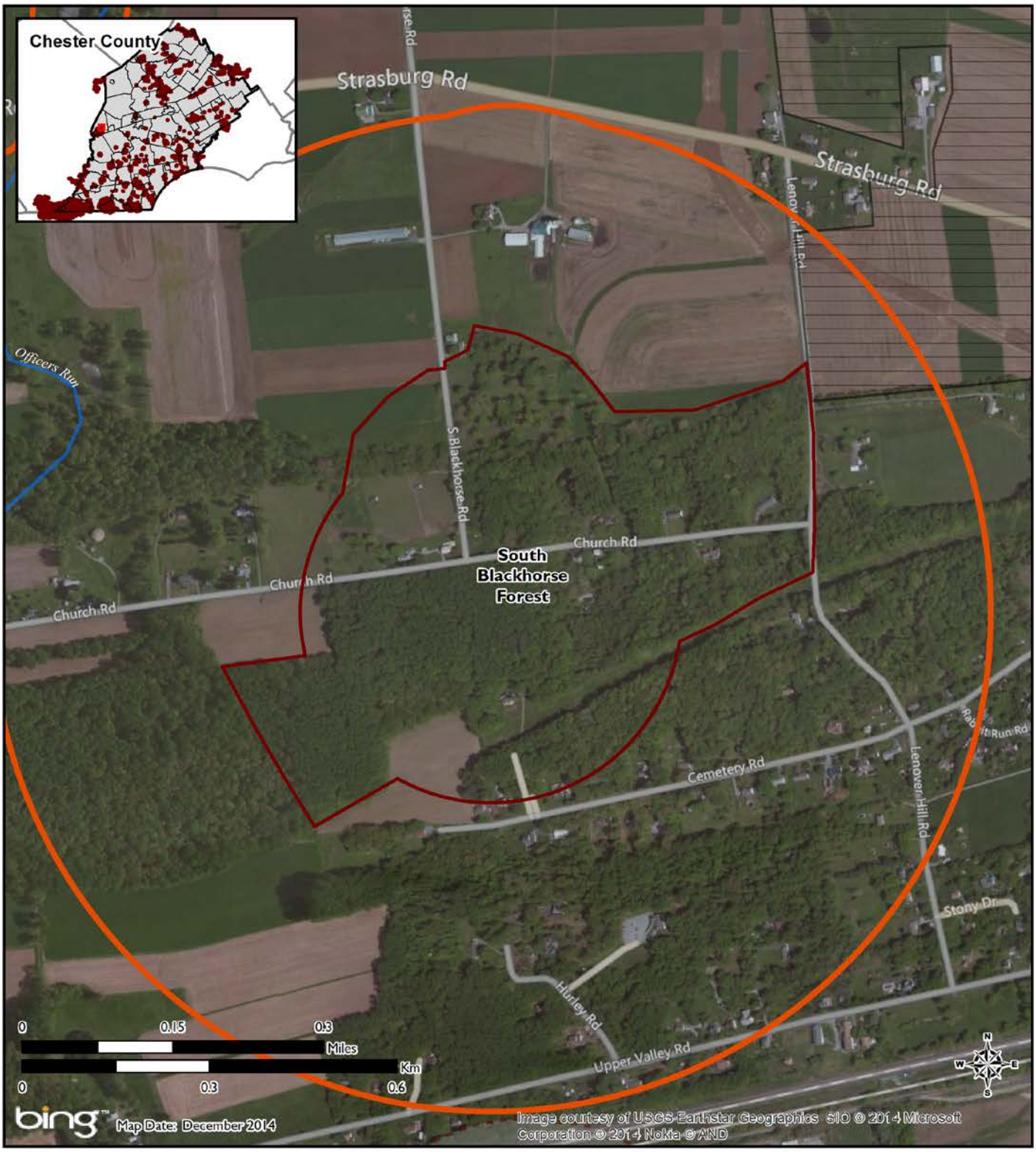
The entire site is privately owned and landowners in the Core Habitat should be aware that the species is sensitive to disturbance.

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

- Avoid disturbance from human activities within the Core Habitat during winter months (November – March).
- Additional development within the Core Habitat should be avoided to protect the sensitive species of concern.
- 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.
- 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.
- 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 are. Maintaining high quality aquatic habitat is important to this species.

Location

Municipalities: *West Sadsbury Township*
USGS quads: *Parkesburg*
Previous CNHI reference:
Associated NHAs: *None*
Overlapping Protected Lands: None



South Blackhorse Forest Natural Heritage Area

Forested 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***

South Branch French Creek NHA

PNHP Significance Rank: *State*

Site Description

This site is located in northern Chester County along the southern edge of State Game Land #43. It includes riparian forests and wetlands along South Branch French Creek and a tributary from the North which crosses under State Route 23. Much of the drainage area within the Core Habitat has been developed as residential, agriculture, and golf course. The northernmost extension of the tributary encompasses a **Skunk Cabbage – Golden Saxifrage Forest Seep** natural community found in the largest forested section of the site. Wetlands and riparian forest throughout the site also provide habitat for a **sensitive species of concern** that is not named 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]
Skunk Cabbage - Golden Saxifrage Forest Seep	**C**	GNR	S4S5	N (N)	8/23/1993	BC
Sensitive species of concern A[3]	**S**	---	---	---	2008	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

Degradation of water quality and loss of natural habitat are critical threats to this site.

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

- Degradation of riparian zones within this NHA threatens the integrity of water quality in South Branch French Creek, its tributaries, and adjacent wetlands. The storm water runoff from roadways and rural development should be considered a potential source of significant contamination. Runoff from these sources has significantly higher levels of pollutants than runoff filtered through a natural habitat.
- Natural succession from open, wet meadow floodplains to shrub and tree dominated habitats can eliminate suitable open canopied habitats supporting species of concern.
- Forest fragmentation due to development or infrastructure activities could result in habitat loss and degradation of the site.
- Exotic invasive plant species threaten to compete with and displace native species.

Conservation Recommendations

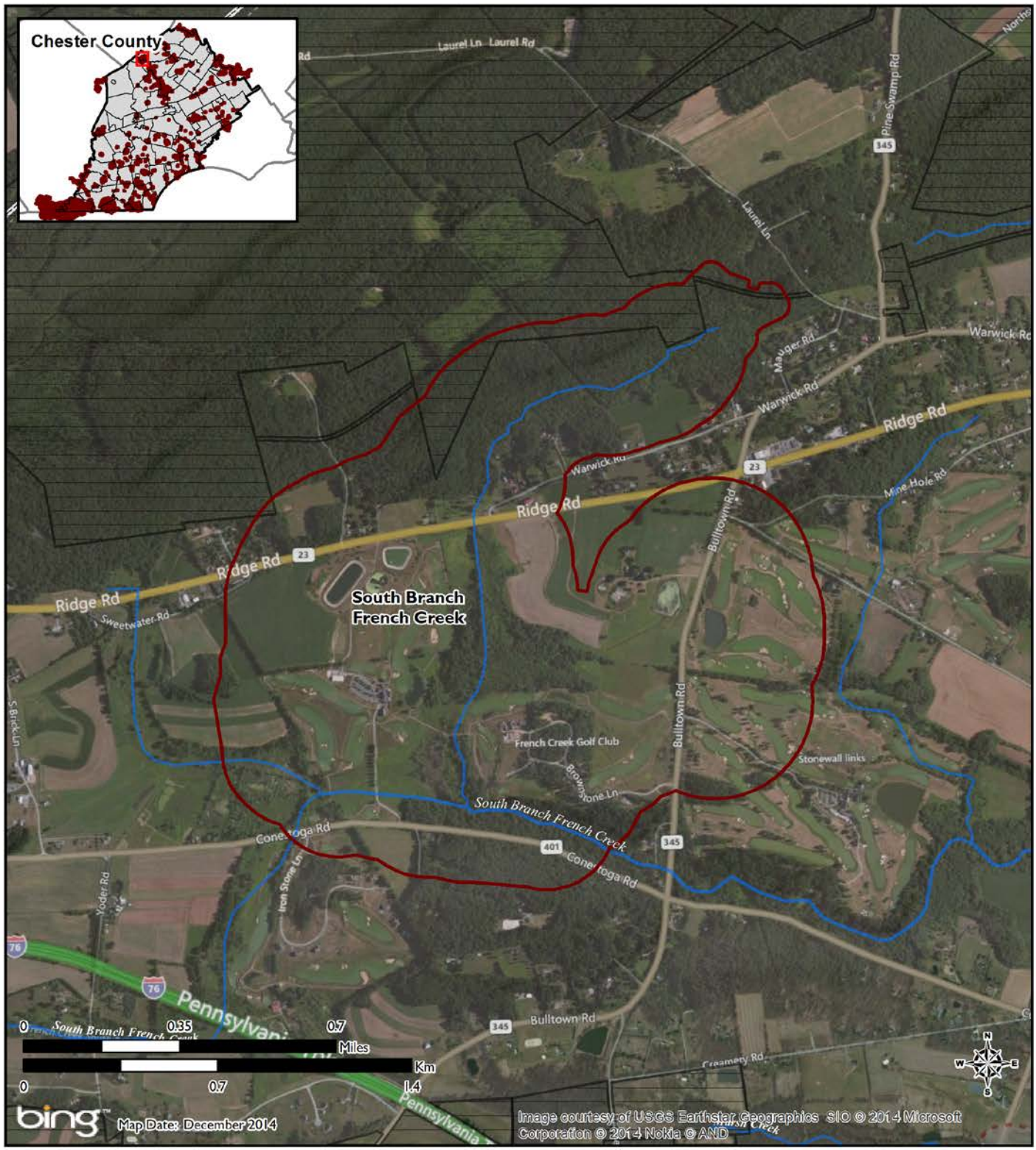
The majority of this NHA is privately owned. Additional development within the Core Habitat should be avoided to protect the sensitive species of concern. This site will be best protected by maintaining the integrity of riparian buffers with native vegetation and assuring a consistent hydrologic regime to protect wetlands.

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

- Avoid disrupting the hydrology of the site by draining or filling the wetlands as well as disturbing the surface or groundwater hydrology.
- Maintain open, wet meadow habitats by periodic removal of woody species of plants. This action will temporarily help set back succession to a closed canopy habitat and preserve the open, wet meadow habitat conditions preferred by species of concern.
- Protect the riparian zone and repair others that have been degraded by encouraging the growth of native vegetation. Careful determination is needed to avoid planting trees in floodplains that should remain as open canopied herbaceous wetland habitats. These habitats should be maintained in their current open condition, with tree plantings to occur uphill of areas containing hydric soils.
- Avoid fragmenting the existing forests and wetlands 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.
- 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 and 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.

Location

Municipalities: *East Nantmeal Township, West Nantmeal Township, Warwick Township*
USGS quads: *Elverson*
Previous CNHI reference: *Warwick Seeps*
Associated NHAs: *None*
Overlapping Protected Lands: *State Game Land #43, St. Peters Trail*



South Branch French Creek Natural Heritage Area

This site supports a state rare natural community, a Skunk Cabbage-Golden Saxifrage Forest Seep, and 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*
- *Conservation Lands*

South Connelltown Road NHA

PNHP Significance Rank: *State*

Site Description

South Connelltown Road NHA is an old field that is beginning to fill in with woody species. Autumn olive, an invasive shrub, is prevalent throughout this site. A number of housing developments have been built in the area surrounding this NHA. This old field habitat within the NHA supports a population of **Elliot's beardgrass**, a plant 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]
Elliott's Beardgrass (*Andropogon gyrans*)	G5	S3	N (PR)	4/17/2008	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.

Elliot's beardgrass is at the northern edge of its range in Pennsylvania and has only been documented in a few southeastern counties. It spans from New Jersey to Illinois, south from Texas to Florida. This species needs open, early successional habitat in order to persist.

Threats and Stresses

Succession is already changing the previous early successional habitat into a shrubland dominated by autumn olive. This invasive shrub is crowding the meadow habitat and changing the species composition.

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

- Invasive species are common throughout this NHA and may displace native vegetation, including species of concern.
- Succession of the open grassy fields may cause the habitat used by Elliot's beardgrass to become overgrown and shaded by woody species.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

Removal of invasives and other woody species is necessary to maintain the early successional habitat that was historically at this location. After the woody species have been removed, regular maintenance needs to be done for the meadow habitat to persist.

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

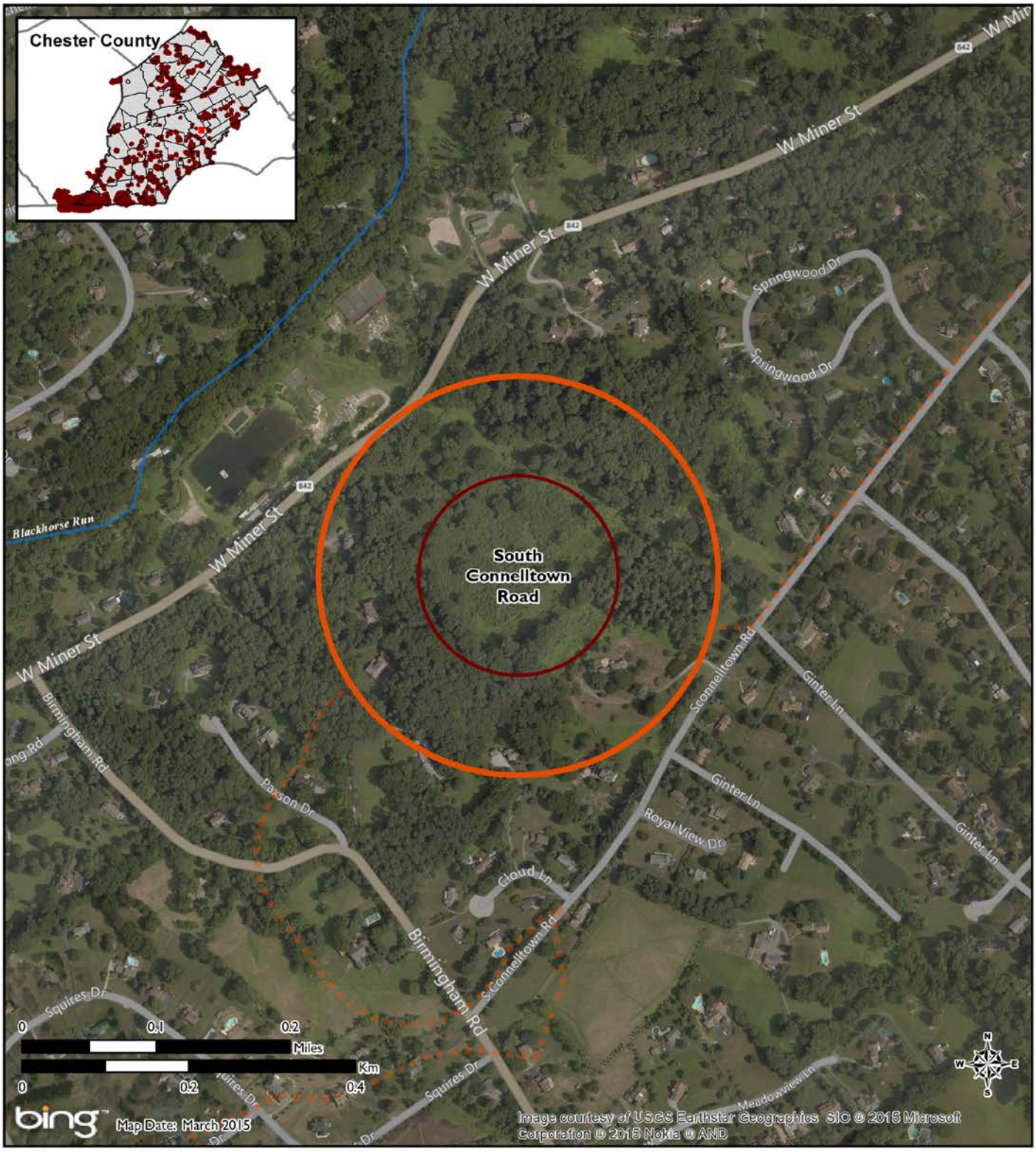
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Remove woody species and maintain the grassy habitat openings for Elliot's beardgrass and other early successional species. Perform periodic maintenance, such as mowing, to prevent

woody species from taking over the area. The needs of the species of concern should be considered when planning the timing and frequency of maintenance.

- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *East Bradford Township*
USGS quads: *West Chester, Unionville*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



South Connelltown Road Natural Heritage Area

This site supports a population of Elliott's beardgrass, 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***

South Guernsey Roadbank NHA

PNHP Significance Rank: *State*

Site Description

South Guernsey Roadbank NHA is a disturbed site that is made up of mowed fields, roadsides, and lawns. This habitat near West Grove is located at the intersection of State Road and Guernsey Road. The roadsides and fields are mowed, which maintains the early successional habitat needed by **Heller's witchgrass**, a plant 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]
Heller's Witchgrass (*Dichanthelium oligosanthes*)	G5	S3	N (PT)	7/1/2006	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.

Heller's witchgrass is found across North America. In Pennsylvania, it has been documented mostly in the southeastern counties. This species requires open habitat and may require maintenance to prevent succession.

Stephanie Seymour

Heller's witchgrass (*Dichanthelium oligosanthes*)

Threats and Stresses

Succession and excessive disturbance are the major threats to the current habitat. Mowing is done on the fields and roadsides, but can negatively affect the habitat if done too frequently. Invasive species may also alter the habitat and make it unsuitable for some native species.

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

- Succession that is not controlled by mowing or other methods of disturbance will likely cause the habitat to become unsuitable for Heller's witchgrass to be able to persist at this site.
- Invasive species are present, and further spread may cause competition with species of concern and other native species.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Herbicides used along the road may cause direct mortality to the species of concern.

Conservation Recommendations

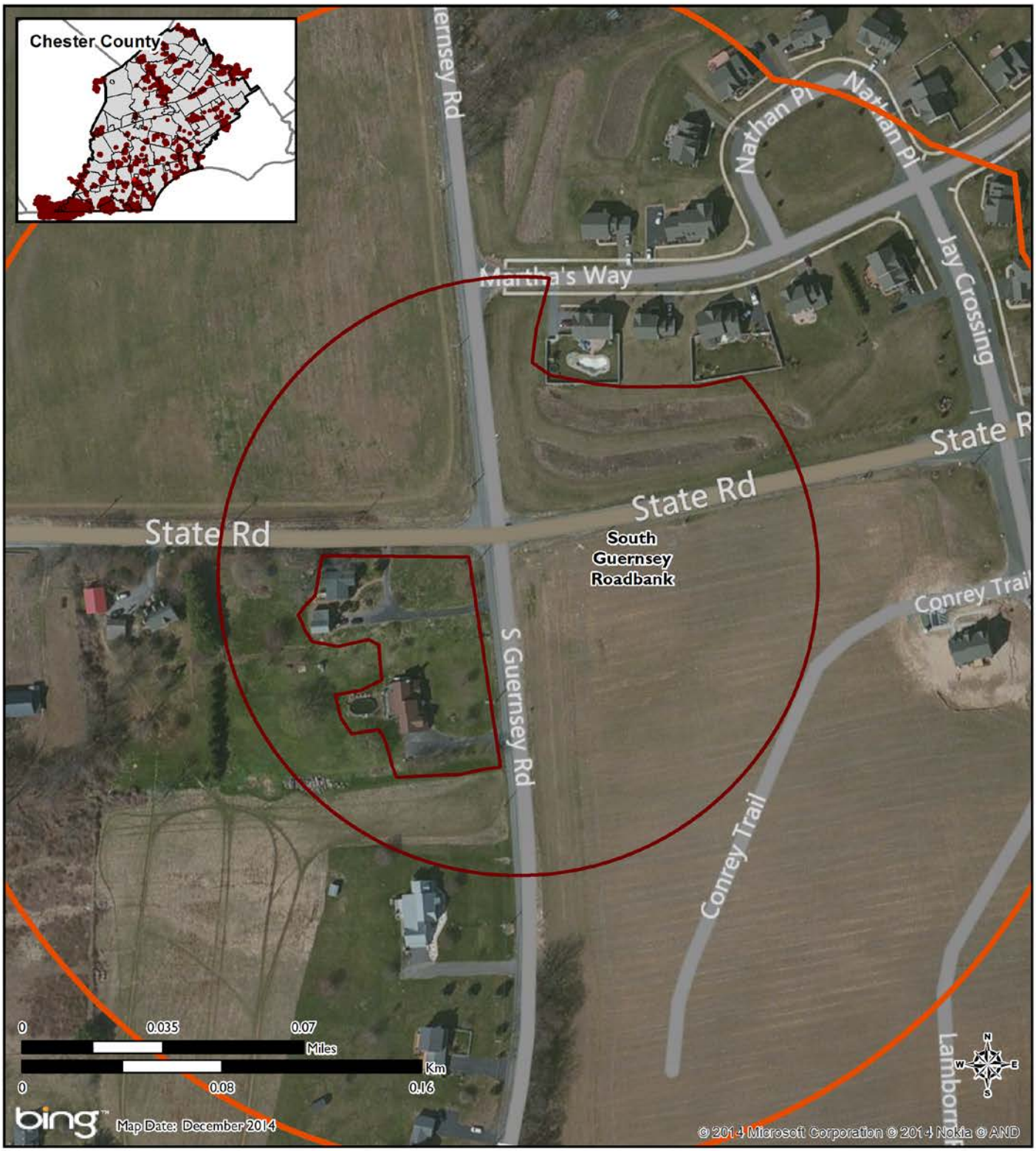
Regular maintenance is needed to prevent succession of woody species that will alter the habitat conditions and species composition. Conduct maintenance at a frequency that avoids the growing season of native species.

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

- Heller's witchgrass requires open habitat that needs to be maintained. The needs of this species should be considered when planning the timing and frequency of maintenance.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.

Location

Municipalities: *London Grove Township*
USGS quads: *West Grove*
Previous CNHI reference:
Associated NHAs: *None*
Overlapping Protected Lands:



South Guernsey Roadbank Natural Heritage Area

Open, disturbed roadside habitat supports a population of Heller's witchgrass, a plant species of concern.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

Spring Mill Road Meadow NHA

PNHP Significance Rank: *State*

Site Description

Spring Mill Road Meadow NHA is in a patch of fragmented habitat that is located between several houses within a housing development in Burnt Mills. Part of the site is forested and has mowed meadow habitat as well. The open, early successional habitat within this NHA supports a population of **horrible thistle**, a plant 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]
Horrible Thistle (*Cirsium horridulum*)	G5	S1	PE (PE)	9/12/2001	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.

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

Horrible thistle is a state endangered plant species that is found throughout the southeastern United States as far west as Texas and Oklahoma and up the Atlantic Coast into New England. In Pennsylvania, horrible thistle has been documented in several southeastern counties. This species is found in a variety of open habitats and disturbed areas.

Threats and Stresses

Succession is a major threat to the habitat within the early successional areas of this NHA. These open areas are mowed, but excessive mowing may negatively impact the habitat conditions. Invasive species may also be introduced and spread through the disturbed area. Additional development will further fragment the small patch of remnant habitat.

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

- Succession that is not controlled by mowing or other methods of disturbance will likely cause the habitat to become unsuitable for horrible thistle to be able to persist at this site.
- Mowing during the growing season may affect the persistence of the species of concern, especially given the small size of the population at this location.
- Additional development can fragment the remaining habitat and create disturbances that may allow invasive species to be introduced to the area.
- Herbicides sprayed on the agricultural fields and edges may cause direct mortality to horrible thistle and other native species. Fertilizers and chemicals used on lawns may wash into the wet meadow and degrade the habitat.
- Invasive species are present in this site and may displace native vegetation, including species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

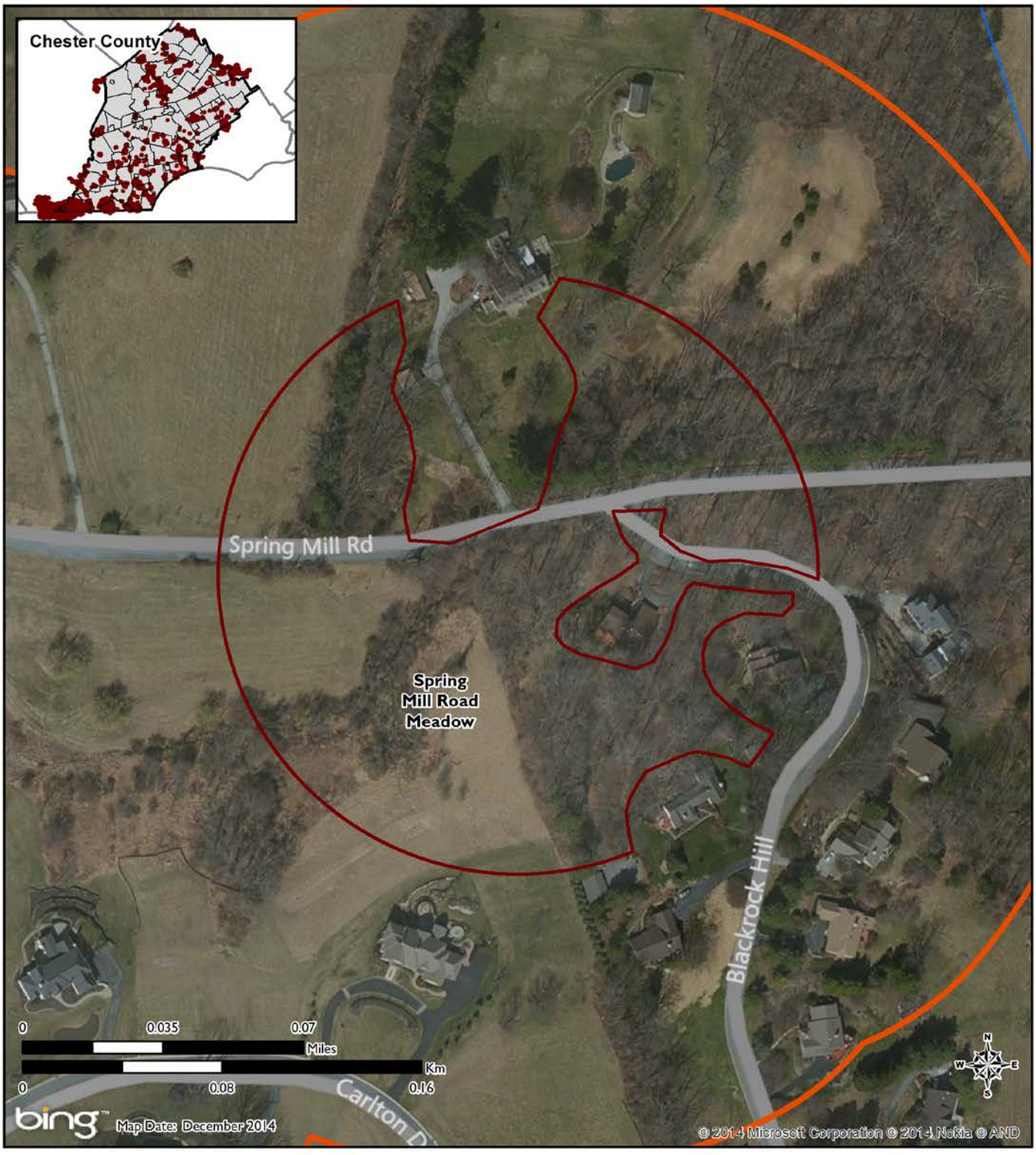
Occasional disturbance will likely be necessary to maintain the habitat conditions and prevent the succession of woody species. Avoid fragmenting the remaining habitat with additional development or other large disturbances.

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

- Horrible thistle requires open habitat that needs to be maintained with mowing or other methods of disturbance. The needs of this species should be considered when planning the timing and frequency of maintenance.
- Avoid fragmenting the habitat with development, roads or other infrastructure or large disturbance.
- Limit herbicide use to situations where it is necessary, such as to control invasive species. Do not use fertilizers and chemicals on lawns or along roads, so it does not wash into other areas and degrade the habitat.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Kennett Township*
USGS quads: *Kennett Square*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Spring Mill Road Meadow Natural Heritage Area

A moist meadow supports a population of the state endangered plant, horrible thistle.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

Spring Road Wet Meadow NHA

PNHP Significance Rank: *State*

Site Description

Spring Road Wet Meadow NHA is open, early successional habitat that is situated between several houses within a development in Sugartown. A small man-made pond was created in the northern end of the NHA. The habitat below the pond is a wet meadow that supports a population of **grass-leaved rush**, a plant species of concern. Habitat around the wet meadow is maintained as lawns for the adjacent houses

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)	7/29/2003	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.

Grass-leaved rush has been documented from Massachusetts west to Michigan and south to Florida and Arizona. This species is found in open wet habitats throughout the state, but most populations occur in the southeastern counties.

Threats and Stresses

Succession is a major threat to the habitat within the early successional areas of this NHA. These open areas are mowed, but excessive mowing may negatively impact the habitat conditions. Additional development will further fragment the small patch of remnant habitat.


Denise Watts, PNHP
Woody species growth alters early successional habitats.

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

- Mowing during the growing season may affect the persistence of the species of concern, especially given the small size of the population at this location.
- Succession of the open grassy fields may cause the habitat used by grass-leaved rush to become overgrown and shaded by woody species.
- Additional development will fragment the remaining habitat and create disturbances that may allow invasive species to be introduced to the area.
- Herbicides sprayed on the agricultural fields and edges may cause direct mortality to grass-leaved rush and other native species. Nutrients and chemicals used on lawns may wash into the wet meadow and degrade the habitat.
- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.

- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Changes in the currently hydrology could significantly alter the habitat for the plant species of concern by making conditions either too wet or too dry to be able to persist at this site.

Conservation Recommendations

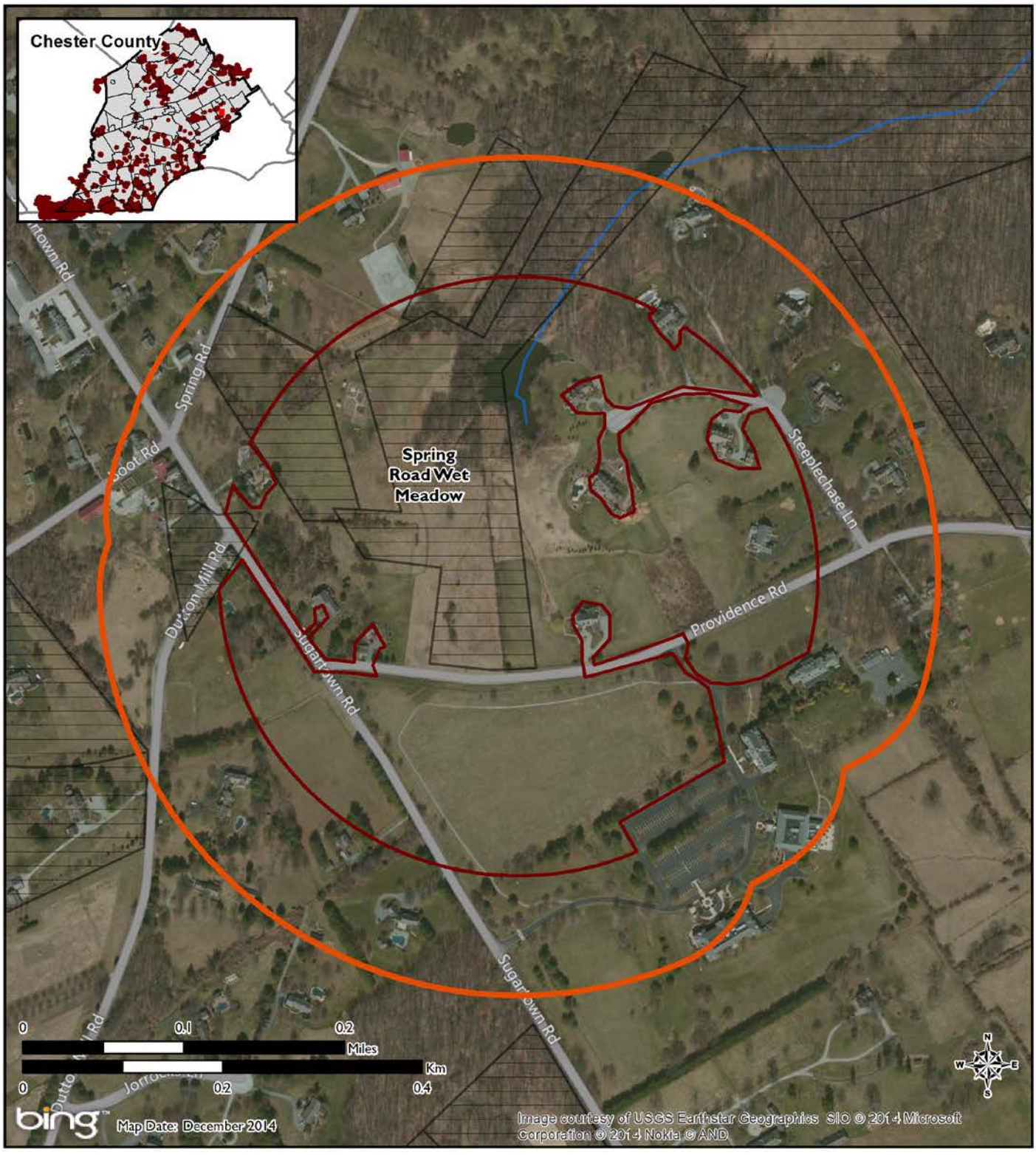
Occasional disturbance will likely be necessary to maintain the habitat conditions and prevent the succession of woody species. Do not further fragment the remaining habitat with additional development or other large disturbances.

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

- Grass-leaved rush requires open habitat that needs to be maintained with mowing or other methods of disturbance. The needs of this species should be considered when planning the timing and frequency of maintenance.
- Avoid further fragmention of the habitat with development, roads or other infrastructure or large disturbance.
- Limit herbicide use to situations where it is necessary, such as to control invasive species. Avoid the use of fertilizers and chemicals on lawns or along roads, to prevent it from washing into other areas and degrading the habitat.
- Attempt to control the introduction and spread of invasive species. Remove invasive species of plants when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Maintain the existing hydrology. Any activities that occur along the roads should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.

Location

Municipalities: *Willistown Township*
USGS quads: *Malvern, West Chester*
Previous CNHI reference: *Dutton Mill Woods*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Property*



Spring Road Wet Meadow Natural Heritage Area

Wetland habitat supports a population of grass-leaved rush, an imperiled plant species in Pennsylvania.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Spring Valley Road Woods NHA

PNHP Significance Rank: *State*

Site Description

Spring Valley Road NHA is part of a larger forest block approximately 250 acres in size. This red maple and chestnut oak dominated forest sits among several housing developments and agricultural fields. A power line right-of-way runs through the eastern end of the NHA. This forested portion of this NHA provides habitat for a small population of a **sensitive species of concern**, not named 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**	---	---	---	8/21/2000	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.

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

Threats and Stresses

Logging and major disturbance can destroy habitat and create openings for the establishment and spread of invasive species. Horse trails are located in some areas of this NHA that may disturb habitat. Maintenance along the right-of-way may also disturb surrounding habitat through mowing or herbicide application.

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

- Logging can further fragment the existing forest and alter the conditions of the habitat needed by the species of concern.
- Herbicides and fertilizers used along right-of-ways, roads, and lawns may wash into the forested area and degrade the habitat or cause direct mortality.
- Invasive species may displace native vegetation and modify the structure of the habitat. Maintenance along the right-of-way may introduce invasive species that can spread through the rest of the habitat.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

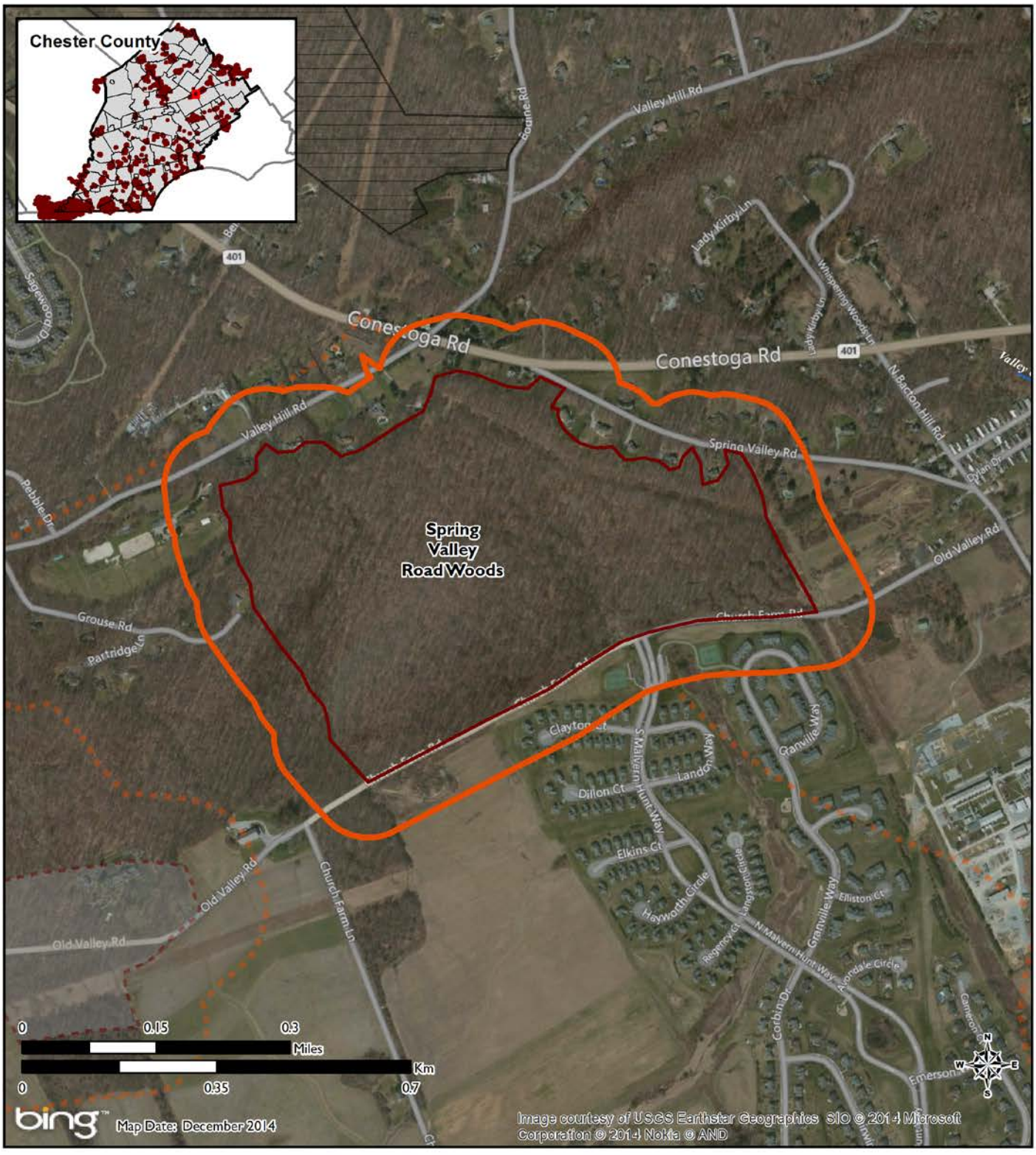
Maintain the existing wooded habitat and minimize activities that may cause fragmentation, such as logging or development. Limit the number of horse trails traversing through the forested habitat in order to reduce disturbance and erosion. Minimize herbicide use along the right-of-way and roads to prevent mortality of native species. Use mowing and other manual disturbance to slow the growth of woody species.

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

- Protect the existing forested areas from logging and disturbance along the forest edge. Maintaining as many intact habitats as possible, given the location within a residential area, will help to preserve habitat for as many species as possible.
- Limit the application of chemicals within the NHA and surrounding areas in order to protect the quality of the habitat.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations. Further disturbance within this habitat will create additional opening for the establishment and spread of invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *West Whiteland Township, East Whiteland Township, Charlestown Township*
USGS quads: *Malvern*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



Spring Valley Road Woods Natural Heritage Area

Upland forest at this site supports a population of a sensitive 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***

Springton Brandywine Bend NHA

PNHP Significance Rank: *Regional*

Site Description

Springton Brandywine Bend NHA is a forested slope and floodplain along East Branch Brandywine Creek. This is a more intact habitat than many other forested areas in this region. Residential developments have fragmented some of the forest adjacent to the NHA. Open shrub wetland habitat within the forest dominated by young red maple supports a population of **bog bluegrass**, a plant species of concern. This NHA also supports a population of a **sensitive species of concern**, not named 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]
Bog Bluegrass (*Poa paludigena*)		G3	S3	PT (PR)	6/4/2006	C
Sensitive species of concern A[3]	S	---	---	---	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.

Bog bluegrass is found scattered throughout Pennsylvania. It is uncommon in its entire range, which stretches from New York south to North Carolina and west to Minnesota and Iowa. This wetland species requires good water quality and neutral or calcareous water chemistry.

Threats and Stresses

Fragmentation of the forest from development or other large scale disturbance will affect the structure of the habitat and likely introduce invasive species. Alteration of the existing hydrology could destroy the unique wetland conditions that occur at the site.

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

- Changes in the currently hydrology could significantly alter the habitat for the plant species of concern by making conditions either too wet or too dry to be able to persist at this site.
- Additional development can fragment the remaining habitat and create disturbances that may allow invasive species to be introduced to the area.
- Invasive species are present in this site and may displace native vegetation, including species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

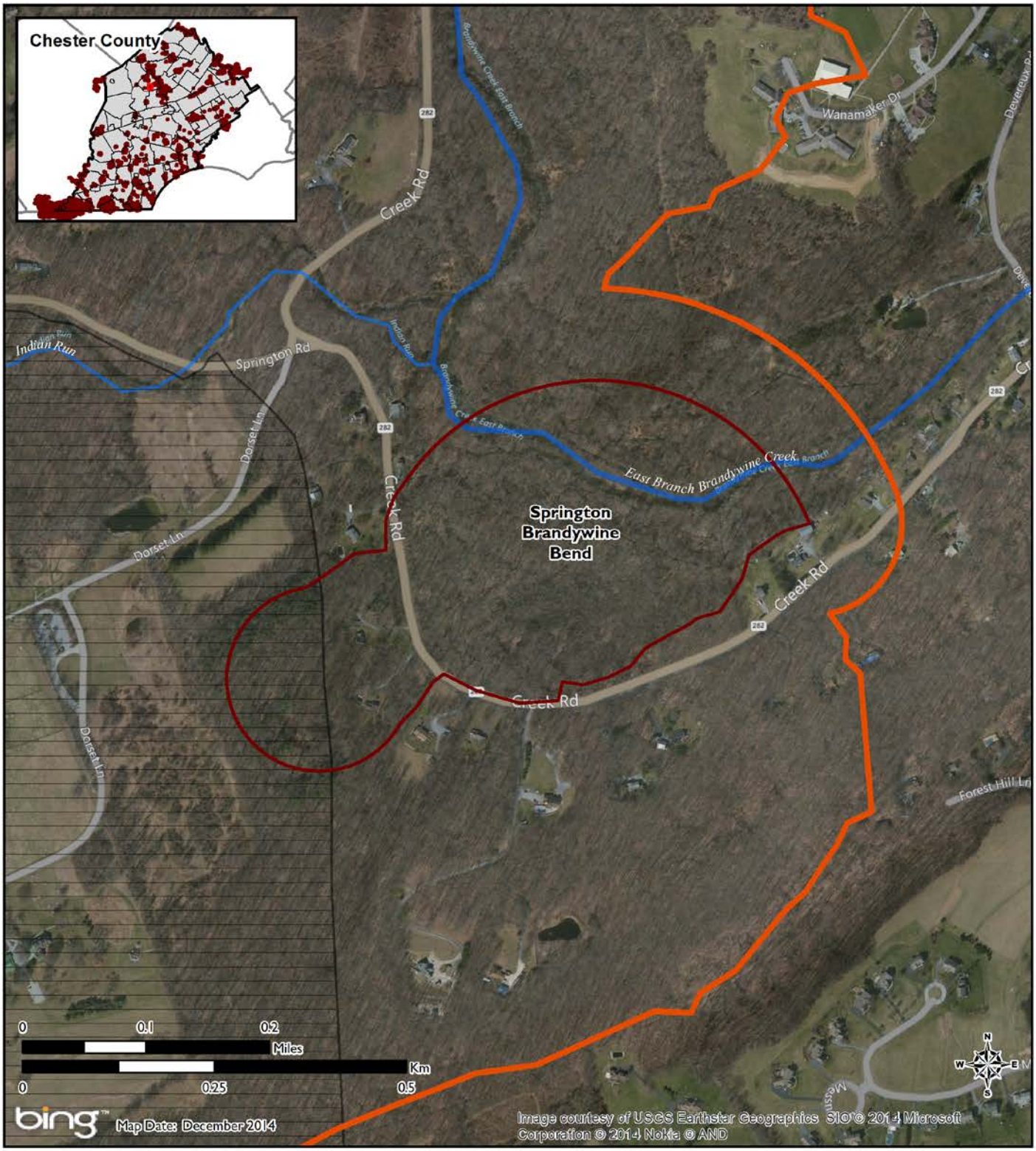
Limit disturbance within the NHA and surrounding habitat to keep it as intact as possible. The deer population needs to be reduced and kept at a level that does not negatively impact the native species.

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

- Maintain the existing hydrology. Any activities conducted along the roads and surrounding habitats need to be done with a consideration for the impact to the flow of water into the wetlands.
- Avoid further fragmention of the habitat with development, roads or other infrastructure or large disturbance.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations. Further disturbance within this habitat will create additional opening for the establishment and spread of invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Wallace Township*
USGS quads: *Wagontown*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Springton Manor County Park*



Springton Brandywine Bend Natural Heritage Area

Forested habitats at this site support a population of bog bluegrass 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***

Street Road Woods NHA

PNHP Significance Rank: *State*

Site Description

Street Road Woods NHA is a wooded wetland that forms the headwaters to a tributary of East Branch Big Elk Creek. This patch of wooded habitat is approximately 25 acres and is surrounded by agricultural fields and residential development. Part of the wetland has been dammed to create a small pond. The red maple and black gum dominated wetland provides habitat that supports **screw-stem**, a plant 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]
Screw-stem (*Bartonia paniculata*)	G5	S3	N (PR)	8/28/2005	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.

In the United State, screw-stem is found from Maine west to Wisconsin and south to Florida and Texas. It is found in parts of Canada as well. It has been documented in a number of counties throughout Pennsylvania, mostly in the eastern half of the state. Screw-stem is found in bogs, swamps, and wet meadows.

Threats and Stresses

Changes in hydrology can modify the existing habitat conditions and species composition. Logging, development, and other large disturbances can destroy the small patch of habitat and create openings for the establishment of invasive species.

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

- Draining or flooding of the forested wetland habitats can eliminate suitable habitat for the species of concern.
- Logging, development, or other activities that further fragment the patch of existing forest may alter the structure of the habitat and allow an increase in invasive species.
- Runoff and other sources of water pollution from the surrounding area threaten to degrade the water quality of streams and surrounding wetlands.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

Maintain the existing wooded habitat. Any activities done on adjacent areas should be done with consideration to not disrupt the flow of ground and surface water.

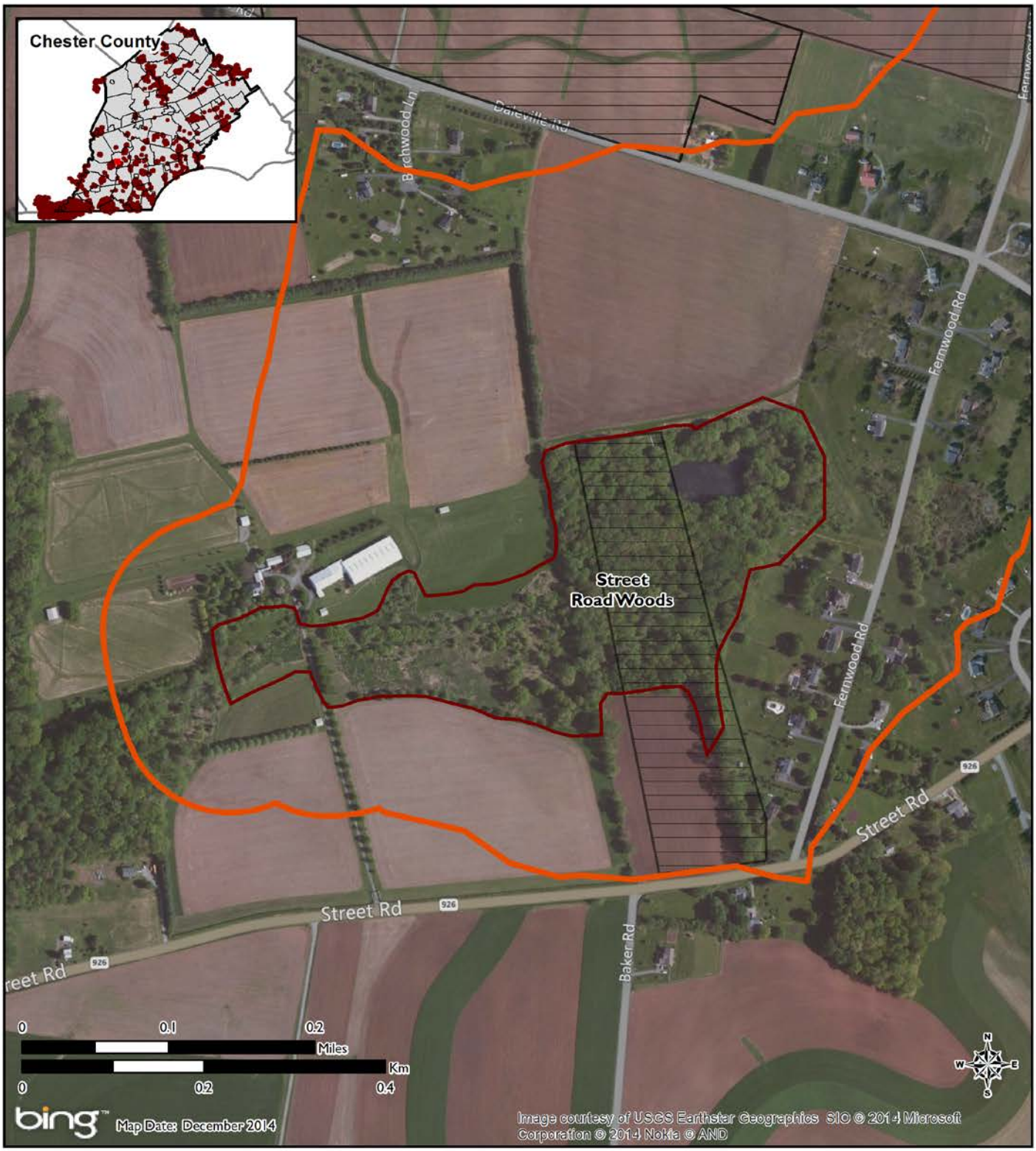
The following steps are recommended to ensure the persistence of these species at this site:

- Maintain the existing hydrology. Any activities that occur in nearby areas should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.

- Protect the existing wooded areas from logging. Avoid further fragmention of the habitat with roads, houses, or other disturbances in order to preserve habitat for as many species as possible.
- Widen the native vegetated buffer along stream and wetlands. A width of 100 meters is ideal, but any increase will benefit the stream and adjacent wetlands.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Londonderry Township*
USGS quads: *Oxford*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Property*



Street Road Woods Natural Heritage Area

Forested wetland supports a population of screw-stem, 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***
- ***Conservation Lands***

Sugartown Serpentine Barrens NHA

PNHP Significance Rank: *Regional*

Site Description

Darin Groff (Natural Lands Trust)

Serpentine bedrock-influenced herbaceous opening at Sugartown.

This Natural Heritage Area supports a globally rare serpentine habitat in a mosaic of the characteristic serpentine barren plant communities, which include open gravel areas, grassy meadows, and conifer and deciduous dominated woodland habitats in various stages of natural succession. The site occurs next to a hospital and is loosely surrounded by residential development. The Sugartown Serpentine Barrens is one of several serpentine habitats that make up an ecologically unique system occurring in scattered, mostly small patches. The serpentine habitats are often referred to as grasslands, and the scattered herbaceous openings can have a strong representation of warm season grasses and grass-like plants, but they also contain a good diversity of other plant species, many rare at the state and global levels. The serpentine community itself is considered globally uncommon due to the limited occurrences of this habitat type around the world.

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]
Serpentine grassland	C	GNR	S1	N (N)	2005	B
Serpentine Virginia pine - oak forest	C	GNR	S2	N (N)	2005	E
Arrow-feathered Three-awn (*Aristida purpurascens*)		G5	S2	PT (PT)	8/28/2007	B
Mead's Sedge (*Carex meadii*)		G4G5	S1	TU (PE)	5/31/1995	BC
Annual Fimbry (*Fimbristylis annua*)		G5	S2	PT (PT)	8/28/2007	B
Sandplain Wild Flax (*Linum intercursum*)		G4	S1	PE (PE)	8/28/2007	D
Plain Ragwort (*Packera anonyma*)		G5	S2	PR (PR)	8/28/2007	B
Few Flowered Nutrush (*Scleria pauciflora*)		G5	S2	PT (PT)	10/2/1992	B
Prairie Dropseed (*Sporobolus heterolepis*)		G5	S1	PE (PE)	8/28/2007	E
Serpentine Aster (*Symphyotrichum depauperatum*)		G2	S2	PT (PT)	8/28/2007	B
Bushy Aster (*Symphyotrichum dumosum*)		G5	S1	TU (PE)	9/12/2008	AB
Sensitive species of concern A[3]	S	---	---	---	8/28/2007	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.

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

Most of the plant species of concern found at this location are strongly associated with the serpentine influenced herbaceous openings, or within the adjacent thin woodlands. In the past, natural disturbance, such as wildfires, would have helped to keep these areas in an open condition. With the suppression of wildfires, much of the previously open areas have gradually closed due to natural succession. Recent management efforts to reclaim these openings have succeeded in securing a series of openings with strong populations of characteristic serpentine vegetation. A continuous active restoration effort to restore the serpentine openings will be necessary to ensure the persistence of these habitats and the species they support.

Serpentine aster is a species of plant that deserves special mention based on its potential for global extinction due to its extremely limited global population. This species is predominantly known to occur in the eastern serpentine barrens of Pennsylvania and Maryland, with a few far flung outliers in Virginia and North Carolina (Gustafson 2005; Kartesz 2013). This extremely limited distribution has given this species the status of G2 – globally imperiled. Serpentine aster is found in the more open areas of serpentine barrens, suggesting that fire or other active management may be needed to remove woody overgrowth and maintain this preferred habitat.

John Kunsman (PNHP)

Serpentine Aster (*Symphyotrichum depauperatum*)

<u>Threats and Stresses</u>

Historically, wildfires likely helped to maintain the open aspect of these habitats. Early accounts record the intentional setting of fire by Native Americans to help open areas for greater potential hunting success. Because of the past prevalence of intentional or accidental wildfires, this habitat was historically less dominated by woody trees and shrubs, but recent fire suppression has favored the expansion of wooded habitats at the expense of herbaceous openings. Invasion of serpentine herbaceous openings by woody trees and shrubs can influence the surrounding habitat. As woody vegetation encroaches on the openings, they tend to trap more organic debris and allow deeper soils to accumulate. As deeper soils occur on the site, they succeed to more common woodland and forest types. Fire disturbances had maintained these herbaceous openings in the past. In the absence of fire, active woody vegetation removal will be necessary to maintain these openings.

John Kunsman (PNHP)

Annual Fimbry (*Fimbristylis annua*)

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

- The lack of natural fire disturbance, or other active management to set back woody succession, poses one of the greatest threats to this habitat. In the absence of disturbance, most of the open serpentine barrens habitats will gradually succeed to more common woody vegetation such as junipers, pines and oaks.
- Residential development occurs along one edge of the serpentine habitat. Increased conversion of this habitat to suburban development decreases the long term viability of this habitat.

- Aggressive invasive species of plants can displace native species.
- Overbrowsing by deer can have a severely negative impact on small populations of plant species of concern.

Conservation Recommendations

Much of the primary serpentine influenced habitat is owned and managed by the Natural Lands Trust. Their stewardship staff has been conducting habitat management on this site since 2000 to maintain the serpentine openings. A number of these serpentine habitats occur in isolated patches in southern, central and eastern Chester County as the bedrock material, serpentinite, is exposed at the surface of the ground in a scattered fashion much like an archipelago chain of islands. Each habitat has a slightly different species composition, largely due to the slightly different environmental conditions found at each distinct location. A long range goal for these isolated habitats is to recognize them as a single system and plan for their ecological needs.

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

- There appears to be no specific management plan for this Natural Heritage Area, and the site would benefit from a thorough review of the site-specific goals and procedures for management here. In the interim, general goals and actions could be gleaned from other serpentine management plans such as the Goat Hill Management Plan (Furedi 2008); Unionville Serpentine Barrens Restoration and Management Plan (Latham 2012); Pink Hill Serpentine Barrens Restoration and Management Plan (Latham 2008).

Roger Latham, Continental Conservation

Prescribed fire is an excellent vegetation management tool for serpentine habitats.

- Active stewardship of these habitats is necessary. In the absence of natural fire disturbance, or active vegetation removal, these habitats will succeed into woodlands and forests, replacing the globally rare habitat with a more common type.
- Habitat restoration activities should strive to establish a mosaic of habitat types to accommodate the variety of organisms and their diverse habitat preferences. While some of these plants will only thrive in the open on thin soils, or even bare bedrock conditions, others need the limited shelter of scattered trees or even the deep shade provided by a mature forest. Some of the insect species require conifers during part of their life cycle while others need deciduous trees or specific shrubs or wildflower host plants. There is no "one-size-fits-all" management recommendation for this habitat other than to provide for a mosaic of habitat diversity. "It's essential in restoring and maintaining disturbance-dependent ecosystems to vary the intensity and frequency of the disturbance in patchwork fashion, so that there is always a mosaic of patches of differing disturbance history. …the patchy landscape produced by random variation in disturbance history from one patch to another is essential to sustain the diversity of habitats and organisms that make up the total ecosystem." (Roger Latham, personal communication November 7th, 2014)
- Management activities should be coordinated with long-term habitat monitoring. "Analysis of desired conditions, inventory of existing conditions, and long-term monitoring of an array of key indicators is essential to know whether restoration and management efforts are accomplishing all of the goals or if some of the threatened or endangered species whose recovery is first and

foremost among those goals might be inadvertently falling by the wayside." (Roger Latham, personal communication November 7th, 2014)

- Expand herbaceous openings as needed on convex landscapes by removing trees and other woody plants. Focus woody plant removal on areas of pines and junipers, which tend to indicate drier, thinner soils. The establishment of hardwoods should be taken as an indicator of deeper, moister soils. Where deeper soils occur, soil organic matter reduction may be necessary to establish thin soils over serpentine bedrock. "Soil organic matter reduction has proven effective in restoring serpentine grassland vegetation where it has been fully displaced by forest succession, as long as intact grassland adjoins the treated area to serve as a seed source. SOM reduction consists of skimming the surface organic horizons from the soil profile using a backhoe or front-end loader and transporting the material offsite by dump truck. It is particularly effective in restoring serpentine grassland where it has been invaded by a dense thicket of common greenbrier (*Smilax rotundifolia*)." (Roger Latham, personal communication November 18th, 2014)
- These systems may be best maintained in an agricultural or rural setting. Residential development near or between these barrens should be strongly discouraged. A priority for the security of these globally rare habitats should be to establish protection for the core habitats as well as to provide for the landscape context in which natural process can be maintained. Adjacent residential development can conflict with or greatly reduce the options for management using prescribed fire.
- Educate the adjacent landowners on the significance of the globally rare habitat and the need for ongoing management activities.
- Suppress the spread of invasive species of plants to prevent native species from being crowded out of the habitat. Removal of invasive plants in the immediately vicinity of the species of concern can help these populations compete for space against much more aggressive species. Invasive species management should be coordinated by individuals familiar with the rare species as well as the invasive species present. Continual invasive species monitoring and control will be necessary.
- Reduce deer herd density to suitable levels to prevent overbrowsing of sensitive species.

Location

Municipalities: *Willistown Township*
USGS quads: *Malvern*
Previous CNHI reference: *Sugartown Serpentine Barrens*
Associated NHAs: *None*
Overlapping Protected Lands: *Natural Lands Trust Property, Agricultural Easement*

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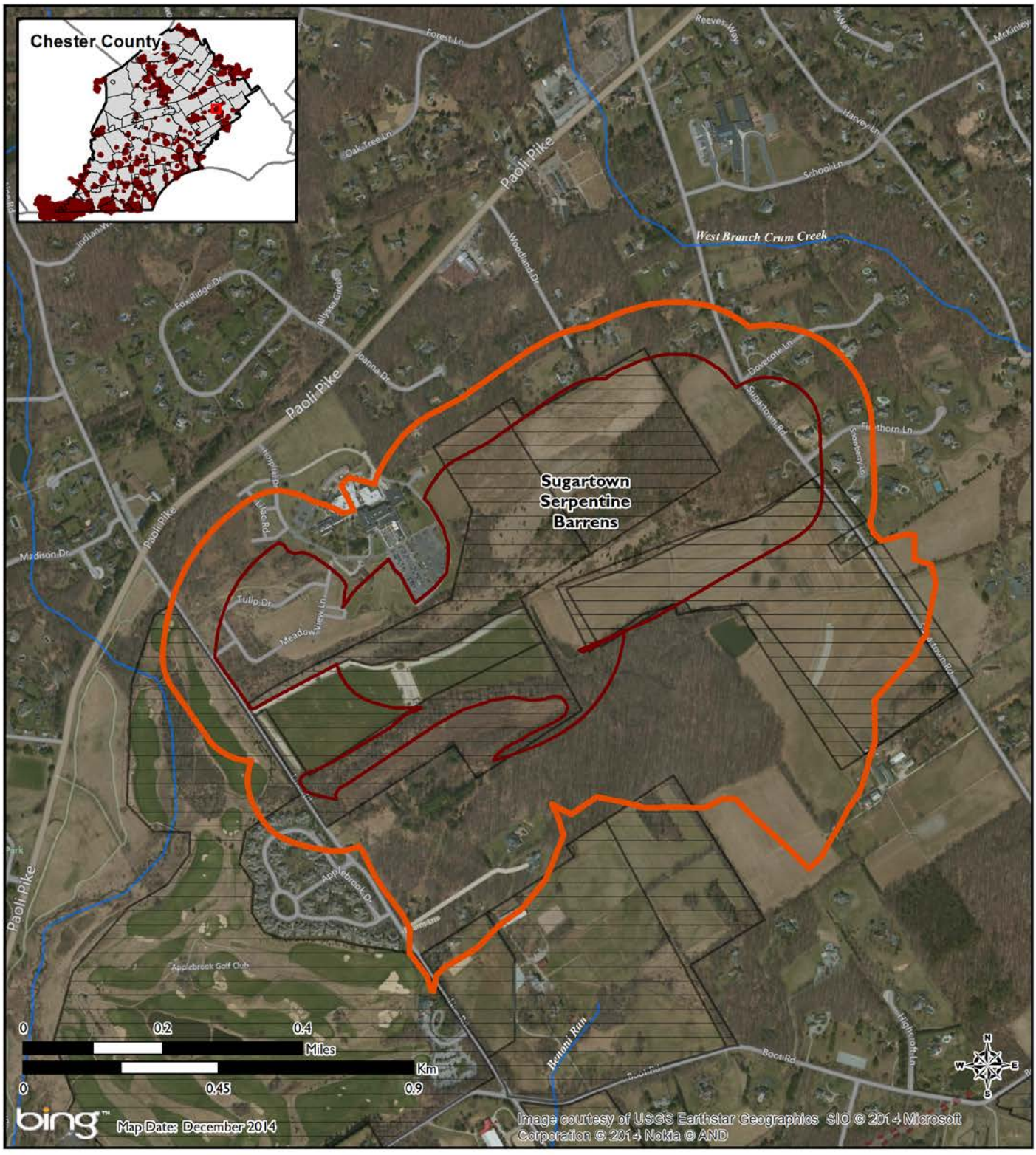


Sugartown Serpentine Barrens Natural Heritage Area

Serpentine barrens include state rare serpentine grassland and serpentine Virginia pine-oak forest communities and support 10 plant species of concern.

Significance Rank:
GLOBAL

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Telegraph Road Woods NHA

PNHP Significance Rank: *State*

Site Description

Telegraph Road Woods NHA is part of the narrow forested corridor along East Branch Brandywine Creek in Copesville. The surrounding habitat is mostly mowed fields and low density residential areas. The woods within this NHA provide habitat for a **sensitive species of concern**, not named 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**	---	---	---	2007	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.

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

Threats and Stresses

Invasive species are common throughout much of this site and may alter the natural habitat conditions. Fragmentation and other disturbance of the existing forested conditions will also likely degrade the habitat.

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

- Invasive species are present in this site and may displace native vegetation, including species of concern.
- Logging, development, or other activities that further fragment the patch of existing forest may alter the structure of the habitat and allow an increase in invasive species.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

Remove invasive species where possible, taking care to not create large openings that may dramatically alter the habitat. Maintain the existing forested area and minimize activities that will disturb or fragment the existing habitat.

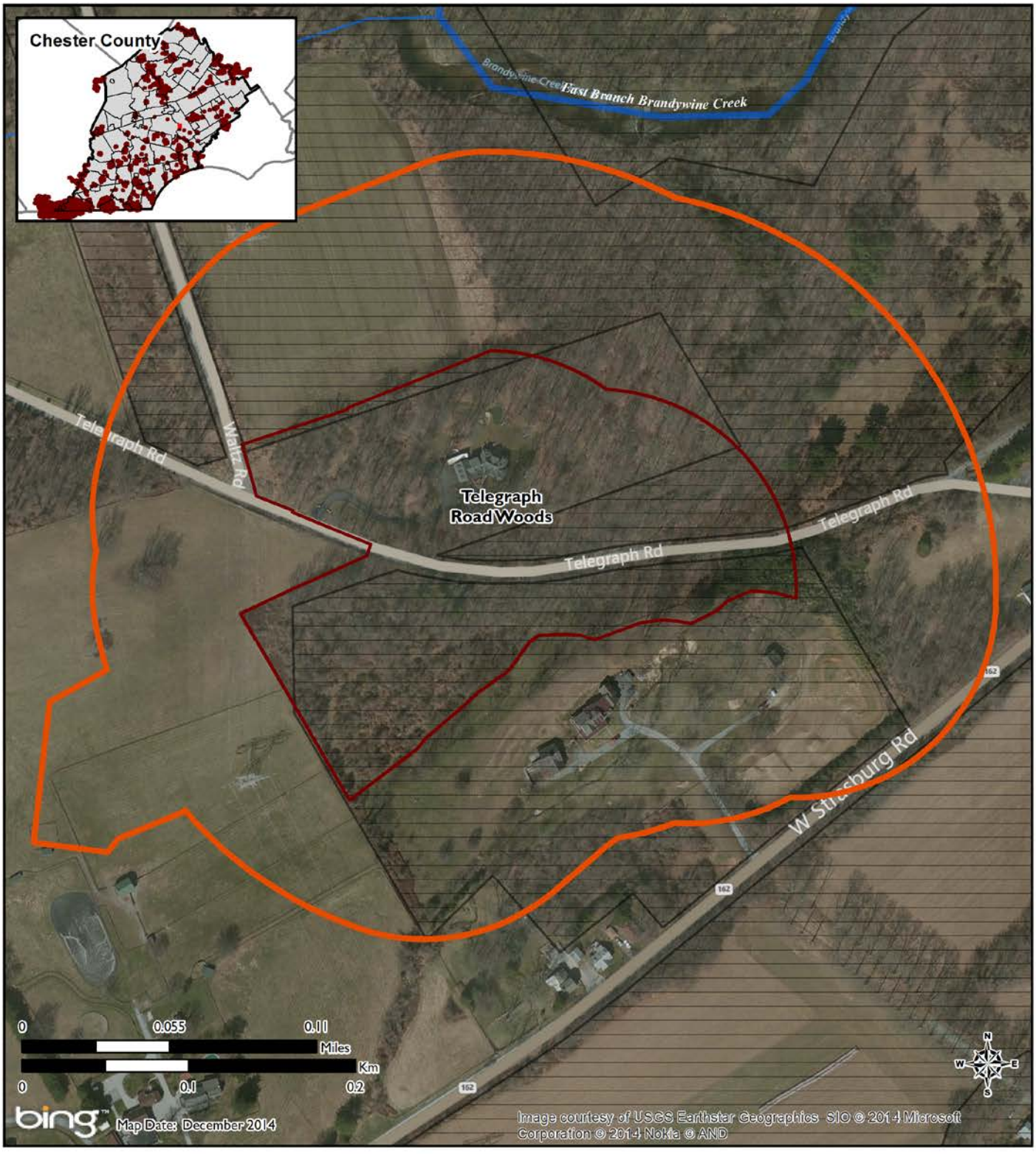
The following steps are recommended to ensure the persistence of these species at this site:

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations. Removal of the honeysuckle may allow more light to penetrate into the forest and alter species composition. Further disturbance within this habitat will create additional opening for the establishment and spread of invasive species.

- Protect the existing forested areas from logging and disturbance along the forest edge. Maintaining intact habitats, especially given the location within a residential area, will help to preserve habitat for as many species as possible.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *East Bradford Township, West Bradford Township*
USGS quads: *Unionville*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Natural Lands Trust Easement, Brandywine Conservancy Easement*



Telegraph Road Woods Natural Heritage Area

This site provides habitat for a sensitive species of concern.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Township Road Woods NHA

PNHP Significance Rank: *State*

Site Description

Township Road Woods NHA is a disturbed, wooded area near a mobile home park. Most of this site is former agricultural land that has succeeded into small trees and invasive shrubs. The more open habitat on the edges of the forested area provide habitat for **Elliot's beardgrass** and **St. Andrew's cross**, two plant 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]
Elliott's Beardgrass (*Andropogon gyrans*)	G5	S3	N (PR)	11/30/2003	E
St Andrew's-cross (*Hypericum stragulum*)	G4	S2	N (PT)	4/24/2006	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.

Elliot's beardgrass is at the northern edge of its range in Pennsylvania and has only been documented in a few southeastern counties. It spans from New Jersey to Illinois, south from Texas to Florida. This species needs open, early successional habitat in order to persist.

St. Andrew's-cross is near the northern edge of its range in Pennsylvania. This species occurs from New York and Massachusetts south into Georgia and west to Kansas and Texas. It is common in the southern portions of its range. In Pennsylvania it has been documented in several southern counties, most commonly in the southeast. It is found in a number of dry, open habitat types.

Threats and Stresses

Invasive species are commonly found throughout this site and threaten to displace native species. As the former field habitat succeeds into woods, the species composition will change. The nearby developed area may also disturb the habitat.

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

- Succession that is not controlled by mowing or other methods of disturbance will likely cause the habitat to become unsuitable for the species of concern to be able to persist at this site.
- Invasive species are present in this site and may displace native vegetation, including species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

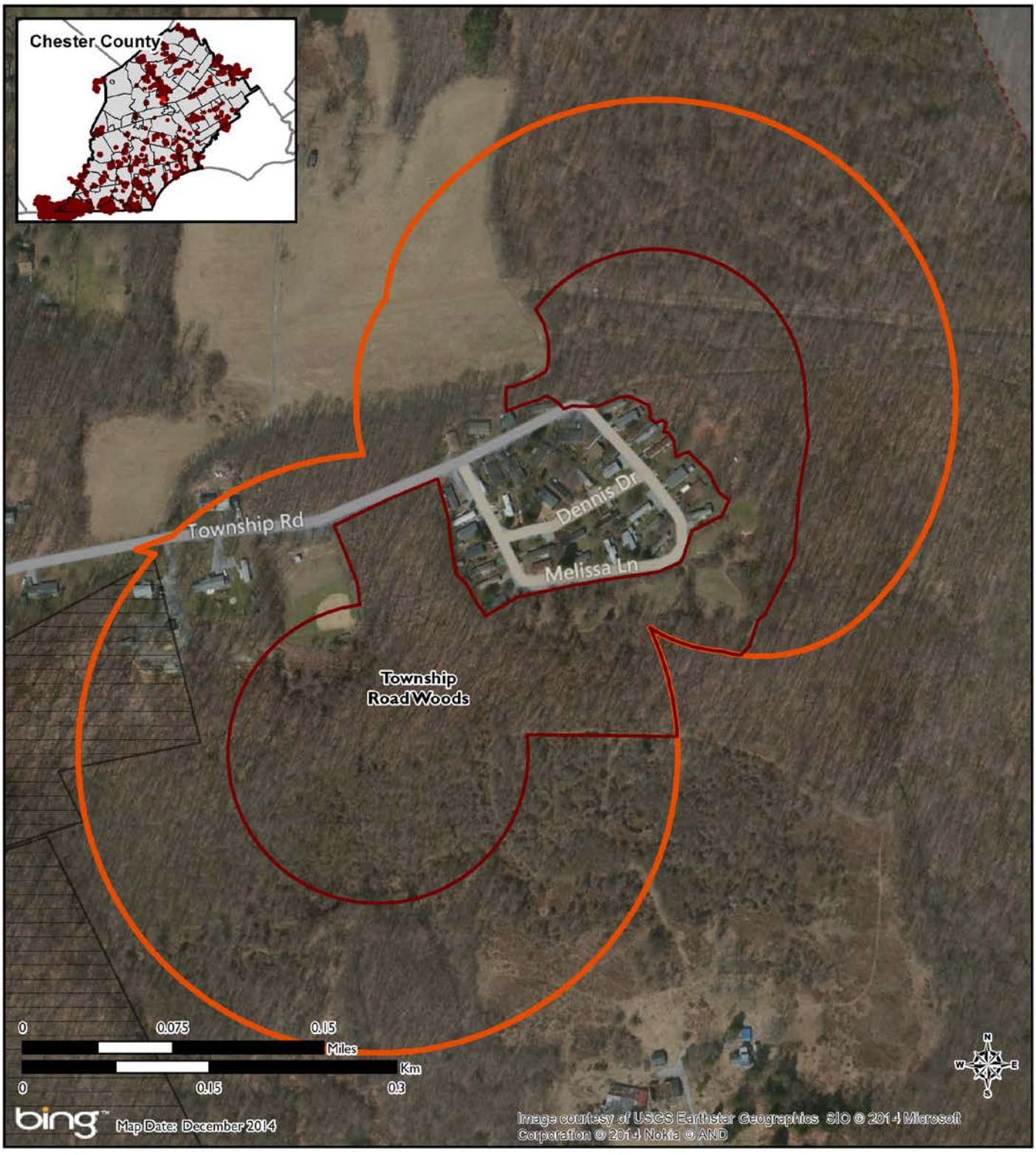
Limit disturbance to the existing habitat. Maintain areas of open habitat by mowing periodically, especially along roads.

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

- Elliot's beardgrass and St. Andrew's-cross require open habitat that needs to be maintained. The needs of these species should be considered when planning the timing and frequency of maintenance.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *East Brandywine Township*
USGS quads: *Downingtown*
Previous CNHI reference: *None*
Associated NHAs: *None*



Township Road Woods Natural Heritage Area

This site supports populations of two plant species of concern: Elliott's beardgrass and St. Andrew's-cross.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Triangle Woods NHA

PNHP Significance Rank: *State*

Site Description

Triangle Woods NHA is a small patch of remnant woods approximately 10 acres in size. The habitat is dominated by sugar maple, hickory, and tulip poplar. A wet opening within the woodlot provides habitat for **cattail sedge**, a plant species of concern. Disturbance created the opening currently used by the 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]
Cattail Sedge (*Carex typhina*)	G5	S2	PE (PT)	7/22/2006	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.

Cattail sedge is found throughout most of the eastern United States and is scattered throughout Pennsylvania. Cattail sedge grows in areas associated with wetlands. It is often found along the edge of vernal pools but can also be found in swamps and along streams.

Threats and Stresses

This NHA is a very small patch of remnant habitat, which will make it susceptible to impacts from nearby disturbance. Invasive species are common throughout the site and may alter the natural habitat.

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

- Invasive species are present in this site and may displace native vegetation, including species of concern.
- Modifications to the hydrology will likely cause unfavorable changes to the habitat and negatively impact the species of concern.
- Growth of woody species within the wet opening will likely eliminate the habitat currently used by cattail sedge.
- Runoff and other sources of water pollution from the surrounding area threaten to degrade the water quality of streams and wetlands.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

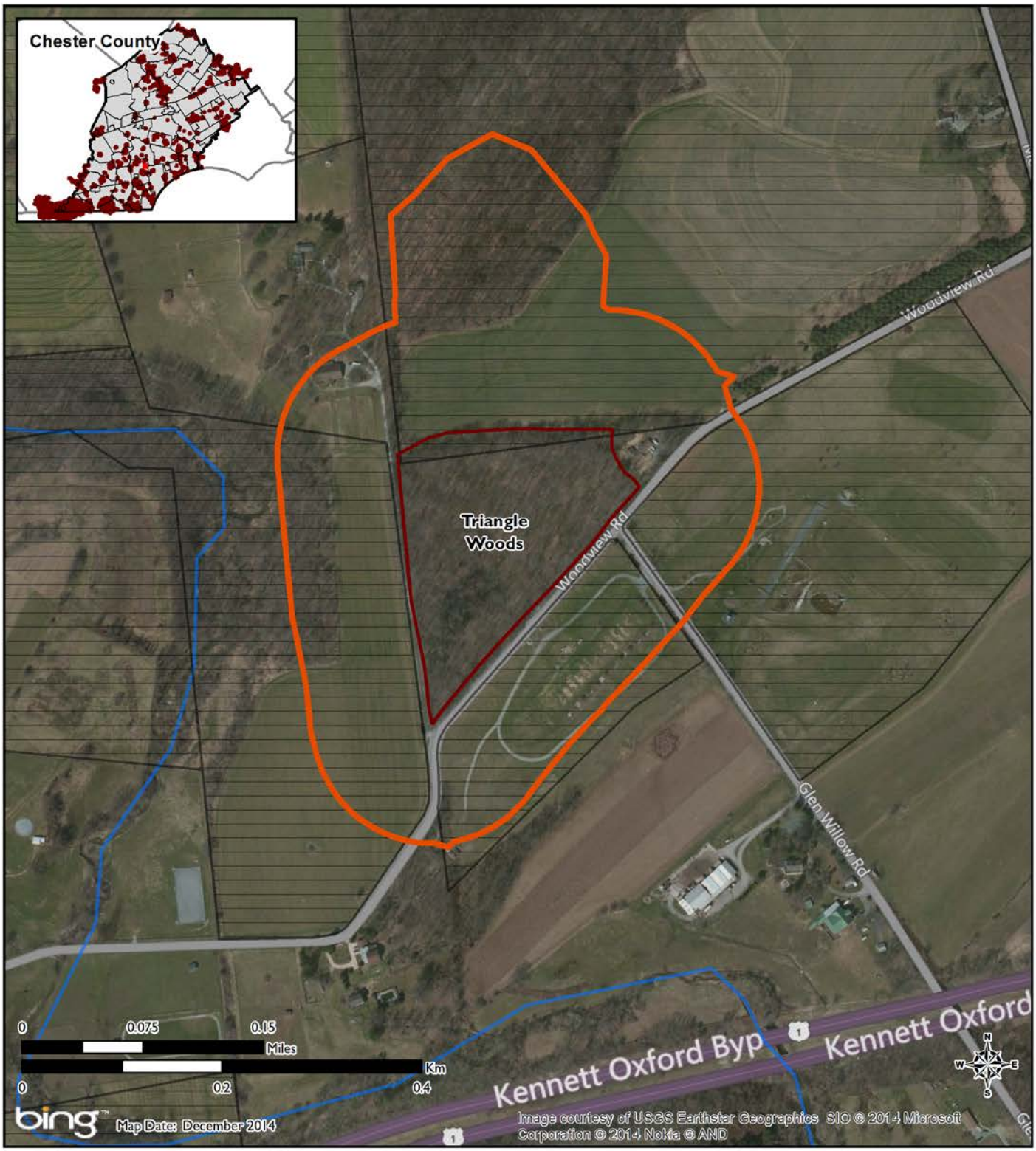
This NHA is a small area of privately owned land that is surrounded by properties held under a conservation easement. Prevent disturbances within and around the NHA that will have negative impacts on the existing habitat.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations. Further disturbance within this habitat will create additional opening for the establishment and spread of invasive species.
- Avoid altering the current hydrology of the site, including draining or filling the wetlands and altering the flow of surface water. Consider potential changes to the flow of water when doing any activities within and around this NHA.
- Periodically clear the growth of woody species to maintain the open, wet habitat needed by the species of concern.
- Maintain the existing vegetated buffer along the stream and wetlands and expand it wherever possible, especially along the road.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *London Grove Township*
USGS quads: *West Grove*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Easement*



Triangle Woods
Natural Heritage Area

A small patch of forest supports a population of cattail sedge, 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***
- ***Conservation Lands***

Trythall Woods NHA

PNHP Significance Rank: *State*

Site Description

Trythall Woods NHA is owned by the Brandywine Conservancy as part of the Crow's Nest Preserve. This preserve is located in northern Chester County on the southern end of the area known as Hopewell Big Woods, which is a large expanse of forest that stretches into Berks County. The majority of this NHA is forested, with a series of seeps in the forest north of Northside Road. French Creek flows along the northern end of the NHA and a small tributary runs through the southern end. Several fields are found in the northern portion of this NHA. The early successional habitat supports a population of **swamp lousewort**, a plant species of concern. Small openings near an old quarry also provide habitat for this species.

Rob Curtis, iNaturalist

Swamp lousewort (*Pedicularis lanceolata*)

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]
Swamp Lousewort (*Pedicularis lanceolata*)	G5	S1S2	N (PE)	10/8/1995	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.

Swamp lousewort has a range from southern New England west into the Dakotas and south into Arkansas and Georgia. In Pennsylvania, it occurs mostly in the southern and northwestern counties, where it grows in calcareous wetlands, including boggy meadows, marshes, swamps, and fens.

Threats and Stresses

Fragmentation of the intact forested habitat could alter species composition and allow for the introduction of invasive species. Changes in hydrology can negatively affect streams, wet forest, and seep habitats. Succession that is not controlled by some form of maintenance would likely fill in the open fields and edge habitats with woody species. Excessive deer browsing may be a threat in some locations.

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

- Logging, development, or other major activities can further fragment the existing forest and alter the conditions of the habitat. Disturbances will also open areas that can be easily colonized by invasive species.
- Succession of the open grassy fields and shrubby edges may cause the habitat used by swamp lousewort to become overgrown and shaded by woody species.
- Changes in hydrology may make the habitat unsuitable to the species of concern found here by either flooding or drying the wet areas.
- Invasive species are present at this site and may displace native vegetation, including species of concern.

- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

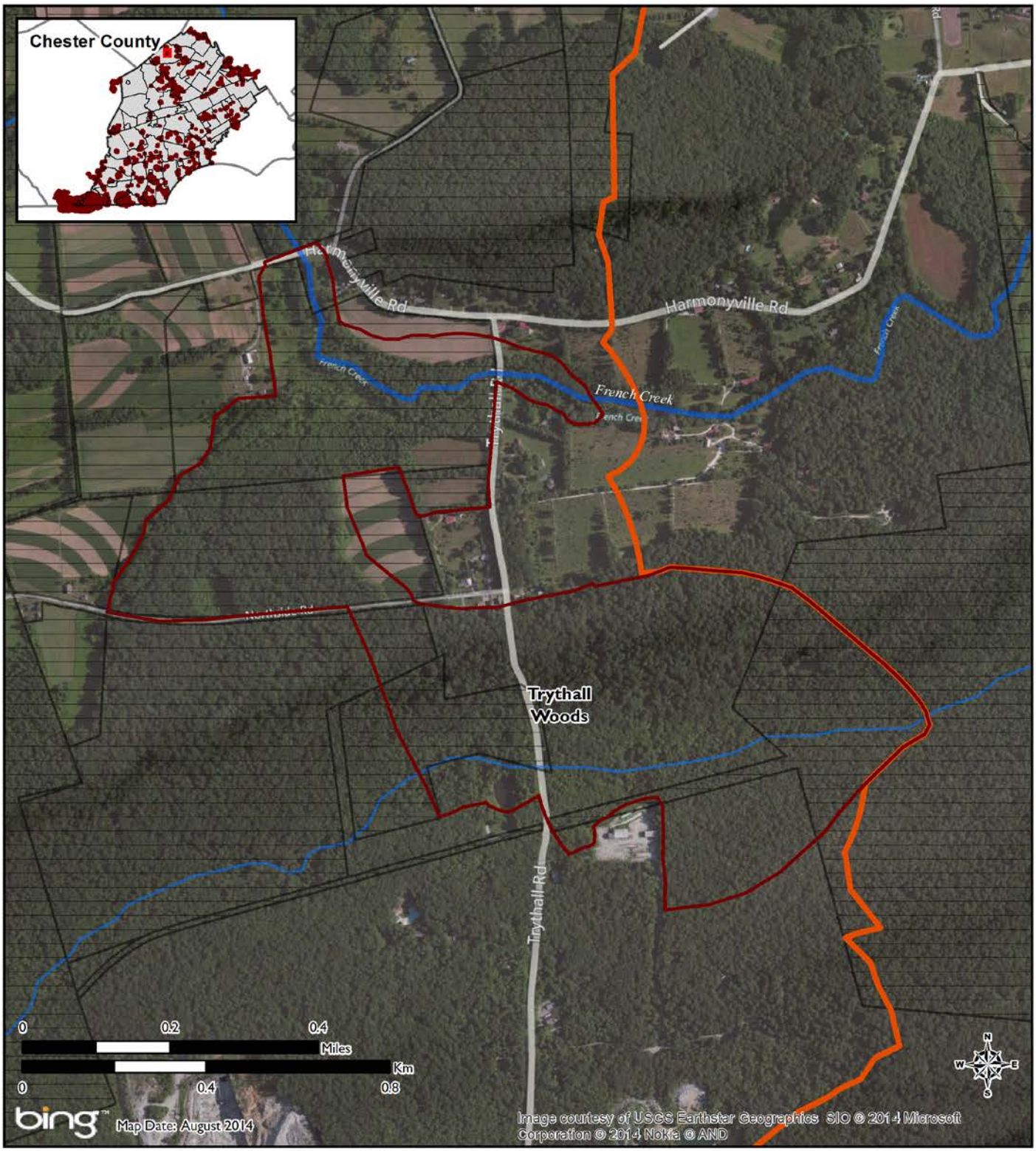
Trythall Woods NHA is mostly owned by Natural Lands Trust (NLT) and managed to protect the natural resources found here. The southeastern corner of this NHA is privately owned, which may make it a challenge to manage this site as a whole. Limit activities that will disturb the forested habitat and create fragmentation. Continue to maintain the early successional habitat and field edges. The known occurrences of swamp lousewort and its habitat type will be enhanced by creating buffers around its habitat, removal of invasive species, and protection of wetland hydrology.

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

- Protect the existing forested areas from logging and other large scale disturbance. Keep the forest as intact as possible to protect the habitat and species within it.
- Swamp lousewort requires open habitat that needs to be maintained. The needs of this species should be considered when planning the timing and frequency of maintenance.
- Maintain the existing hydrology. Any activities that occur along the roads should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Warwick Township*
USGS quads: *Pottstown, Elverson*
Previous CNHI reference: *Trythall Woods, Trythall Road Wetland*
Associated NHAs: *None*
Overlapping Protected Lands: *Natural Lands Trust Property, State Game Land #43, Brandywine Conservancy Easement, St. Peters Trail*



Trythall Woods
Natural Heritage Area

Seepage forested wetlands support a population of swamp lousewort, a plant species of concern.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Unionville Serpentine Barren NHA

PNHP Significance Rank: *Regional*

Site Description

This Natural Heritage Area contains a globally rare serpentine habitat in a mosaic of the characteristic serpentine barren plant communities, which include small, open gravel areas, and grassy meadows, within a matrix of conifer and deciduous dominated woodland habitats in various stages of natural succession. The serpentine habitats are often referred to as grasslands, and the scattered herbaceous openings can have a strong representation of warm season grasses and grass-like plants, but they also contain a good diversity of other plant species, many rare at the state and global levels. Unionville Serpentine Barrens is currently known to support 7 animal species of concern, (butterflies & moths) that feed on the unique variety of plants present, 19 plant species of concern, and an additional sensitive species of concern. The serpentine community itself is considered globally uncommon due to the limited occurrences of this habitat type around the world.

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]
Serpentine grassland	C	GNR	S1	N (N)	2005	BC
Juniper Hairstreak (*Callophrys gryneus*)		G5	S3	N (N)	4/12/2014	E
Cobweb Skipper (*Hesperia metea*)		G4	S2	N (N)	5/11/2014	E
Dot-lined White Moth (*Artace cribraria*)		G5	S1	N (N)	6/20/2014	E
Straight lined Mallow (*Bagisara rectifascia*)		G4	SU	N (N	8/11/2014	E
Packard's Lichen Moth (*Cisthene packardii*)		G5	S1S3	N (N)	8/25/2014	E
Regal Moth (*Citheronia regalis*)		G4G5	SU	N (N)	7/12/2014	E
A Noctuid Moth (*Meropleon ambifusca*)		G3G4	SU	N (N)	7/27/2014	E
Small White-snakeroot (*Ageratina aromatica*)		G5	S3	N (PR)	8/14/2014	E
Elliott's Beardgrass (*Andropogon gyrans*)		G5	S3	N (PR)	2014	E
Arrow-feathered Three-awn (*Aristida purpurascens*)		G5	S2	PT (PT)	2014	E
Tall Gramma (*Bouteloua curtipendula*)		G5	S2	PT (PT)	4/4/2000	E
Bicknell's Sedge (*Carex bicknellii*)		G5	S1	PE (PE)	6/7/2011	C
Richardson's Sedge (*Carex richardsonii*)		G5	S1	N (PE)	5/14/2003	B
New Jersey tea (*Ceanothus americanus*)		G5	SNR	N (SP)	2014	E
Field Chickweed (*Cerastium velutinum var. velutinum*)		G5T4?1	S3	N (SP)	2014	E
Tufted Hairgrass (*Deschampsia cespitosa*)		G5	S3	N (PT)	2015	E
Heller's Witchgrass (*Dichanthelium oligosanthes*)		G5	S3	N (PT)	2014	E
Long-haired Panic-grass (*Dichanthelium villosissimum var. villosissimum*)		G5T5	SH	TU (PE)	2002	E
Annual Fimbry (*Fimbristylis annua*)		G5	S2	PT (PT)	6/16/1992	CD
Bicknell's Hoary Rockrose (*Helianthemum bicknellii)*		G5	S2	PE (PE)	7/6/2003	C
Forked Rush (*Juncus dichotomus*)		G5	S1	PE (PE)	6/7/2011	E
Michaux's stitchwort (*Minuartia michauxii*)		G5	S2	N (PT)	2014	E

Plain Ragwort (*Packera anonyma*)		G5	S2	PR (PR)	6/11/2003	B
Few Flowered Nutrush (*Scleria pauciflora*)		G5	S2	PT (PT)	6/25/1993	B
Serpentine Aster (*Symphyotrichum depauperatum*)		G2	S2	PT (PT)	9/29/1992	C
Sensitive species of concern A[3]	S	---	---	---	9/29/1992	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.

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

Many of the butterfly and moth species (Lepidoptera) documented at this location are limited in distribution in Pennsylvania to serpentine and other grassland habitats, which are often set in a matrix of open oak and pine woodlands. Conservation of these species requires protection of the habitat they use during all stages of their life cycles. Maintaining a mosaic of grassland, oak, and pine areas at serpentine barrens sites and the surrounding area will create a diverse and healthy habitat capable of supporting the rare Lepidoptera listed above. Creation of corridors between barrens sites could also encourage movement of species between sites and help create more secure populations. Pesticide application, especially for the control of gypsy moths, can have a devastating effect on populations of Lepidoptera species of concern and should not be used in this area.

The plant species of concern found at this location are, for the most part, strongly associated with the serpentine influenced small herbaceous openings, or within the adjacent thin woodlands. In the past, natural disturbance, such as wildfires, would have helped to keep these areas in an open condition. With the suppression of wildfires, the open areas have gradually closed due to natural succession. Recent management efforts to reclaim these openings have succeeded in securing a series of scattered openings with strong populations of characteristic serpentine vegetation. A continuous active restoration effort to restore the serpentine openings will be necessary to ensure the persistence of these habitats and the species they support.

Serpentine aster is a species of plant that deserves special mention based on its potential for global extinction due to its extremely limited global population. This species is predominantly known to occur in the eastern serpentine barrens of Pennsylvania and Maryland, with a few far flung outliers in Virginia and North Carolina (Gustafson 2005; Kartesz 2013). This extremely limited distribution has given this species the status of G2 – globally imperiled. Serpentine aster is found in the more open areas of serpentine barrens, suggesting that fire or other active management may be needed to remove woody overgrowth and maintain this preferred habitat.

Rocky Gleason (PNHP)

Serpentine Aster (*Symphyotrichum depauperatum*)

Threats and Stresses

Historically, wildfires likely helped to maintain the open aspect of these habitats. Early accounts record the intentional setting of fire by Native Americans to help open areas for greater potential hunting success. Because of the past prevalence of intentional or accidental wildfires, this habitat was historically less dominated by woody trees and shrubs, but recent fire suppression has favored the expansion of wooded habitats at the expense of herbaceous openings. Invasion of serpentine herbaceous openings by woody trees and shrubs can influence the surrounding habitat. As woody vegetation encroaches on the

openings, they tend to trap more organic debris and allow deeper soils to accumulate. As deeper soils occur on the site, they succeed to more common woodland and forest types. Fire disturbances had maintained these herbaceous openings in the past. In the absence of fire, active woody vegetation removal will be necessary to maintain these openings.

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

- The lack of natural fire disturbance, or other active management to set back woody succession, poses one of the greatest threats to this habitat. In the absence of natural fire events, most of the open serpentine barrens habitats will gradually succeed to more common woody vegetation such as junipers, pines and oaks.
- Use of pesticides to control gypsy moths or other insect pests can pose a significant hazard to the insect species of concern at this location. Elimination of specific insect host plants can also eliminate insect species of concern.
- Aggressive invasive species of plants can displace native species.
- Overbrowsing by deer can have a severely negative impact on small populations of plant species of concern.

Conservation Recommendations

A management plan specifically for the Unionville Serpentine barrens was recently developed by Roger Latham of Continental Conservation (Latham 2012). Please consult that plan for fine details about management at this location. These serpentine habitats occur in isolated patches as the bedrock material, serpentinite, is exposed at the surface of the ground in a scattered fashion much like an archipelago chain of islands. Each habitat has a slightly different species composition, largely due to the slightly different environmental conditions found at each distinct location. A long-range goal for these isolated habitats is to recognize them as a single system and plan for their ecological needs. The area between and around these habitats should be maintained to provide the necessary buffer to allow prescribed burns to be used as a tool to maintain and increase the mosaic of open habitat once a network of the woody species have been removed.

Roger Latham, Continental Conservation

Prescribed fire is an excellent vegetation management tool for serpentine habitats.

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

- Active stewardship of these habitats is necessary. In the absence of natural fire disturbance, or active vegetation removal, these habitats will succeed into woodlands and forests, replacing the globally rare habitat with a more common type.
- Habitat restoration activities should strive to establish a mosaic of habitat types to accommodate the variety of organisms and their diverse habitat preferences. While some of these plants will only thrive in the open on thin soils, or even bare bedrock conditions, others need the limited shelter of scattered trees or even the deep shade provided by a mature forest. Some of the insect species require conifers during part of their life cycle while others need deciduous trees or specific shrubs or wildflower host plants. There is no "one-size-fits-all" management recommendation for this habitat other than to provide for a mosaic of habitat diversity. "It's essential in restoring and maintaining disturbance-dependent ecosystems to vary the intensity and frequency of the disturbance in patchwork fashion, so that there is always a

mosaic of patches of differing disturbance history. …the patchy landscape produced by random variation in disturbance history from one patch to another is essential to sustain the diversity of habitats and organisms that make up the total ecosystem." (Roger Latham, personal communication November 7th, 2014)

- Management activities should be coordinated with long-term habitat monitoring. "Analysis of desired conditions, inventory of existing conditions, and long-term monitoring of an array of key indicators is essential to know whether restoration and management efforts are accomplishing all of the goals or if some of the threatened or endangered species whose recovery is first and foremost among those goals might be inadvertently falling by the wayside." (Roger Latham, personal communication November 7th, 2014)
- Expand herbaceous openings as needed on convex landscapes by removing trees and other woody plants. Focus woody plant removal on areas of pines and junipers, which tend to indicate drier, thinner soils. The establishment of hardwoods should be taken as an indicator of deeper, moister soils. Where deeper soils occur, soil organic matter reduction may be necessary to establish thin soils over serpentine bedrock. "Soil organic matter reduction has proven effective in restoring serpentine grassland vegetation where it has been fully displaced by forest succession, as long as intact grassland adjoins the treated area to serve as a seed source. SOM reduction consists of skimming the surface organic horizons from the soil profile using a backhoe or front-end loader and transporting the material offsite by dump truck. It is particularly effective in restoring serpentine grassland where it has been invaded by a dense thicket of common greenbrier (*Smilax rotundifolia*)." (Roger Latham, personal communication November 18th, 2014)
- These systems may be best maintained in an agricultural or rural setting. Residential development near or between these barrens should be strongly discouraged. Adjacent residential development can conflict with or greatly reduce the options for management using prescribed fire.
- Educate the adjacent landowners on the significance of the globally rare habitat and the need for ongoing management activities.
- Suppress the spread of invasive species of plants to prevent native species from being crowded out of the habitat. Removal of invasive plants in the immediately vicinity of the species of concern can help these populations compete for space against much more aggressive species. Invasive species management should be coordinated by individuals familiar with the rare species as well as the invasive species present. Continual invasive species monitoring and control will be necessary.

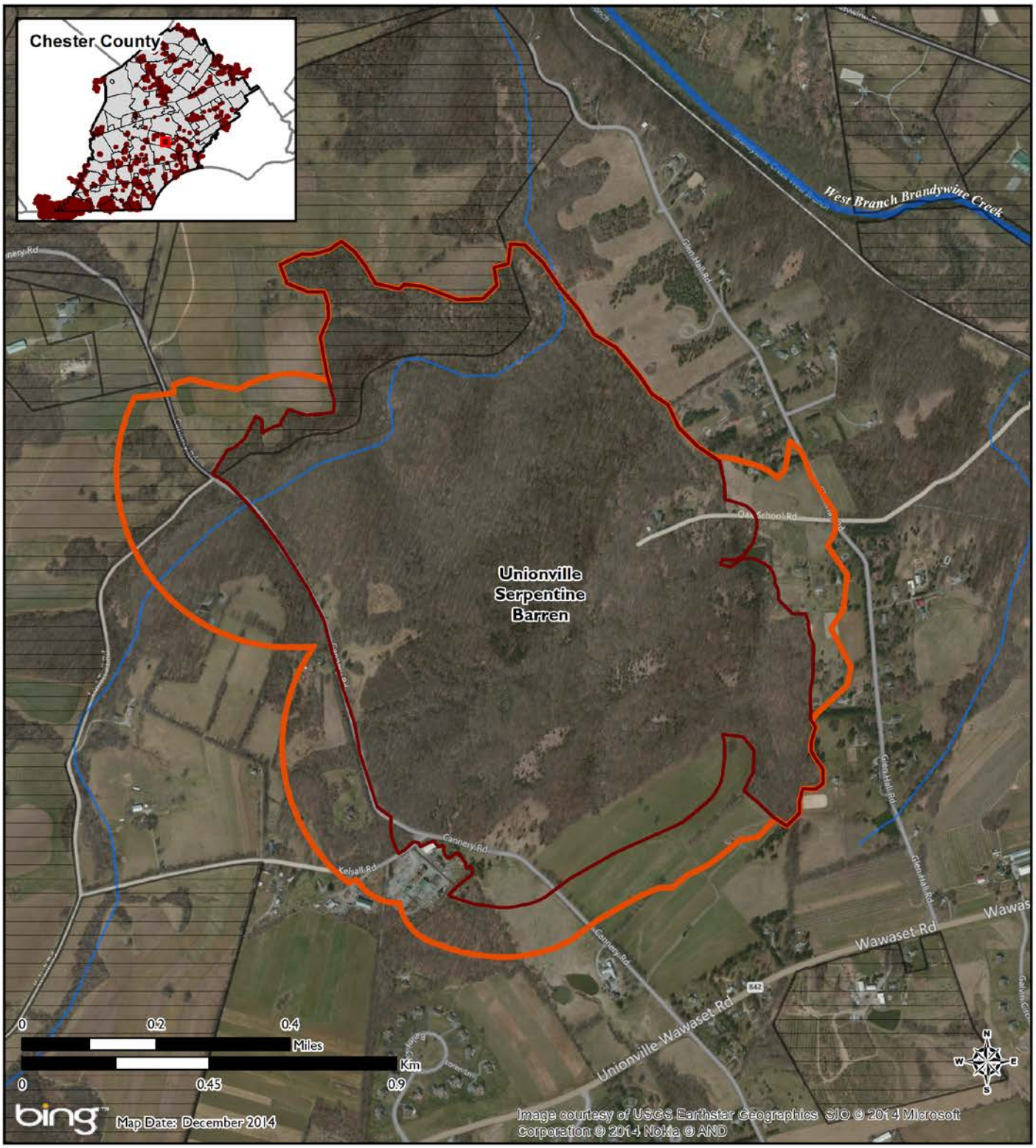
Rocky Gleason (PNHP)

Few Flowered Nutrush (*Scleria pauciflora*)

- Reduce deer herd density to suitable levels to prevent overbrowsing of sensitive species.

<u>Location</u>

Municipalities: *Newlin Township*
USGS quads: *Unionville*
Previous CNHI reference: *Unionville Serpentine Barren*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Easement*



Unionville Serpentine Barren Natural Heritage Area

This site contains a serpentine grassland natural community, critically imperiled in PA and supports many plant and lepidopteran species of concern.

Significance Rank:
GLOBAL

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Valley Forge NHA

PNHP Significance Rank: *State*

Site Description

Valley Forge NHA is located along the southwestern corner of Valley Forge National Historical Park in a highly developed area. This site is bisected by the Pennsylvania Turnpike, with residential developments located south of the highway. The northern side of this NHA is a wooded riparian corridor along Valley Creek with man made settlement ponds near the turnpike. **Northern Myotis**, a bat species of concern, was seen foraging in this area.

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]
Northern Myotis (*Myotis septentrionalis*)		G4	S1	---	8/4/2005	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.

By day, the Northern Myotis roosts within tree cavities or under the exfoliating bark of both live and dead trees. By night, this bat prefers to forage at canopy level along stream corridors and throughout forested habitats. Because of its preference for forested settings, large blocks of un-fragmented forest are preferred summer habitats. The rampant spread of White Nose Syndrome caused by the fungus *Pseudogymnoascus destructans* has caused dramatic losses to this species. Because of this, it is ever more important to protect summer foraging habitat in order to give bats the opportunity to gain crucial fat reserves for winter hibernation.

Threats and Stresses

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

- Degradation of water quality can have indirect negative impacts on the species of concern found within this NHA. The storm water runoff from roadways, suburban development and agriculture should be considered a potential source of significant contamination. Runoff from these sources have significantly higher levels of sediment, nutrients, pesticides, herbicides and other pollutants than runoff filtered through a natural habitat.
- Fragmentation due to development or infrastructure activities can result in habitat loss and degradation of the site.
- Removal of live or dead trees with exfoliating bark can ruin existing or potential summer roosting habitat.
- Exotic invasive plant species threaten to compete with and displace native species.
- Over-browsing by white-tailed deer is a serious threat to the overall plant diversity and forest regeneration.

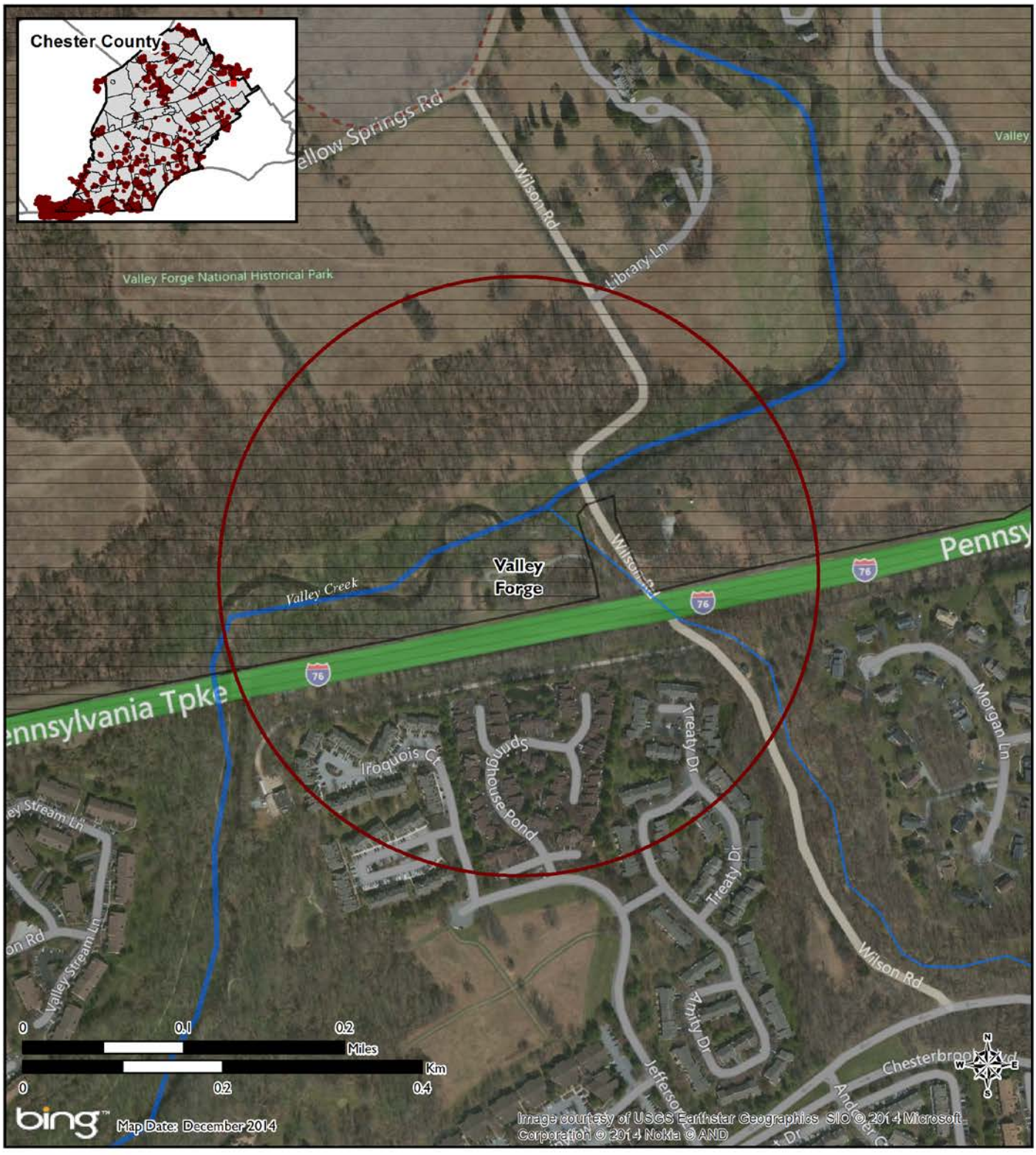
Conservation Recommendations

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

- Discourage the removal of live or dead trees with exfoliating bark. Trees such as Shagbark Hickory (*Caraya ovata*) and Shellbark Hickory (*Caraya laciniosa*) provide especially good daytime bat roosts. When tree removal is absolutely necessary, it should be carried out over the winter months during hibernation.
- While the Northern Myotis does not frequently roost or hibernate in manmade structures, structures destined for removal should be inspected for bat usage prior to demolition.
- 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 population of species of concern, the natural landscape also helps to protect water quality of the stream that drains through this NHA.
- Control invasive plant species to prevent native species from being crowded out by introduced species. 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 and repair a heavily infested habitat. Invasive species management should be coordinated by individuals familiar with the rare species as well as the invasive species present. Continual invasive species monitoring and control will be necessary.
- Reduce the deer density in the area. Uncommon species of native plants are particularly susceptible to deer herbivory.

Location

Municipalities: *Tredyffrin Township*
USGS quads: *Valley Forge*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Valley Forge National Historic Park*



Valley Forge
Natural Heritage Area

The floodplain corridor of Valley Creek provides foraging habitat for Northern Myotis, a critically imperiled bat 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*
- *Conservation Lands*

Valley Forge - Yellow Springs Field NHA

PNHP Significance Rank: *State*

Site Description

This NHA is part of Valley Forge National Historical Park, located just north of the Pennsylvania Turnpike. Valley Forge – Yellow Springs Field NHA is maintained by occasional mowing. This NHA is part of a series of fields to the north of Yellow Springs Road that are approximately 20 acres in size. The surrounding area is made up of similar early successional fields and forested habitat. The mowed field within this NHA provides habitat for **St. Andrew's-cross**, a plant 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]
St Andrew's-cross (*Hypericum stragulum*)	G4	S2	N (PT)	9/24/1997	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.

St. Andrew's-cross is near the northern edge of its range in Pennsylvania. This species occurs from New York and Massachusetts south into Georgia and west to Kansas and Texas. It is common in the southern portions of its range. In Pennsylvania it has been documented in several southern counties, most commonly in the southeast. It is found in a number of dry, open habitat types.

Threats and Stresses

Succession that is not controlled by some type of maintenance will fill in the meadow habitat with woody species. Excessive mowing and herbicide use can also negatively impact the early successional species.

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

- Succession that is not controlled by mowing or other methods of disturbance will likely cause the habitat to become unsuitable for the species of concern to be able to persist at this site.
- Herbicides and fertilizers used in the fields and along roads may cause direct mortality to the species of concern and degrade habitat conditions.
- Invasive species are present in this site and may displace native vegetation, including species of concern.
- White-tailed deer density in this area is high. Over-browsing by deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

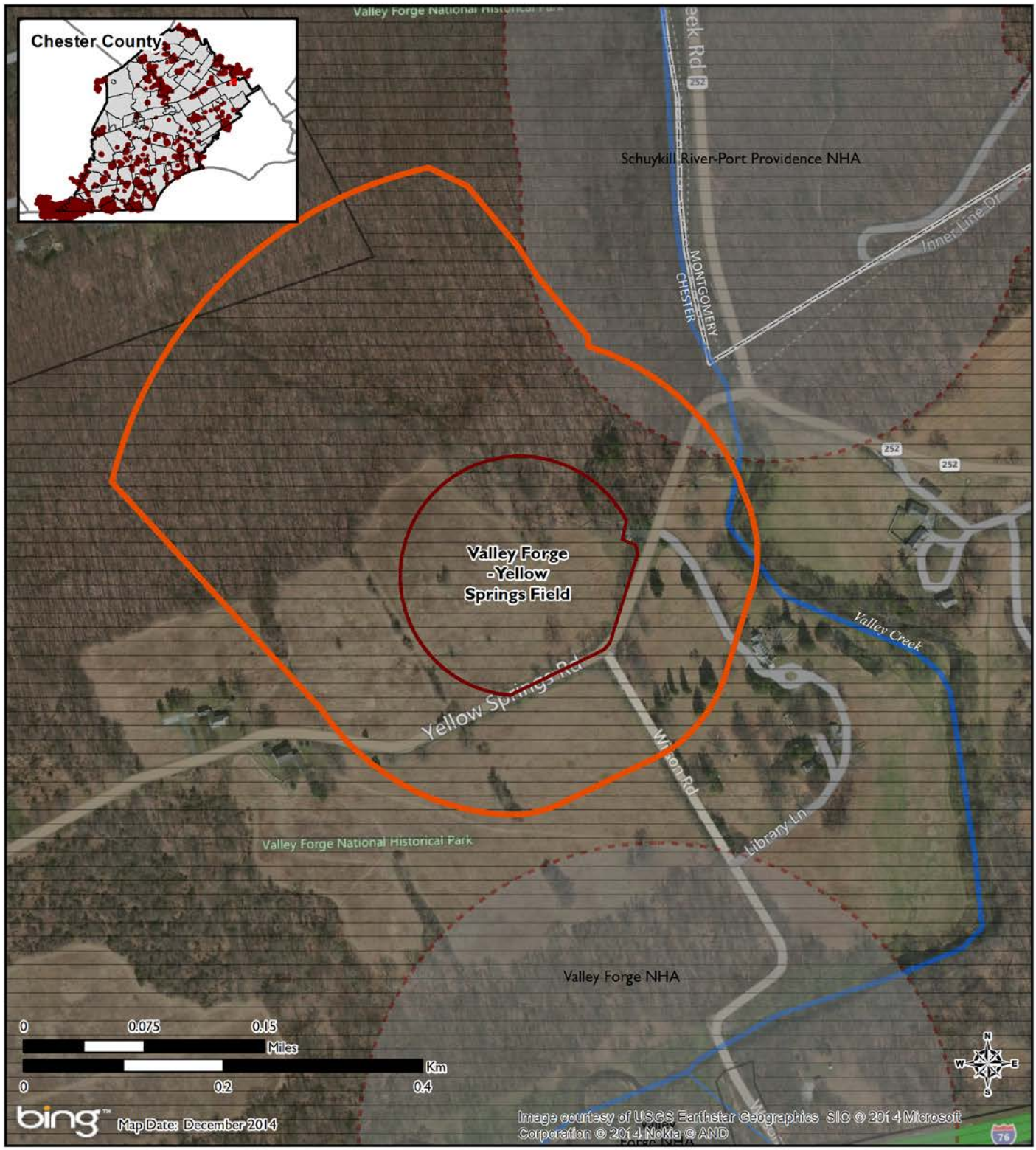
Ownership of this NHA as part of Valley Forge National Historical Park should help to provide continued maintenance of this area and prevent development. The meadow is actively managed to preserve the early successional habitat conditions. Maintenance should be done outside of the growing season in order to limit the impact on the native species at this site.

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

- St. Andrew's-cross requires open habitat that needs to be maintained. The needs of this species should be considered when planning the timing and frequency of maintenance.
- Limit herbicide use to situations where it is necessary, such as to control invasive species.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Reduce deer density, then continue to monitor and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Tredyffrin Township*
USGS quads: *Valley Forge*
Previous CNHI reference: *Valley Forge NHP - SP518, SP546, SP549*
Associated NHAs: *None*
Overlapping Protected Lands: *Valley Forge National Historic Park*



Valley Forge - Yellow Springs Field Natural Heritage Area

This open field supports a population of St. Andrew's-cross, an imperiled 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***
- ***Conservation Lands***

Warwick County Park NHA

PNHP Significance Rank: *Regional*

Site Description

Warwick County Park is located in northern Chester County in Knauertown, south of Route 23. This NHA is located in the forested area of the park. The forest is dominated by beech, oak, birch, and tulip poplar. Seeps occur throughout portions of the site that provide habitat for **bog bluegrass**, a globally vulnerable plant species of concern. Bog bluegrass is found scattered throughout Pennsylvania. It is uncommon in its entire range, which stretches from New York south to North Carolina and west to Minnesota and Iowa. This wetland species requires good water quality and neutral or calcareous water chemistry. Other wet areas dominated by skunk cabbage occur at this site, and **netted chainfern** has been documented in these areas. Netted chainfern is also a wetland species that is found scattered throughout Pennsylvania. Its entire range spans from Nova Scotia south to Florida and west to Texas. It is more common in the southern portion of its range.

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]
Bog Bluegrass (*Poa paludigena*)		G3	S3	PT (PR)	6/7/2012	C
Netted Chainfern (*Woodwardia areolata*)		G5	S2	N (PT)	6/8/1997	BC
Sensitive species of concern A[3]	S	--	--	--	5/22/2012	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

Disturbances, such as logging and trail widening, may threaten the integrity of this NHA by increasing the number of invasive species and altering the drainage patterns that currently maintain the seep and wetland habitats present.

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

- Changes in the currently hydrology could significantly alter the habitat for the plant species of concern by making conditions either too wet or too dry to be able to persist at this site.
- Invasive species are present in this site and may displace native vegetation, including species of concern.
- Over-browsing by white-tailed deer impacts all the native vegetation and structure of the habitat.
- Recreation at this site may cause erosion along existing trails and provide areas of disturbance that may be colonized by new populations of invasive species.
- Logging ~~will~~ can further fragment the existing forest and alter the conditions of the habitat needed by the species of concern.

Conservation Recommendations

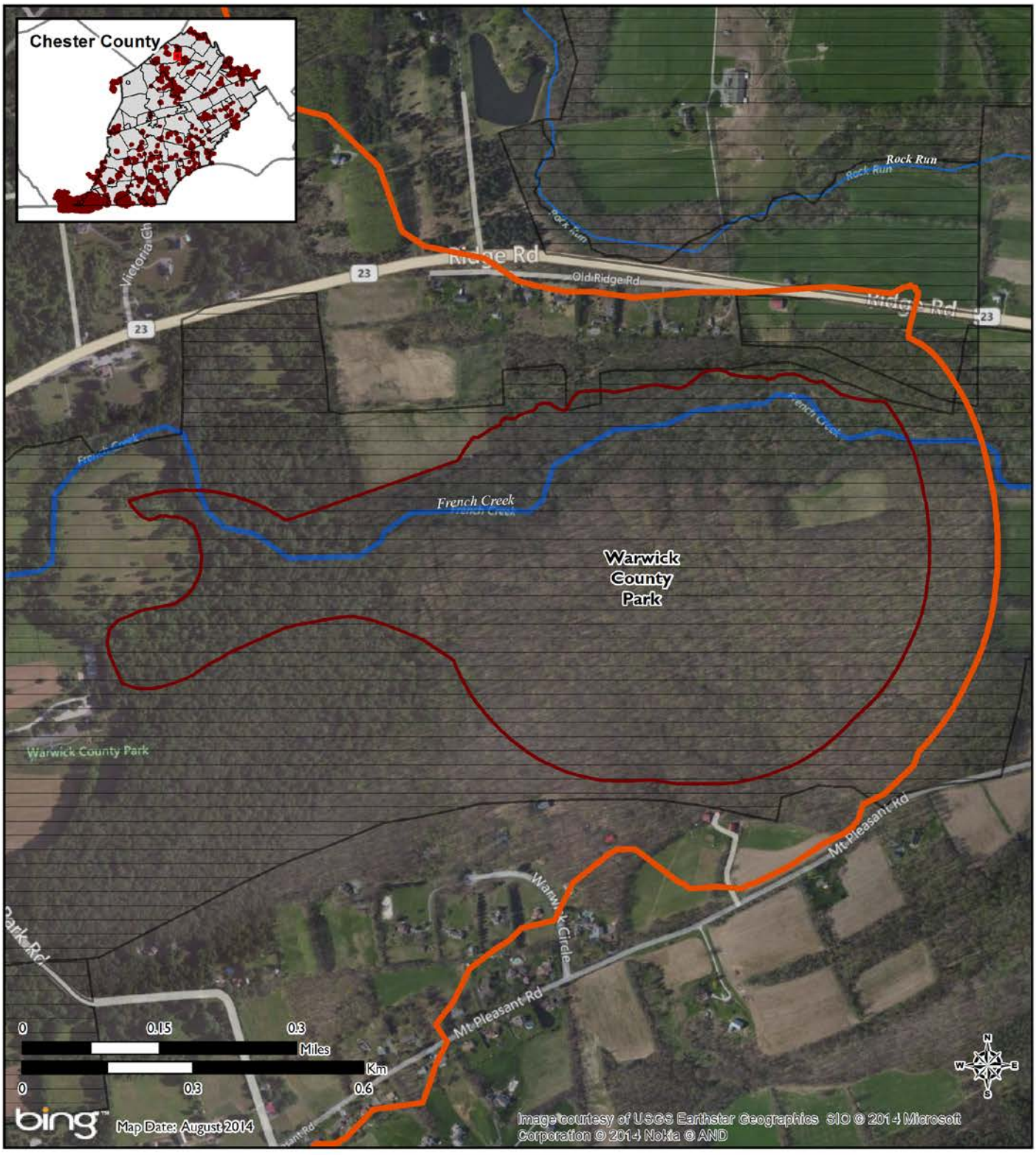
This NHA is entirely contained by Warwick County Park, which will offer some protection from large scale disturbances. This site is best left in its current condition and should need little active management if disturbances are kept to a minimum.

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

- Maintain the existing hydrology. Any activities that occur above the seepage area should be conducted with a consideration for the impact to the flow of water into the wetlands below. Activities such as trail creation, widening, or maintenance may be especially problematic if not done properly.
- Limit the disturbance along existing trails to necessary maintenance.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations. Further disturbance within this habitat will create additional openings for the establishment and spread of invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Protect the existing forested areas from logging and disturbance along the forest edge. Maintaining as many intact habitats as possible, given the location within a residential area, will help to preserve habitat for as many species as possible.

Location

Municipalities: *Warwick Township*
USGS quads: *Pottstown*
Previous CNHI reference: *Warwick County Park Seeps*
Associated NHAs: *None*
Overlapping Protected Lands: *Warwick County Park*



Warwick County Park Natural Heritage Area

Forest and seeps support populations of netted chainfern, imperiled in PA, and bog bluegrass, a globally vulnerable plant species.

Significance Rank:
REGIONAL

Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Wawaset-Brandywine Floodplain NHA

PNHP Significance Rank: *State*

Site Description

A wide, flat floodplain occurs along much of the West Branch Brandywine Creek. This NHA is located along the floodplain near Wawaset. Most of the floodplain at the site is forested and dominated by black walnut, box elder, and silky dogwood. The rest of this NHA is a wet meadow. The wet, forested floodplain provides habitat for a small population of **cattail sedge**, a plant 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]
Cattail Sedge (*Carex typhina*)	G5	S2	PE (PT)	6/26/2002	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.

Cattail sedge is found throughout most of the eastern United States and is scattered throughout Pennsylvania. Cattail sedge grows in areas associated with wetlands. It is often found along the edge of vernal pools but can also be found in swamps and along streams.

Threats and Stresses

Changes in hydrology that would dry or flood the habitat adjacent to West Branch Brandywine Creek can affect the species composition of the habitat. Invasive species may also impact the existing conditions.

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

- Draining or flooding of wet meadow and forested wetland habitats can eliminate suitable habitat for the species of concern.
- Invasive species are present in this site and may displace native vegetation, including species of concern.
- Runoff and other sources of water pollution from the surrounding area threaten to degrade the water quality of streams and wetlands.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

Minimize disturbance within the NHA and surrounding areas that can alter the hydrology of the site or introduce additional invasive species.

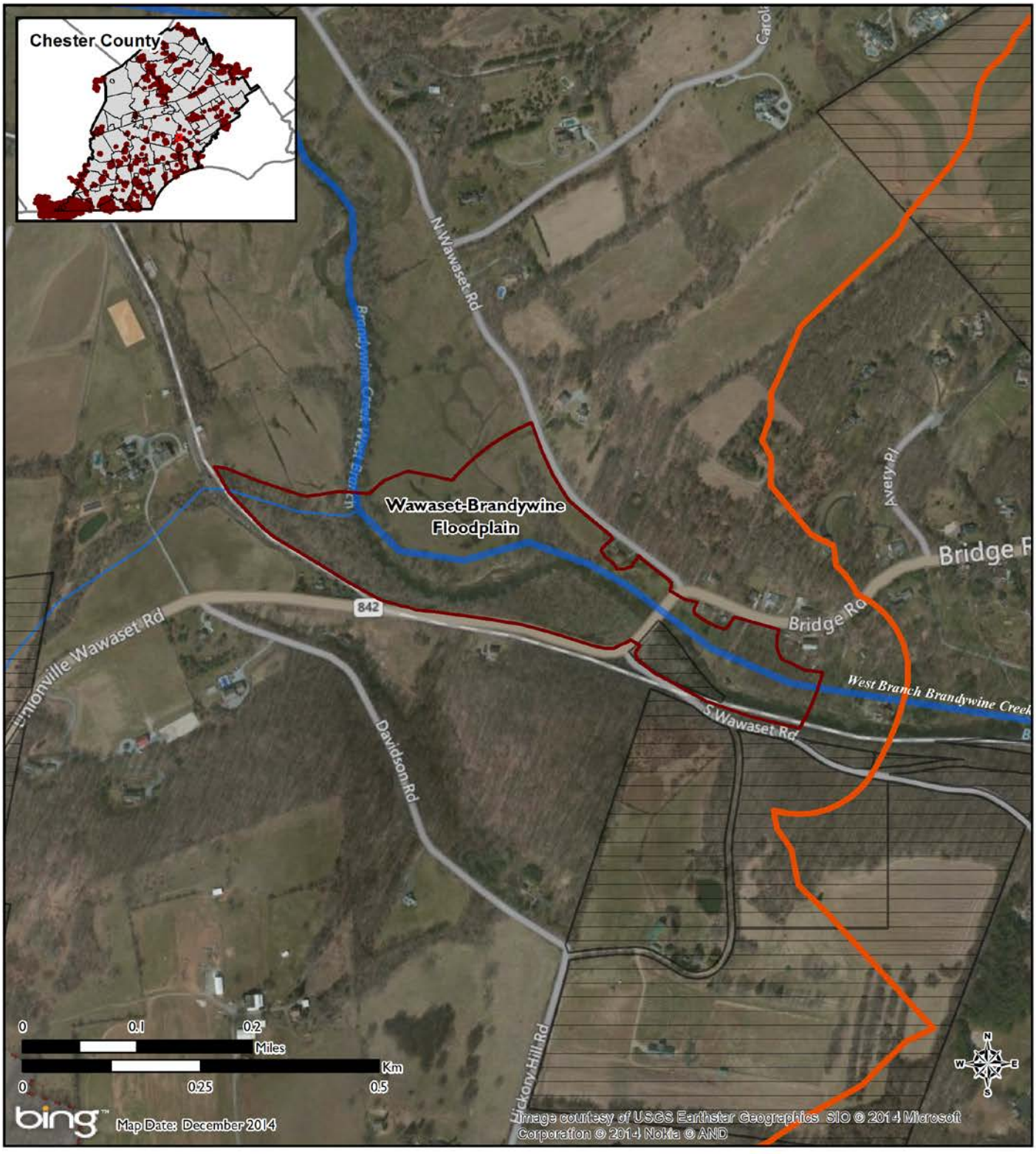
The following steps are recommended to ensure the persistence of these species at this site:

- Avoid alteration of the current hydrology of the site, including draining or filling the wetlands and altering the flow of surface water. Consider potential changes to the flow of water when doing any activities within and around this NHA.

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations. Further disturbance within this habitat will create additional opening for the establishment and spread of invasive species.
- Maintain the existing vegetated buffer along the stream and wetlands and expand it wherever possible, especially along the road.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *East Bradford Township, Pocopson Township*
USGS quads: *Unionville*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Easement*



Wawaset-Brandywine Floodplain Natural Heritage Area

Riparian forest and wetland along West Branch of Brandywine Creek supports a population of cattail sedge, 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*
- *Conservation Lands*

Wawaset Marsh NHA

PNHP Significance Rank: *State*

Site Description

Wawaset Marsh NHA is a mile and a half stretch of floodplain along Brandywine Creek located where the east and west branches come together. A number of residential developments have been built in the surrounding area. A large graminoid wetland that is approximately 25 acres in size is located on the northern side of Brandywine Creek. This area provides habitat for **Indian wild rice**, a plant species of concern. The shoreline at the lower end of this NHA has exposed, sandy habitat along the bends of the creek. This dynamic habitat supports a population of **ellisia**, a plant species of concern found on these open sandy deposits. The wooded slope along the Brandywine Creek also provides habitat for a **sensitive species of concern**, not named 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]
Ellisia (*Ellisia nyctelea*)		G5	S2	PT (PT)	6/2/2002	BC
Indian Wild Rice (*Zizania aquatica*)		G5	S3	PR (PR)	8/21/1992	D
Sensitive species of concern A[3]	S	---	---	---	4/29/1951	H

[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.

Ellisia is a state threatened spring flowering herb found along shady stream banks. It is found throughout much of the United States, but has not been documented in New England, the southeast or the West Coast. It is at the northern end of its range in Pennsylvania and is found along major waterways in the southeast, as far west as the Susquehanna River. Habitat loss and invasive species are the major threats to ellisia.

Indian wild rice is a large grass species that can grow up to nine feet tall. It is found throughout much of the United States, but some portions may be due to introduction of the species. Most occurrences in Pennsylvania are found in intertidal marshes along the Delaware River. It can be found in other shallow water habitat, particularly in the southeast. It has been documented in Erie and Huntingdon County as well. Habitat loss and degradation are major threats to Indian wild rice, as well as invasive species.

Stephanie Seymour

Indian wild rice (*Zizania aquatica*)

Threats and Stresses

Changes in hydrology have the potential to greatly alter the habitat conditions found at this site. Invasive species are common along the sandy shoreline and other wetland habitat and can alter the habitat conditions and species composition of the wetlands and other habitats.

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

- Changes in hydrology may make the habitat unsuitable to the species of concern found here. Ellisia is found on stream bank habitat that is sensitive to changes in flooding regime. Water level changes may also alter the habitat of surrounding wetlands.
- Herbicides, fertilizers, and sediment from agricultural fields, roads, and lawns may wash into the wetland area and degrade the habitat conditions.
- Invasive species are present at this site and may displace native vegetation, including species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

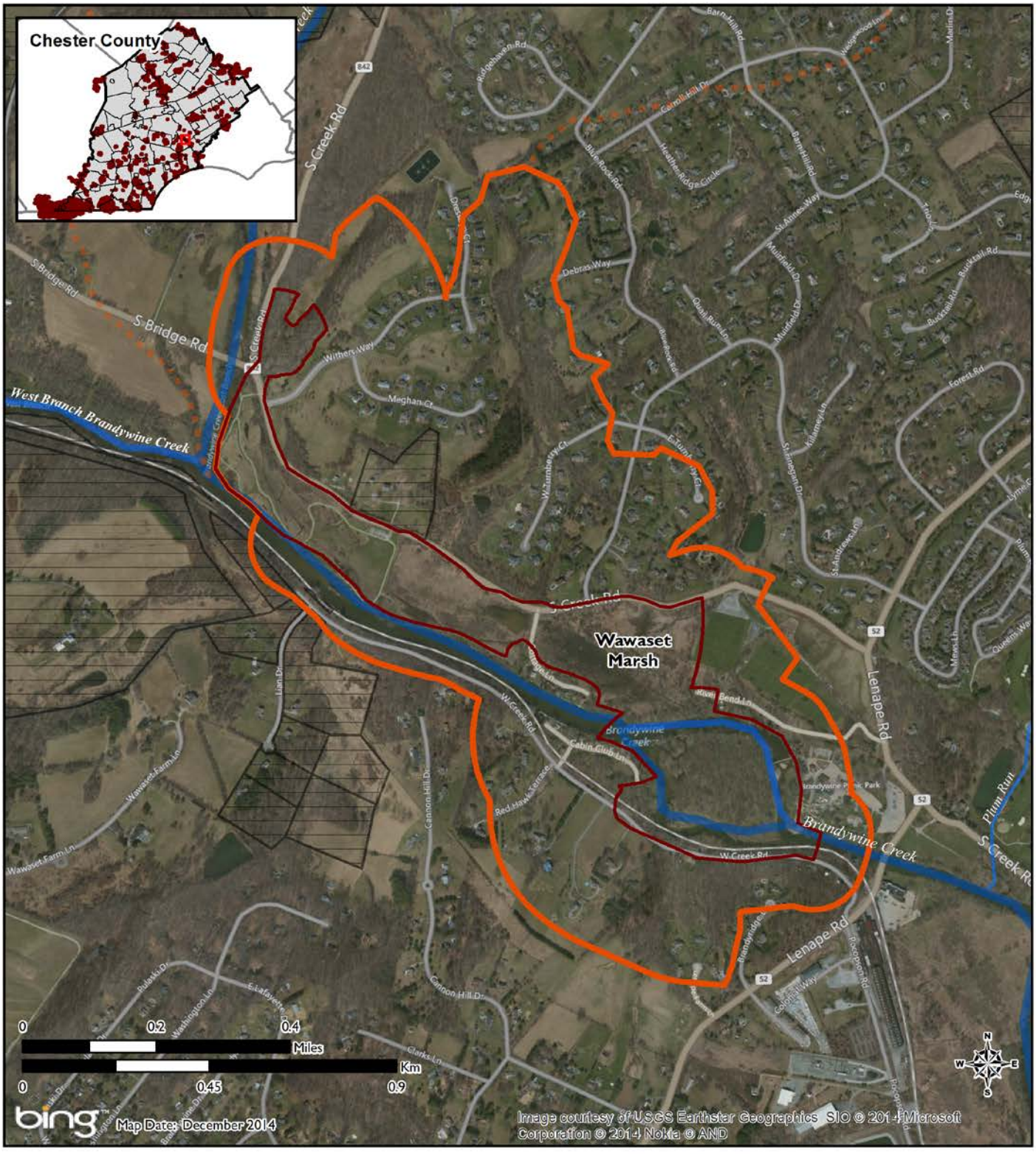
This entire NHA is privately owned, which will offer no formal protection to this site. The wetland habitat and stream should prevent development within the site, but large disturbances to the surrounding area should be avoided in order to protect the habitat quality.

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

- Limit herbicide use to situations where it is necessary, such as to control invasive species. Create a sufficient vegetated buffer along the stream in order to filter sediment and chemicals from runoff. A buffer of 100 meter is ideal, but any increase will help to protect the water quality.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Maintain the existing hydrology. Any activities that occur in the surrounding areas should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Birmingham Township, East Bradford Township, Pocopson Township*
USGS quads: *Unionville*
Previous CNHI reference: *Wawaset Marsh*
Associated NHAs: *None*
Overlapping Protected Lands: *Natural Lands Trust Conservation Easement*



Wawaset Marsh
Natural Heritage Area

Cat-tail marsh along West Branch Brandywine Creek supports populations of Indian wild rice and Ellisia, both 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***
- ***Conservation Lands***

Ways Run Wetland NHA

PNHP Significance Rank: *State*

Site Description

This NHA begins as a small wetland that is dominated by red maple and shrubs and creates the headwaters to Ways Run. After Ways Run crosses State Road, the wetland becomes narrower and does not extend much past the stream channel. Most of the site is bordered by agricultural fields, along with some residential areas. The weedy edge between the red maple wetland and the agricultural fields provides habitat for **stiff cowbane**, a plant 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]
Stiff Cowbane (*Oxypolis rigidior*)	G5	S2	TU (PT)	8/1/2012	CD

[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.

Stiff cowbane is a plant species in the carrot family. Its range spans from New Jersey west to Minnesota and south to Texas and Florida. It is at the northern edge of its range in Pennsylvania and has mostly been documented in southern counties. Stiff cowbane is found in open, wet habitats.

Threats and Stresses

The limited vegetative buffer along Ways Run may affect the water quality of the stream and surrounding wetlands. The proximity to agricultural fields may input herbicides, fertilizer, and sediment into Ways Run, as well as runoff from the road that crosses the NHA.

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

- Runoff and other sources of water pollution from the surrounding area threaten to degrade the water quality of streams and surrounding wetlands.
- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Succession along the narrow band of habitat between the shrub wetland and agricultural field may shade out the area used by stiff cowbane.
- Mowing during the growing season may affect the persistence of the species of concern, especially given the small size of the population at this location.
- Herbicides sprayed on the agricultural fields and edges may cause direct mortality to the stiff cowbane and other native species.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

This NHA is within a highly disturbed area. The agricultural fields, residential areas, and road have reduced the size of the vegetated riparian buffer and opened the area up to colonization by a number of

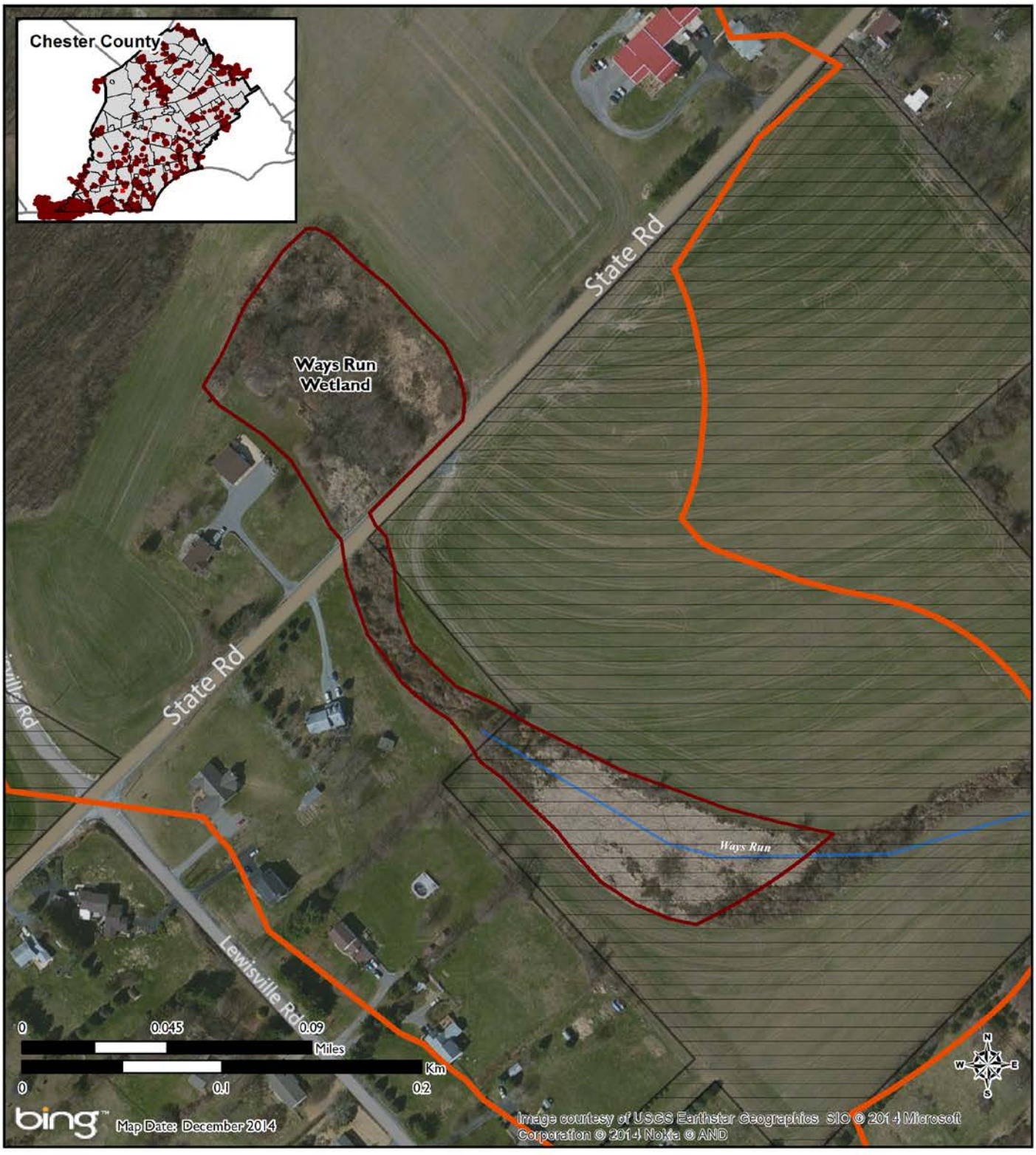
invasive species. Widening the riparian buffer in order to protect the quality of the stream and wetland is a high priority for the conservation of this NHA.

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

- Widen the native vegetated buffer along Ways Run. A width of 100 meters is ideal, but any increase will benefit the stream and adjacent wetlands.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Maintain the early successional habitat along the edge of the wetland. If mowing is used, it should be conducted at a time that does not interfere with the growing season of stiff cowbane.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape

Location

Municipalities: *New London Township*
USGS quads: *Oxford*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Agricultural Easement*



Ways Run Wetland
Natural Heritage Area

Wetland habitat at this site supports a population of stiff cowbane, an imperiled plant species in Pennsylvania.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

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

Welkinweir Reserve NHA

PNHP Significance Rank: *State*

Site Description

Most of Welkinweir Reserve NHA is owned by the Green Valleys Association. This portion of the site is used for recreation, education, and research of the natural areas within the reserve. The dominant habitat within this NHA is red maple – mixed hardwood forest. This forested habitat is along a tributary to French Creek and provides habitat for a **sensitive species of concern**, not named 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**	---	---	---	5/4/2005	CD

[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

White-tailed deer density in this area appears to be too high to be sustained by the current habitat. Deer browse can negatively impact many native species. Invasive species are found in many parts of this NHA and can also alter the structure of the habitat.

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

- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Logging can further fragment the existing forest and alter the conditions of the habitat needed by the species of concern.

Conservation Recommendations

Much of this NHA is owned by the Green Valleys Association and is managed as a natural area. This will protect the forested habitat from being further fragmented. The remaining privately owned portions of this NHA should be protected from logging, development, and other disturbances. Efforts should be made to reduce the deer density in this area to protect the habitat.

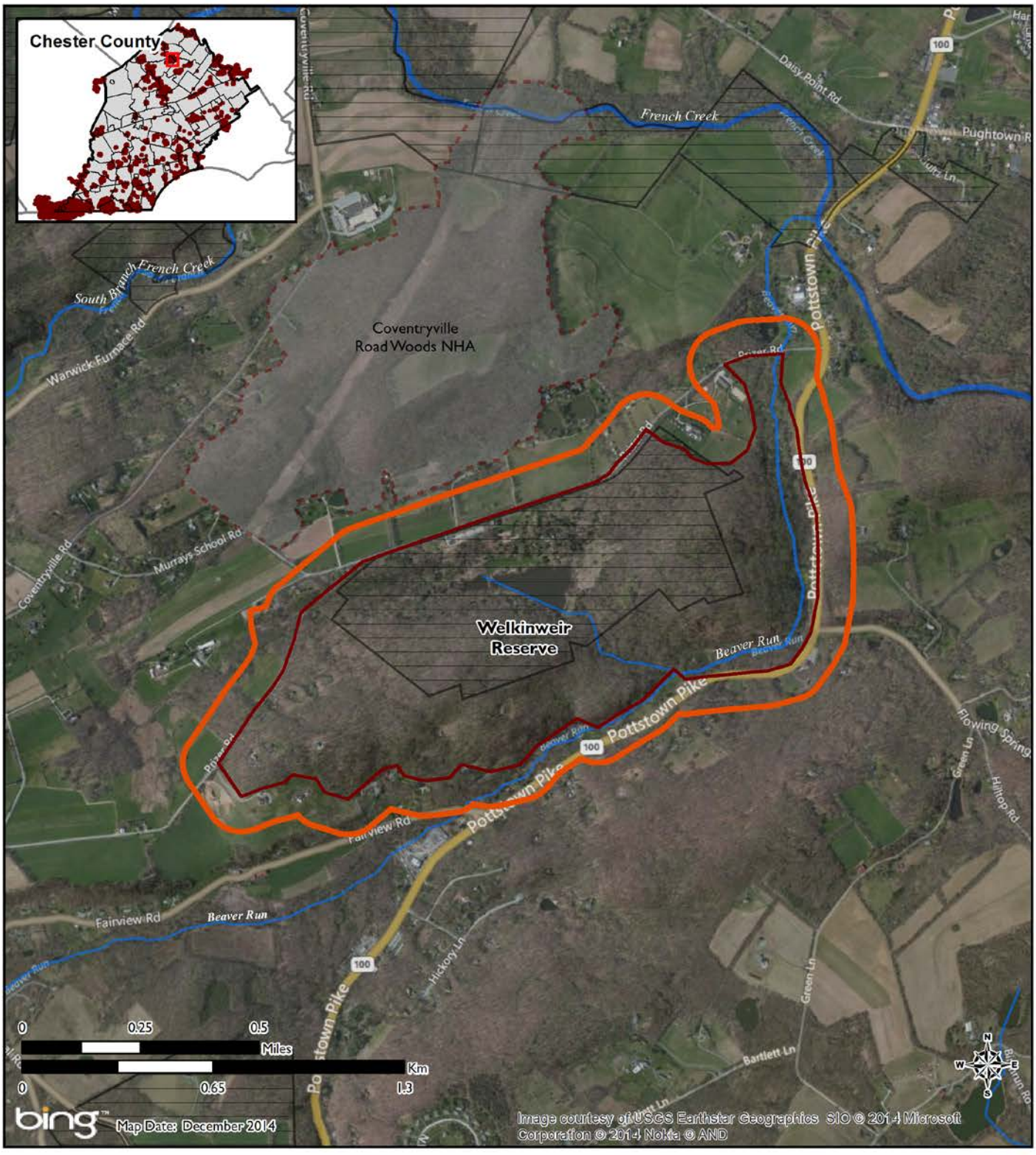
The following steps are recommended to ensure the persistence of these species at this site:

- Reduce deer density. Monitor the population and maintain it at a level that is able to be supported by the landscape.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.

- Protect the existing forested areas from logging. Avoid further fragmention of the habitat with roads, houses, or other disturbances in order to preserve habitat for as many species as possible.

Location

Municipalities: *East Nantmeal Township, South Coventry Township*
USGS quads: *Pottstown*
Previous CNHI reference: *Nantmeal Powerline*
Associated NHAs: *None*
Overlapping Protected Lands: *Green Valleys Association Property*



Welkinweir Reserve
Natural Heritage Area

Upland forest provides habitat for 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***
- ***Conservation Lands***

West Branch Brandywine Creek NHA

PNHP Significance Rank: *State*

Site Description

West Branch Brandywine Creek NHA is a mix of wooded habitat and agricultural fields south of Route 322 near Honey Brook. Most of the site is located in Lancaster County with just a small section crossing into Chester County. The wooded area is located along the Welsh Mountains, but the large patch of forest has been fragmented by residential development in areas adjacent to the NHA. Agricultural fields surround much of the rest of the NHA. West Branch Brandywine Creek flows through the edge of the wooded habitat within this NHA. This area had been logged, and the openings in the canopy created habitat for **bushy bluestem**, a plant species of concern. Regrowth of the trees will likely close the canopy and shade out early successional species. Small patches of wetland habitat are located throughout the rest of the NHA. Early successional wetland habitat supports a population of **swamp lousewort**, while wooded wetlands provide habitat for **sweet bay magnolia**, both plant species of concern. A **sensitive species of concern** was also documented at this site that is not named 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]
Bushy Bluestem (*Andropogon glomeratus*)		G5	S3	TU (PR)	5/18/1993	C
Sweet Bay Magnolia (*Magnolia virginiana*)		G5	S2	PT (PT)	5/18/1993	C
Swamp Lousewort (*Pedicularis lanceolata*)		G5	S1S2	N (PE)	9/12/1994	BC
Sensitive species of concern A[3]	S	---	---	---	6/19/2009	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.

Bushy bluestem has a range across the continent in the southern states, with an extension northeastward into southern New England. In Pennsylvania, it has been documented historically in scattered locations, particularly in the southern counties. Bushy bluestem grows in a variety of damp to wet open places, clearings, and sometimes in human-created disturbed ground. Given the preference of the species for open habitats, active management, such as fire, mowing, or invasive species removal, is often required to maintain the proper successional stage at sites where it grows.

Swamp lousewort has a range from southern New England west into the Dakotas and south into Arkansas and Georgia. In Pennsylvania, it occurs mostly in the southern and northwestern counties, where it grows in calcareous wetlands, including boggy meadows, marshes, swamps, and fens. The known occurrences of swamp lousewort and its habitat type will be enhanced by creating buffers around its habitat, removal of invasive species, and protection of wetland hydrology. Excessive deer browsing may be a threat in some locations.

Sweet bay magnolia is predominately found along the Atlantic Coast and southern United States, from Massachusetts and New York south and west to Florida and Texas. It is more common in the southern portion of its range. Sweet bay magnolia is near the northern end of its range in Pennsylvania and has

been documented in several southern counties. This species is found in wet woods and swamps. It is also planted as an ornamental species, which may make identifying native populations difficult.

Threats and Stresses

Regrowth of woody species in logged areas will eliminate the early successional habitat that was created with the disturbance. This will alter species composition but may be the preferred management in order to create a larger patch of wooded habitat. Excessive mowing in the fields may impact the growth of native species. Runoff from roads, fields, and lawns may impact the quality of the wetland habitat.

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

- Changes in the currently hydrology could significantly alter the habitat for the plant species of concern by making conditions either too wet or too dry to be able to persist at this site.
- Forest fragmentation due to development or infrastructure activities could result in habitat loss and degradation of the site. Forested habitat should be maintained to preserve the population of sweet bay magnolia.
- Natural succession from open, wet meadow floodplains and woodland openings to shrub and tree dominated habitats can eliminate suitable open canopied habitats supporting the sensitive species of concern.
- Invasive species are found in many areas of this site and may displace native vegetation, including species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Herbicides, fertilizers, and sediment from lawns, fields, and roads may wash into the forested area and fields, which will degrade the habitat conditions.

Conservation Recommendations

This is a large site with a number of different habitat types, each with its own unique requirements. Future disturbances should be limited in the wooded areas. Openings in the canopy will likely allow for the establishment of invasive species. Remove woody species within the herbaceous wetlands in order to prevent changes in hydrology and habitat conditions.

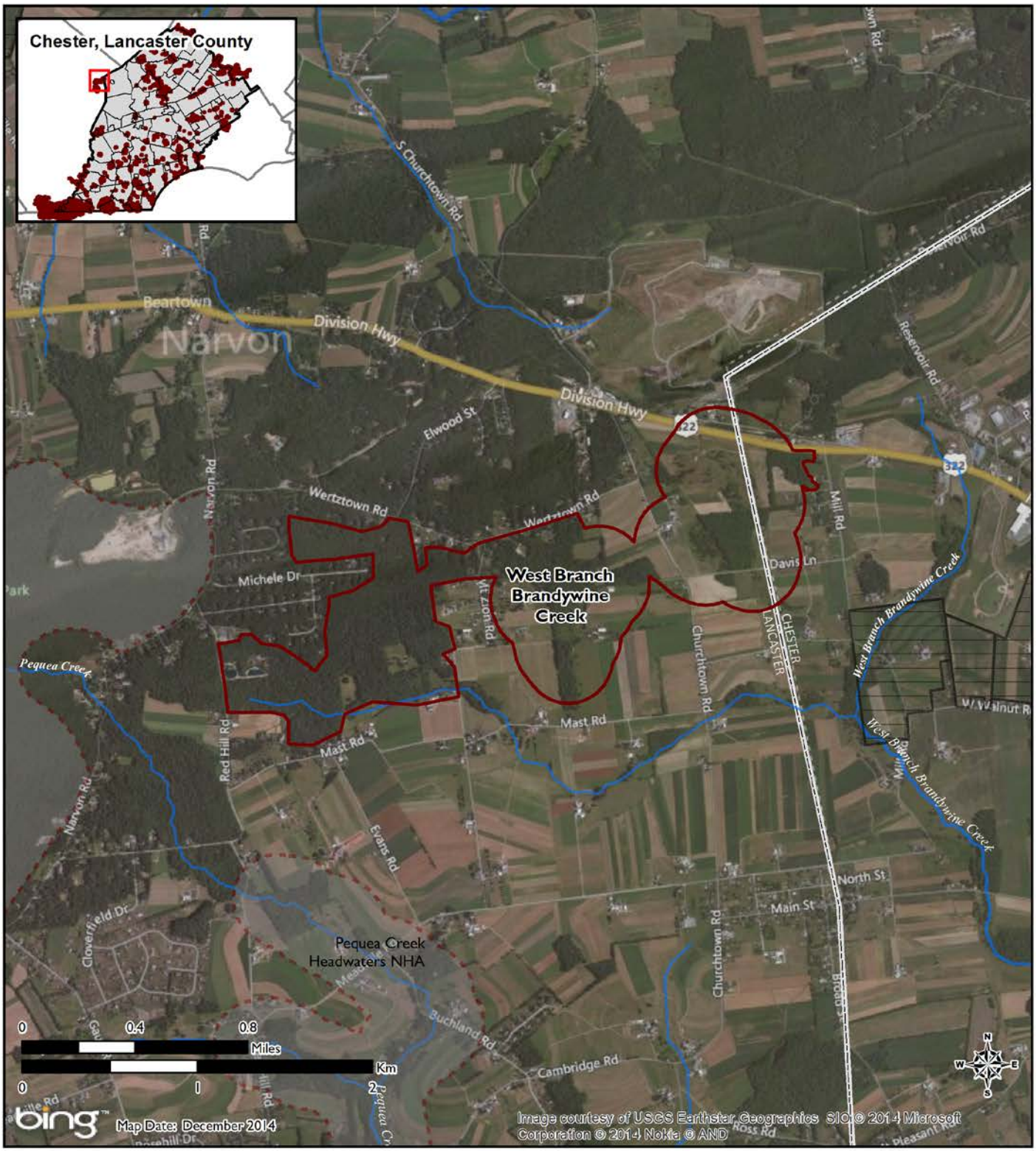
The following steps are recommended to ensure the persistence of these species at this site:

- Maintain the existing hydrology. Any activities that occur in the fields and along roads should be conducted with a consideration for the impact to the flow of water into the nearby wetlands.
- Avoid fragmenting the existing forests and wetlands 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 and wetlands found within this NHA.
- Maintain open, wet meadow habitats by periodic removal of woody species of plants. This action will temporarily help set back succession to a closed canopy habitat and preserve the open, wet meadow habitat conditions preferred by species of concern. The needs of these species should be considered when planning the timing and frequency of maintenance.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Reduce the current deer density and continue to monitor and maintain the population at a level that is able to be supported by the landscape.

- Limit herbicide use to situations where it is necessary, such as to control invasive species.

Location

Municipalities: *Honey Brook Township, Caernarvon Township, Salisbury Township*
USGS quads: *Honey Brook*
Previous CNHI reference: *West Branch Brandywine Creek, Mill Road Woods*
Associated NHAs: *None*
Overlapping Protected Lands: *None*



West Branch Brandywine Creek Natural Heritage Area

This site supports 3 plant species of concern and 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***

West Branch White Clay Creek NHA

PNHP Significance Rank: *State*

Site Description

West Branch White Clay Creek NHA is a section of the creek approximately two and a half miles long that stretches from Chesterville south to the edge of White Clay Creek Preserve below Good Hope Road. Most of this site is remnant wooded habitat that is surrounded by residential development and some agricultural fields. A number of upland and wetland wooded habitats support populations of several species of concern – **silver-haired bat**, **autumn bluegrass**, and **puttyroot**. Open areas along wetland edges and roadsides provide habitat for **horrible thistle** and **stiff cowbane**, two plant species of concern. A population of **triangle floater**, a mussel species of concern, was documented in the stream itself. This stretch of West Branch White Clay Creek also supports **two sensitive species of concern**, not named at the request of the jurisdictional agency overseeing their 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]
Silver-haired Bat (*Lasionycteris noctivagans*)		G5	SUB	N (CR)	5/13/2012	E
Triangle Floater (*Alasmidonta undulata*)		G4	S3S4	N (N)	10/7/1996	E
Puttyroot (*Aplectrum hyemale*)		G5	S3	PR (PR)	2/7/2013	C
Horrible Thistle (*Cirsium horridulum*)		G5	S1	PE (PE)	5/29/2000	C
Stiff Cowbane (*Oxypolis rigidior*)		G5	S2	TU (PT)	8/11/2007	BC
Autumn Bluegrass (*Poa autumnalis*)		G5	S1	PE (PE)	5/19/2007	BC
Sensitive species of concern A[3]	S	---	---	---	2/12/2013	B
Sensitive species of concern B[3]	S	---	---	---	5/2007	C
Sensitive species of concern C[3]	S	---	---	---	6/26/2012	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.

Silver-haired bats are found throughout the United States and southern Canada. They are not known to hibernate in Pennsylvania, but some breeding has been documented in the state, mostly in the northern counties. Silver-haired bats are found along wooded stream and pond edges, roosting in dense vegetation or under loose tree bark.

In the United States, triangle floater is found from Maine to Florida along coastal and a few inland states. This species is uncommon throughout most of its range. It is found scattered throughout eastern and central Pennsylvania within the Susquehanna River drainage. Streams and rivers with sand and gravel substrate are typical habitats for triangle floater.

In Pennsylvania, autumn bluegrass has been documented in several southwestern counties and is typically found along stream banks and in moist woods. It is more common in the southern portions of its range, which spans from New Jersey west into Michigan and south to Florida and Texas. Autumn bluegrass is considered critically imperiled in Pennsylvania due to the small number of known populations in a small geographical area.

Horrible thistle is a state endangered plant species that is found throughout the southeastern United States as far west as Texas and Oklahoma and up the Atlantic Coast into New England. In Pennsylvania, horrible thistle has been documented in several southeastern counties. This species is found in a variety of open habitats and disturbed areas.

In Pennsylvania, puttyroot is most commonly found in the southeastern counties and grows in moist woodlands and on forested slopes and stream banks. Puttyroot produces leaves that are visible through the fall and winter. The leaves wither in late spring, and the plant flowers in May and June.

Stiff cowbane is a plant species in the carrot family. Its range spans from New Jersey west to Minnesota and south to Texas and Florida. It is at the northern edge of its range in Pennsylvania and has mostly been documented in southern counties. Stiff cowbane is found in open, wet habitats.

Threats and Stresses

Alteration of the hydrology of the streams and wetlands within and adjacent to this site would likely alter the condition of the habitat and species composition. Impacts from the surrounding developments and fields threaten the water quality, especially in areas with a minimal riparian buffer.

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

- Degradation of riparian zones within this NHA threatens the integrity of water quality in West Branch White Clay Creek and adjacent wetlands. The storm water runoff from roadways and development should be considered a potential source of significant contamination. Runoff from these sources has significantly higher levels of pollutants than runoff filtered through a natural habitat.
- Natural succession from open, wet meadows to shrub and tree dominated habitats can eliminate suitable open canopied habitats supporting species of concern.
- Forest fragmentation due to development or other infrastructure could result in habitat loss and degradation of the site.
- Exotic invasive plant species threaten to compete with and displace native species.
- 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 park-like forests in which the native plant understory and vertical stratification are greatly reduced.

Conservation Recommendations

West Branch White Clay Creek NHA has a mix of privately owned property, conservation easements, and White Clay Creek Preserve. The protected lands should help to maintain the remaining wooded riparian area. This site will be best protected by maintaining the integrity of vegetative buffers and assuring a consistent hydrologic regime to protect wetlands.

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

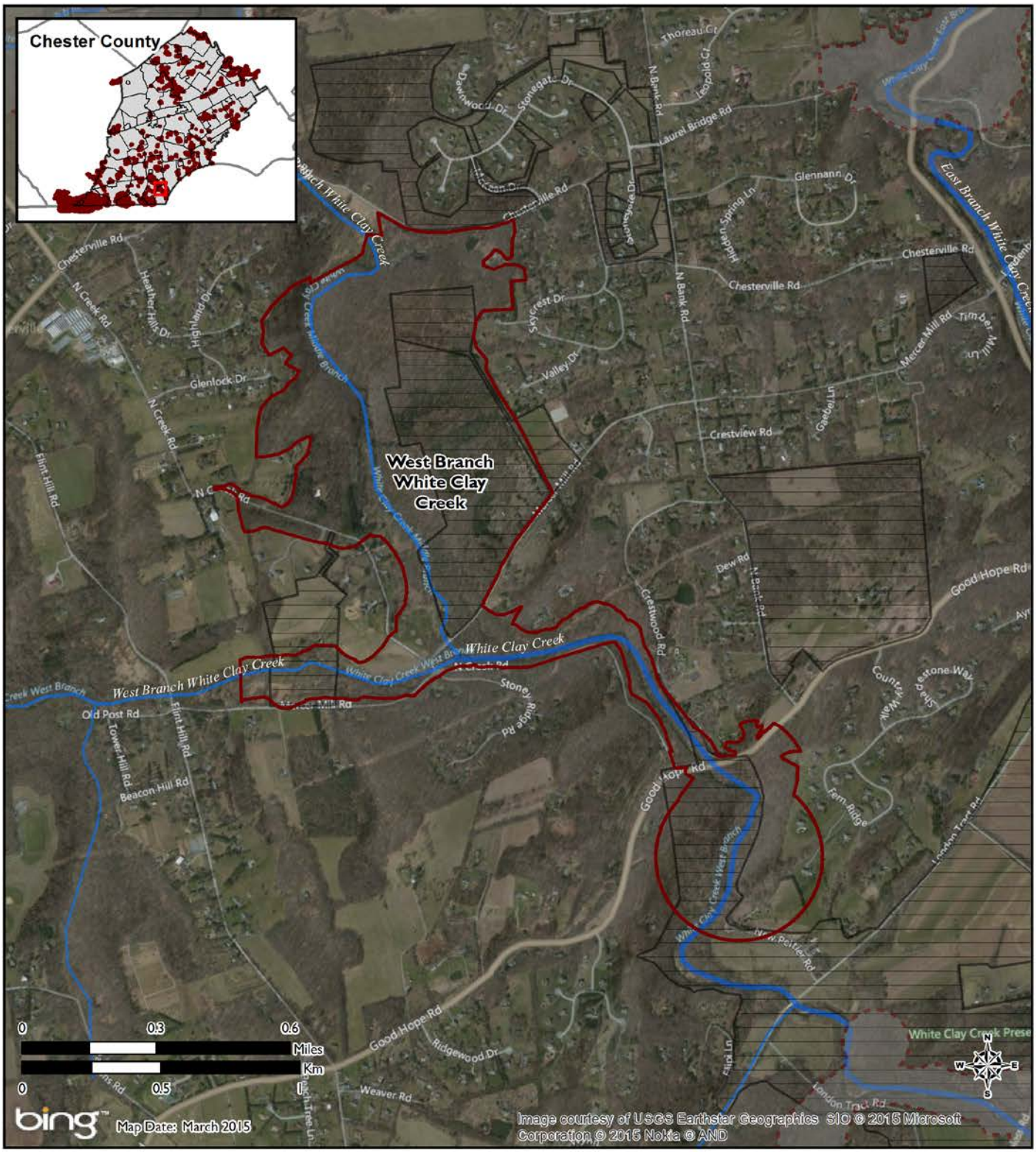
- Avoid disrupting the hydrology of the site by draining or filling the wetlands as well as disturbing the surface or groundwater hydrology.
- Maintain open, wet meadow habitats by periodic removal of woody species of plants. This action will temporarily help set back succession to a closed canopy habitat and preserve the open, wet meadow habitat conditions preferred by species of concern.
- Protect the riparian zone and repair others that have been degraded by encouraging the growth of native vegetation. Careful determination is needed to avoid planting trees in floodplains that

should remain as open canopied herbaceous wetland habitats. These habitats should be maintained in their current open condition, with tree plantings to occur uphill of areas containing hydric soils.

- Avoid fragmenting the existing forests and wetlands 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.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations. Further disturbance within this habitat will create additional opening for the establishment and spread of invasive species.
- Reduce deer density, and then continue to monitor and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Franklin Township, London Britain Township*
USGS quads: *West Grove*
Previous CNHI reference: *North Bank Site*
Associated NHAs: *None*
Overlapping Protected Lands: *White Clay Creek State Park, Natural Lands Trust Easement, Brandywine Conservancy Easement*



West Branch White Clay Creek Natural Heritage Area

Upland and riparian forest as well as aquatic habitat along the West Branch of White Clay Creek support two sensitive species of concern, in addition to several other 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***

West Chester Reservoir NHA

PNHP Significance Rank: *State*

Site Description

Located in eastern Chester County, this NHA encompasses West Chester Reservoir and adjacent woodlands between the towns of Fern Hill and Woodcrest. Remnant forest along the reservoir and the open water habitat of the reservoir itself support a **sensitive species of concern**. This species cannot be named 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	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 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 sensitive species of concern at this site relies on good water quality, and is vulnerable to siltation and chemical pollution.

Conservation Recommendations

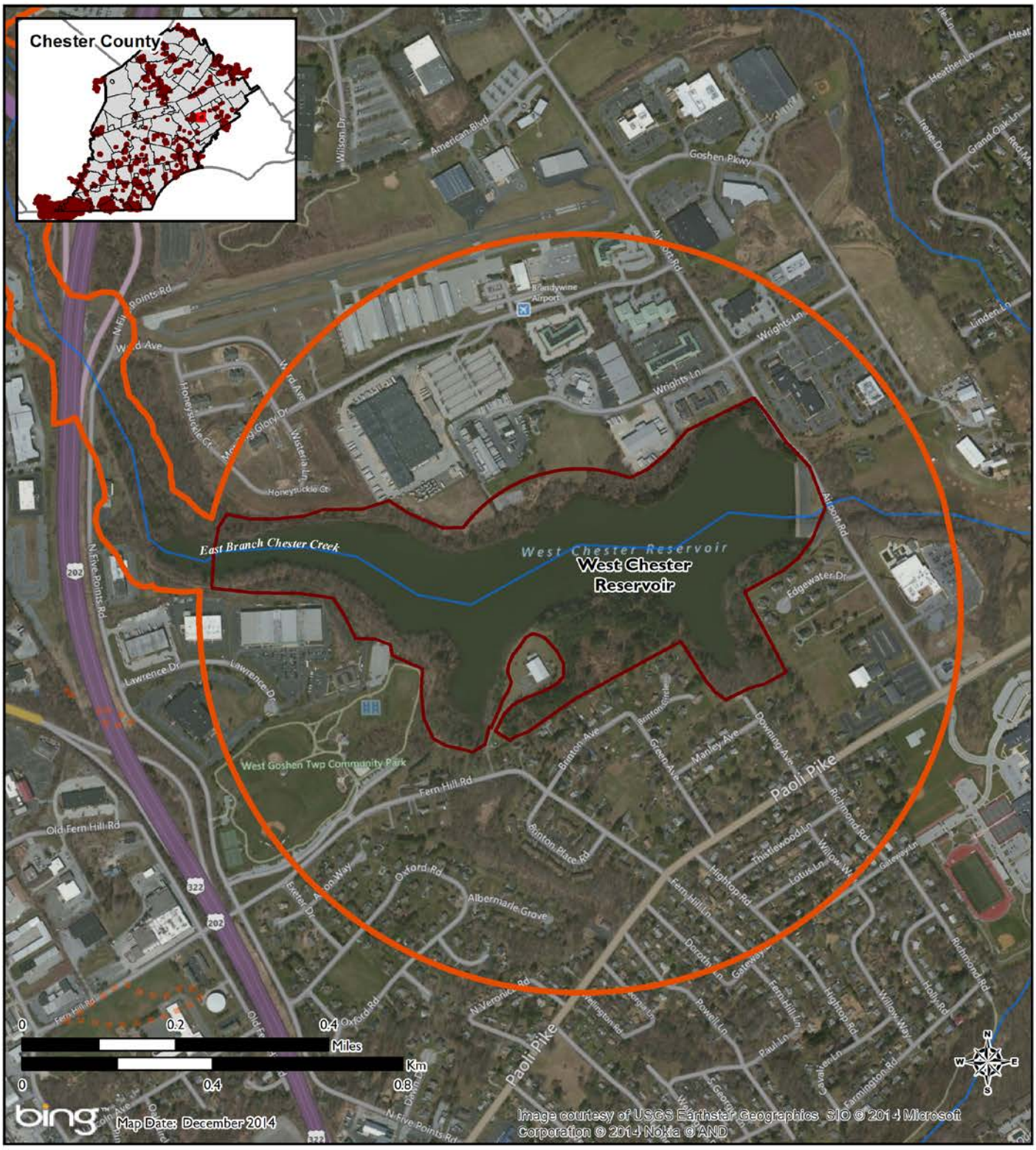
The entire site is privately owned and landowners in the Core Habitat should be aware that the species is sensitive to disturbance.

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

- Avoid disturbance from human activities within the Core Habitat during the breeding season (December – July).
- Additional development within the Core Habitat should be avoided to protect the sensitive species of concern.
- 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.
- 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.
- 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 are. Maintaining high quality aquatic habitat is important to this species.

Location

Municipalities: *West Goshen Township, East Goshen Township*
USGS quads: *West Chester*
Previous CNHI reference:
Associated NHAs: *None*
Overlapping Protected Lands: None



West Chester Reservoir Natural Heritage Area

Aquatic and riparian habitats at this site support 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 Supporting Landscape***

West Upland Woods NHA

PNHP Significance Rank: *State*

Site Description

West Upland Woods NHA is a portion of a small woodlot approximately 75 acres in size along the banks of East Branch White Clay Creek. Surrounding land use consists primarily of pastures and other agriculture. The riparian woods within this NHA provide habitat that supports a small population of **autumn bluegrass**, a plant 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]
Autumn Bluegrass (*Poa autumnalis*)	G5	S1	PE (PE)	6/7/1997	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.

In Pennsylvania, autumn bluegrass has been documented in several southwestern counties and is typically found along stream banks and in moist woods. It is more common in the southern portion of its range, which spans from New Jersey west into Michigan and south to Florida and Texas. Autumn bluegrass is considered critically imperiled in Pennsylvania due to the small number of known populations in a small geographical area.

Threats and Stresses

Logging and other major disturbances threaten the small patch of remaining habitat. Invasive species are present at this site and may alter the structure of the native habitat.

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

- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.
- Further fragmentation of the small patch of existing forest may alter the structure of the habitat and allow an increase in invasive species.

Conservation Recommendations

A conservation easement protects the NHA and the surrounding habitat. This should limit activities that would disturb or fragment the remaining forested habitat. Minimizing disturbance should also help to slow the spread of invasive species. Maintain the forested buffer along East Branch White Clay Creek and tributaries and expand it wherever possible to improve water quality.

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

- Protect the existing forested areas from logging and disturbance along the forest edge. Maintaining as many intact habitats as possible, given the location within an agricultural area, will help to preserve habitat for as many species as possible.

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations. Further disturbance within this habitat will create additional opening for the establishment and spread of invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *West Marlborough Township*
USGS quads: *Coatesville*
Previous CNHI reference: *Clonmell Upland Rd Creek Site*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Easement*

West Upland Woods Natural Heritage Area

This forested site supports a population of Autumn bluegrass, 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***
- ***Conservation Lands***

White Clay Creek NHA

PNHP Significance Rank: *State*

Site Description

This NHA is almost entirely part of White Clay Creek Preserve, located northeast of Strickersville. This is the only state park in Pennsylvania that is designated as a preserve and connects to White Clay Creek State Park in Delaware. White Clay Creek has been designated as a National Wild and Scenic River. The northern edge of the preserve is where several branches of White Clay Creek come together. A number of plant species of concern have been documented in this section of the preserve.

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]
Vannote's Cheumatopsyche Caddisfly (*Cheumatopsyche vannotei*)		GH	SH	N (N)	8/3/1968	H
Puttyroot (*Aplectrum hyemale*)		G5	S3	PR (PR)	2/7/2013	B
Log Fern (*Dryopteris celsa*)		G4	S1	N (PE)	10/30/1994	D
Autumn Bluegrass (*Poa autumnalis*)		G5	S1	PE (PE)	6/1/2008	BC
Tawny Ironweed (*Vernonia glauca*)		G5	S1	PE (PE)	8/17/1985	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.

In Pennsylvania, **autumn bluegrass** has been documented in several southwestern counties and is typically found along stream banks and in moist woods. It is more common in the southern portions of its range, which spans from New Jersey west into Michigan and south to Florida and Texas. Autumn bluegrass is considered critically imperiled in Pennsylvania due to the small number of known populations in a small geographical area.

Log fern has been documented in several southeastern counties in Pennsylvania. It is uncommon in many parts of its range, which spans from New York west to Michigan and south to Georgia and Texas. Log fern is a hybrid species that is a cross between southern wood fern (*Dryopteris ludoviciana*) and Goldie's woodfern (*Dryopteris goldiana*) and is found in moist woods.

In Pennsylvania, **puttyroot** is most commonly found in the southeastern counties and grows in moist woodlands and on forested slopes and streambanks. Puttyroot produces leaves that are visible through the fall and winter. The leaves wither in late spring and the plant flowers in May and June.

Tawny ironweed is at the northern edge of its range in Pennsylvania and has been documented in a few southeastern counties. Its entire range stretches from Pennsylvania and New Jersey south to Georgia and Mississippi. This species is most frequently found in open, early successional habitats.

Threats and Stresses

Invasive species are present throughout many areas of this NHA. Agricultural areas along the stream may impact the water quality of White Clay Creek.

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

- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Over-browsing by white-tailed deer impacts all the native vegetation and structure of the habitat.
- Further fragmentation of the existing forest may alter the structure of the habitat and allow an increase in invasive species. Widening or other disturbances along the roads may have a negative impact on the species of concern.

Conservation Recommendations

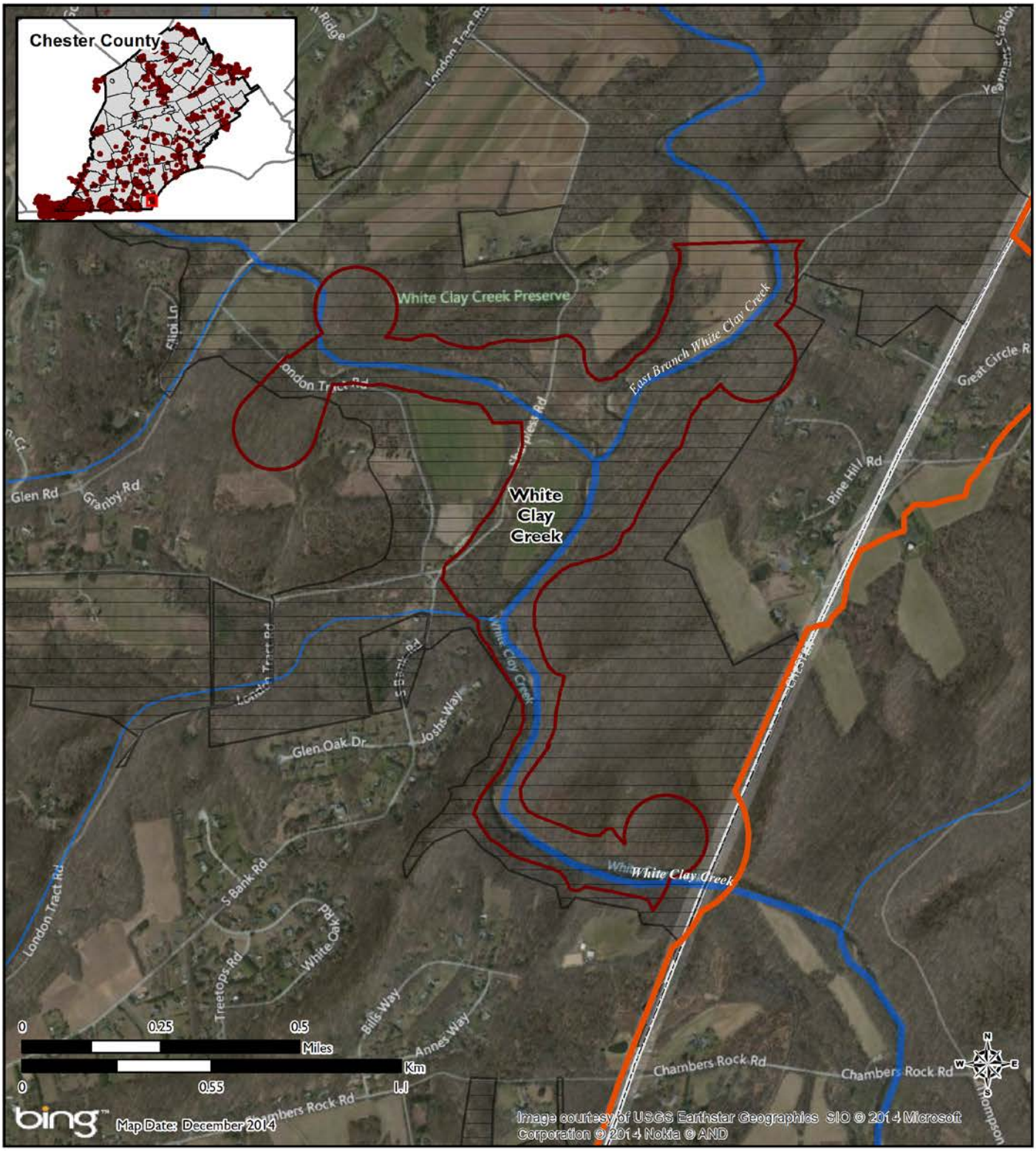
This site is almost entirely located on White Clay Creek Preserve, and White Clay Creek has also been designated as a National Wild and Scenic River. Both of these things should help to preserve the habitat from major disturbances. Disturbance to the forested area should be kept to a minimum to preserve the habitat and limit opening for the establishment of invasive species.

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

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations. Further disturbance within this habitat will create additional opening for the establishment and spread of invasive species.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.
- Protect the existing forested areas from logging and disturbance along the forest edge. Maintaining as many intact habitats as possible will help to preserve habitat for as many species as possible.

Location

Municipalities: *London Britain Township*
USGS quads: *West Grove, Newark West*
Previous CNHI reference: *London Tract Woods & Wetlands, London Tract South*
Associated NHAs: *None*
Overlapping Protected Lands: *White Clay Creek Preserve*



White Clay Creek Natural Heritage Area

Forested habitats along White Clay Creek support populations of 4 plant species of concern and an historic occurrence of Vannote's cheumatopsyche caddisfly.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

White Horse Road Farm NHA

PNHP Significance Rank: *State*

Site Description

White Horse Road Farm NHA is a small woodlot surrounded by residential development and farmland. A small stream begins north of this NHA and passes through a housing development before flowing through the wooded habitat. At the southern end of this wooded patch is an area of swampy red maple woods that provides habitat for **autumn bluegrass**, a plant 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]
Autumn Bluegrass (*Poa autumnalis*)	G5	S1	PE (PE)	5/21/2000	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.

In Pennsylvania, autumn bluegrass has been documented in several southwestern counties and is typically found along stream banks and in moist woods. It is more common in the southern portions of its range, which spans from New Jersey west into Michigan and south to Florida and Texas. Autumn bluegrass is considered critically imperiled in Pennsylvania due to the small number of known populations in a small geographical area.

Threats and Stresses

Invasive species are abundant throughout this site, especially along the edge habitat and are the biggest threat to the site and the native species found within it. Changes in the existing hydrology would affect the habitat types found within this NHA.

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

- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Further fragmentation of the small patch of existing woods may alter the structure of the habitat and allow an increase in invasive species.
- Changes in hydrology may alter the habitat and make it unsuitable for autumn bluegrass.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

Minimize disturbance to the remaining woods. Maintain the forested buffer along the stream and improve it wherever possible. Control invasive species in order to preserve the native species found in this NHA.

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

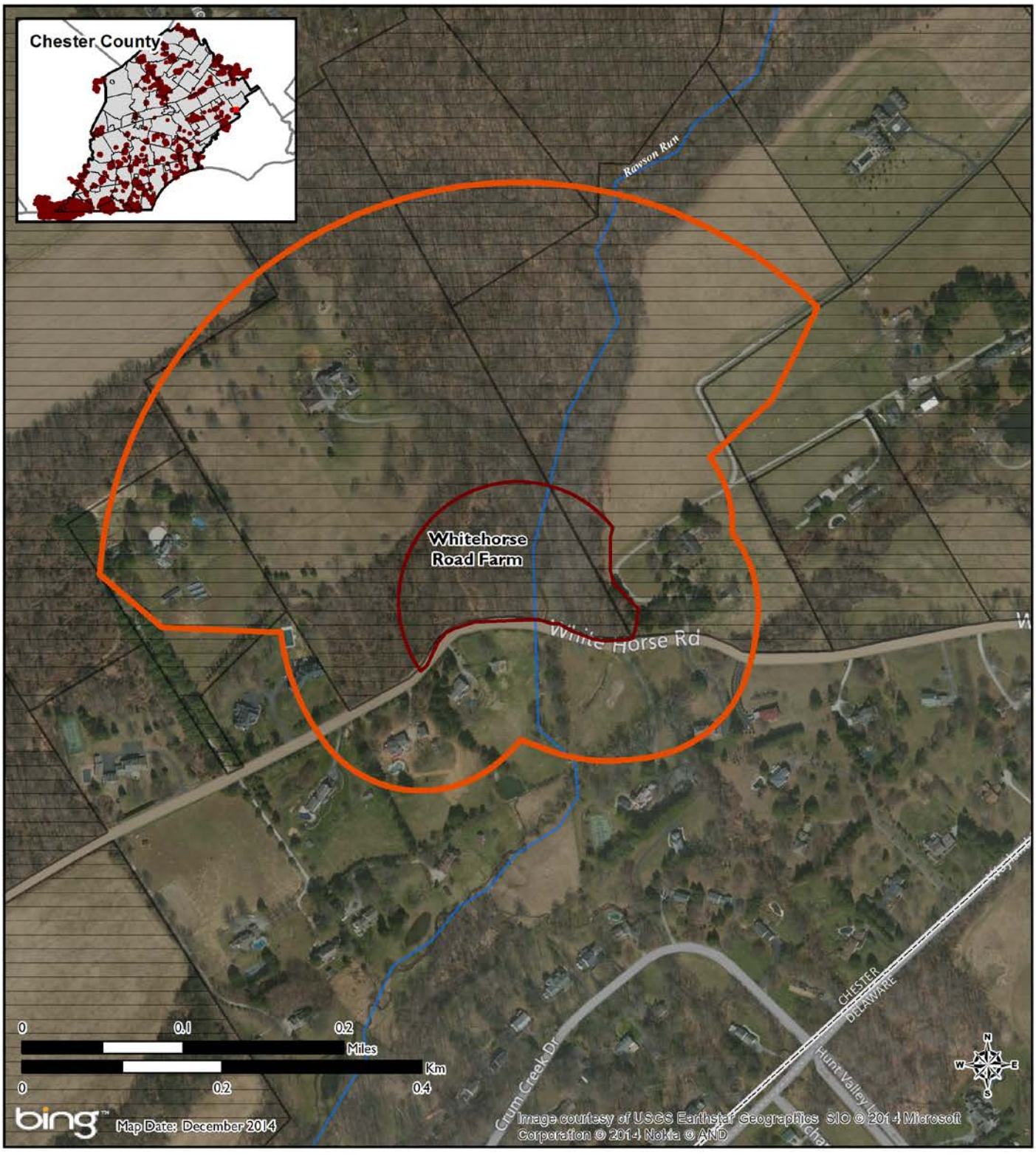
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and

more effective than targeting established populations. Further disturbance within this habitat will create additional opening for the establishment and spread of invasive species.

- Avoid altering the current hydrology of the site, including draining or filling the wetlands and altering the flow of surface water. Consider potential changes to the flow of water when doing any activities within and around this NHA.
- Protect the existing wooded areas from logging and disturbance along the habitat edge. Maintaining as many intact habitats as possible, given the location within an agricultural area, will help to preserve habitat for as many species as possible.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *Easttown Township*
USGS quads: *Valley Forge*
Previous CNHI reference: *None*
Associated NHAs: *None*
Overlapping Protected Lands: *Willistown Conservation Trust Easement, Brandywine Conservancy Easement*



Whitehorse Road Farm Natural Heritage Area

This site supports a population of Autumn bluegrass, 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***
- ***Conservation Lands***

Willistown Serpentine Barrens NHA

PNHP Significance Rank: *Global*

Site Description

A small serpentine bedrock influenced habitat is bisected by a roadway and fragmented by suburban development, but several of the characteristic serpentine habitat plant species continue to persist in scattered roadside patches. The serpentine habitats are often referred to as grasslands, and these herbaceous openings can have a strong representation of warm season grasses and grass-like plants, but they often also contain a good diversity of other plant species, many uncommon at the state and global levels.

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]
Arrow-feathered Three-awn (*Aristida purpurascens*)		G5	S2	PT (PT)	10/23/1998	C
Field Chickweed (*Cerastium velutinum var. velutinum*)		G5T4?	S3	N (SP)	8/18/2010	C
Heller's Witchgrass (*Dichanthelium oligosanthes*)		G5	S3	N (PT)	8/18/2010	D
Plain Ragwort (*Packera anonyma*)		G5	S2	PR (PR)	8/18/2010	D
Prairie Dropseed (*Sporobolus heterolepis*)		G5	S1	PE (PE)	7/5/1990	E
Serpentine Aster (*Symphyotrichum depauperatum*)		G2	S2	PT (PT)	8/18/2010	D
Sensitive species of concern A[3]	S	---	---	---	8/10/1992	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.

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

The plant species of concern found within this Natural Heritage Area are associated with the serpentine influenced herbaceous opening and the adjacent thin woodlands. In the past, natural disturbance, such as wild fires, or grazing by large mammals, would have helped to keep this area in an open condition. Without active management, the open grassy area will gradually close due to natural succession. In this agricultural / residential setting, typical periodic mowing likely has helped to preserve the open aspect preferred by the species of concern.

John Kunsman (PNHP)

Serpentine Aster
(*Symphyotrichum depauperatum*)

Serpentine aster is a species of plant that deserves special mention based on its potential for global extinction due to its extremely limited global population. This species is predominantly known to occur in the eastern serpentine barrens of Pennsylvania and Maryland, with a few far flung outliers in Virginia and North Carolina (Gustafson 2005; Kartesz 2013). This extremely limited distribution has given this species the status of G2 – globally imperiled. Serpentine aster is found in the more open areas of serpentine barrens, suggesting that fire or other active management may be needed to remove woody overgrowth and maintain this preferred habitat.

Threats and Stresses

Reviews of aerial photos taken in 1937 show this area as dominated by active agriculture with scattered woodlots, which likely represented land that was too stony to plow due to the thin soils over serpentine bedrock. Other portions were likely used as pasture, which would have been a suitable habitat for the plant species of concern that continue to persist here. Most of the farms in the area have since been replaced by residential development, though the dry, road edges and thin woods appear to have offered the plant species of concern some refuge.


John Kunsman (PNHP)

Arrow-feathered Three-awn (*Aristida purpurascens*)

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

- Houses and their associated infrastructure have eliminated most of the suitable habitat for the species of concern at this location.
- Efforts to replace the dry, grassy opening with other landscaping would likely eliminate the habitat for the plant species of concern.
- Invasive species of plants can displace native species of plants.
- Over browsing by white-tailed deer is a serious threat to the overall plant diversity.

Conservation Recommendations

These serpentine habitats occur in isolated patches in this area as the bedrock material, serpentinite, is exposed at the surface of the ground in a scattered fashion much like an archipelago chain of islands. Each habitat has a slightly different species composition, largely due to the slightly different environmental conditions found at each distinct location. A long range goal for these isolated habitats is to recognize them as a single system and plan for their ecological needs.


Rocky Gleason (PNHP)

Plain Ragwort (*Packera anonyma*)

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

- Educate the adjacent landowners on the significance of the globally rare habitat and the need for ongoing management activities. The serpentine influenced plant species are considered quite rare in the state and could be cultivated at this location as part of the residential landscape. Maintain the dry, herbaceous openings, fostering the populations of serpentine influenced plants by removing their more common competitors. This is a relatively unique assortment of plants and there will be very few other landscapes with this assortment of species.
- Suppress the spread of invasive species of plants to prevent native species from being crowded out of the habitat. Removal of invasive plants in the immediately vicinity of the species of concern can help these populations compete for space against much more aggressive species. Invasive species management should be coordinated by individuals familiar with the rare

species as well as the invasive species present. Continual invasive species monitoring and control will be necessary.

- Reduce deer herd density to suitable levels to prevent overbrowsing of sensitive species.

Location

Municipalities: *Willistown Township*
USGS quads: *Media*
Previous CNHI reference: *Willistown Serpentine Barrens*
Associated NHAs: *None*
Overlapping Protected Lands: *Willistown Conservation Trust Easement*

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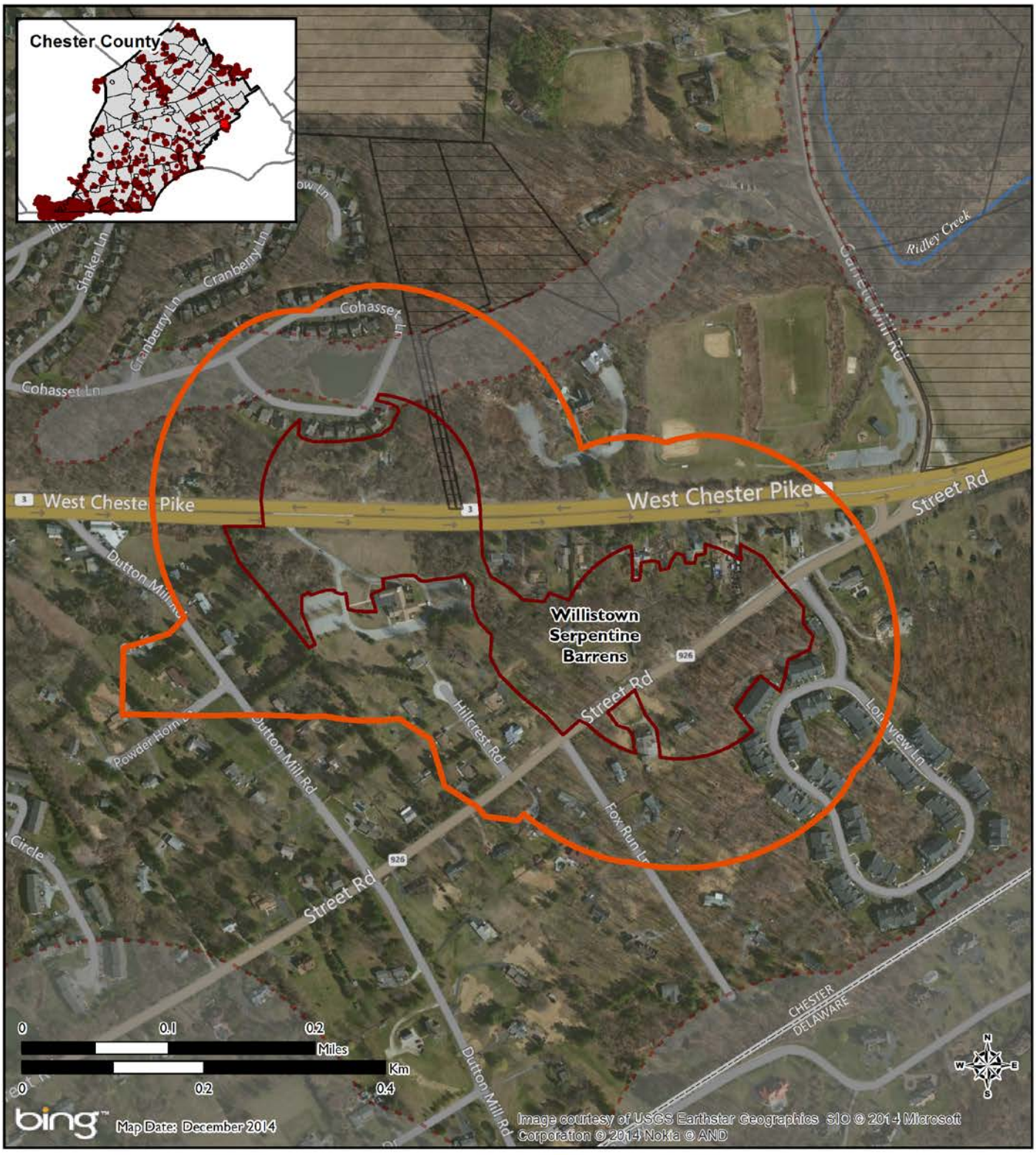


Willistown Serpentine Barrens Natural Heritage Area

Serpentine barrens support five plant species of concern and one sensitive species of concern.

Significance Rank:
GLOBAL

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Wollaston Road Woods NHA

PNHP Significance Rank: *State*

Site Description

This NHA is a remnant patch of forest that is approximately 90 acres in size. The surrounding habitat is agricultural fields and housing developments. A series of vernal pools were documented throughout a portion of the forest. Most of these small wetlands dry during the summer and provide habitat for a number of species. Some of the larger pools typically remain wet through the entire year. A number of vernal pools at Wollaston Road Woods NHA provide habitat for two plant species of concern, **cattail sedge** and **false hop sedge**.

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]
False Hop Sedge (*Carex lupuliformis*)		G4	S1	TU (PE)	9/4/1994	C
Cattail Sedge (*Carex typhina*)		G5	S2	PE (PT)	9/4/1994	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.

Both of these sedge species are found throughout most of the eastern United States and are scattered throughout Pennsylvania. Cattail sedge and false hop sedge are both species found associated with wetlands. They are often found along the edge of vernal pools, but can also be found in swamps and along streams.

Stephanie Seymour

The seasonal wetlands dry during the summer, which creates a unique habitat utilized by a number of species.

Threats and Stresses

Logging of the remaining forest is a major threat facing this NHA. Invasive species are present in many areas of this site and threaten the structure of the habitat. The vernal pools that occur within the forest rely on maintaining the current hydrology to allow them to remain wet during a portion of the year.

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

- Logging can further fragment the existing forest and alter the conditions of the habitat needed by the species of concern.
- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Runoff and other sources of water pollution from the surrounding area threaten to degrade the water quality of streams and wetlands.
- Draining or flooding of wet meadow and forested wetland habitats can eliminate suitable habitat for the species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

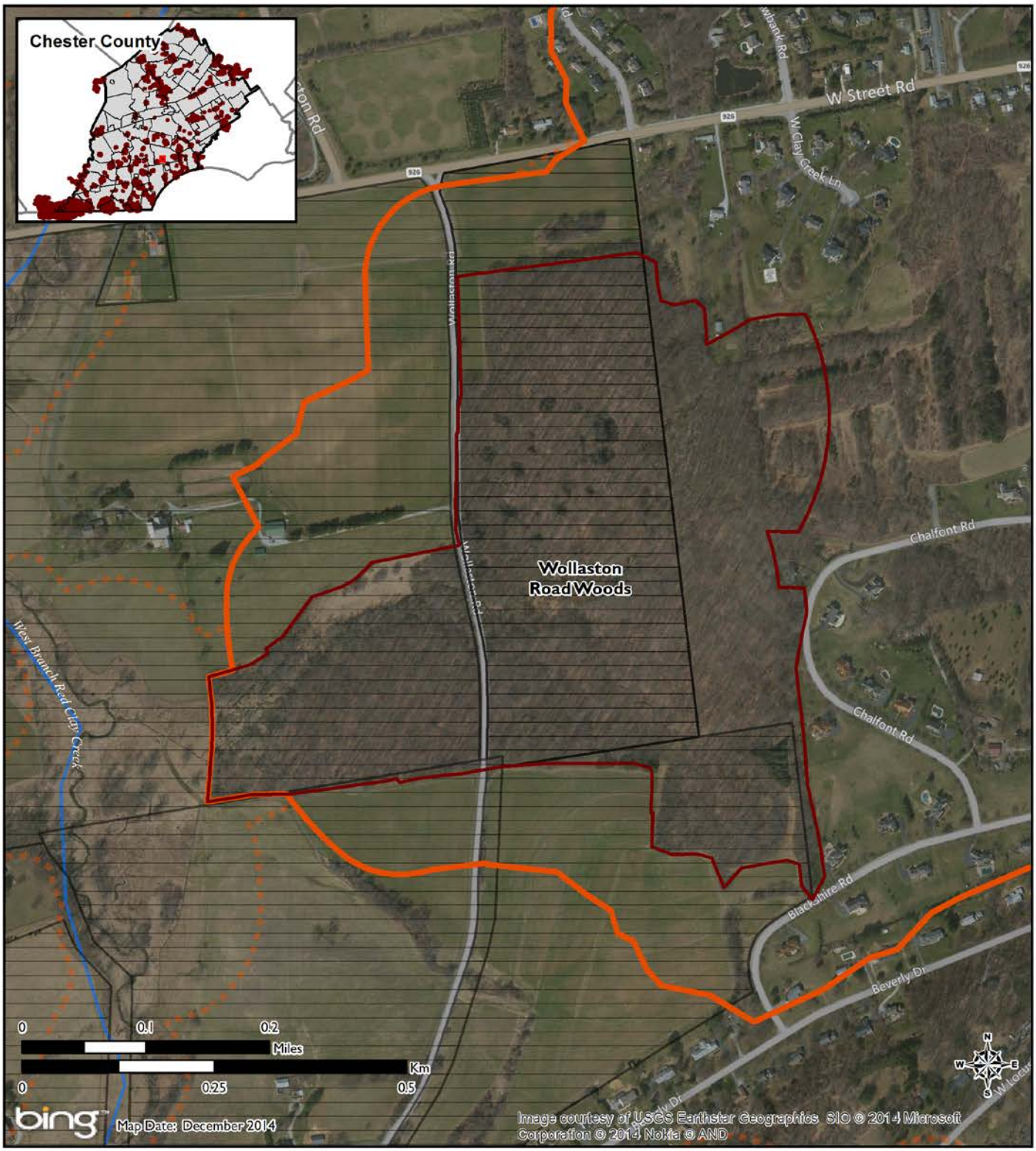
This NHA is privately owned, with portions of the site protected under a conservation easement. The forested area should be left undisturbed in order to protect the habitats needed by the species of concern and other native species present at this site. Maintain the existing hydrologic regime necessary for the wetland habitats present at this NHA.

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

- Protect the existing forested areas from logging and disturbance along the forest edge. Maintaining as many intact habitats as possible, given the location within a fragmented landscape, will help to preserve habitat for as many species as possible.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations. Further disturbance within this habitat will create additional opening for the establishment and spread of invasive species.
- Maintain the existing vegetated buffer along the stream and wetlands and expand it wherever possible, especially along the road.
- Do not alter the current hydrology of the site, including draining or filling the wetlands and altering the flow of surface water. Consider potential changes to the flow of water when doing any activities within and around this NHA.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *East Marlborough Township*
USGS quads: *Kennett Square*
Previous CNHI reference: *Wollaston Road Woods*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Property, Brandywine Conservancy Easement, Agricultural Easement*



Wollaston Road Woods Natural Heritage Area

Forested wetlands at this site support two plant species of concern: cattail sedge and false hop sedge.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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

Woodville Southeast NHA

PNHP Significance Rank: *State*

Site Description

Woodville Southeast NHA is located on the eastern edge of London Grove Township and is part of a forested riparian area in a mostly agricultural landscape. The forest is dominated by maple and tulip poplar. East Branch White Clay Creek flows through the site. This NHA supports a population of a **sensitive species of concern**, which is not named at the request of the 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**	---	---	---	5/14/2006	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

Disturbance within this NHA and surrounding areas may alter habitat conditions and increase the abundance of invasive species. Further fragmentation of the riparian area may impact White Clay Creek and the surrounding habitat.

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

- Logging may disturb the small amount of remaining habitat, as well as cause changes in hydrology and allow for the introduction of additional invasive species.
- Runoff and other sources of water pollution from the surrounding area threaten to degrade the water quality of streams and wetlands.
- Invasive species are present in many areas of this site and may displace native vegetation and alter the habitat required by the species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

Woodville Southeast NHA is entirely located on private property that is covered by a conservation easement. Limiting activities that will disrupt the remaining forested area is necessary to protect this habitat in its current condition.

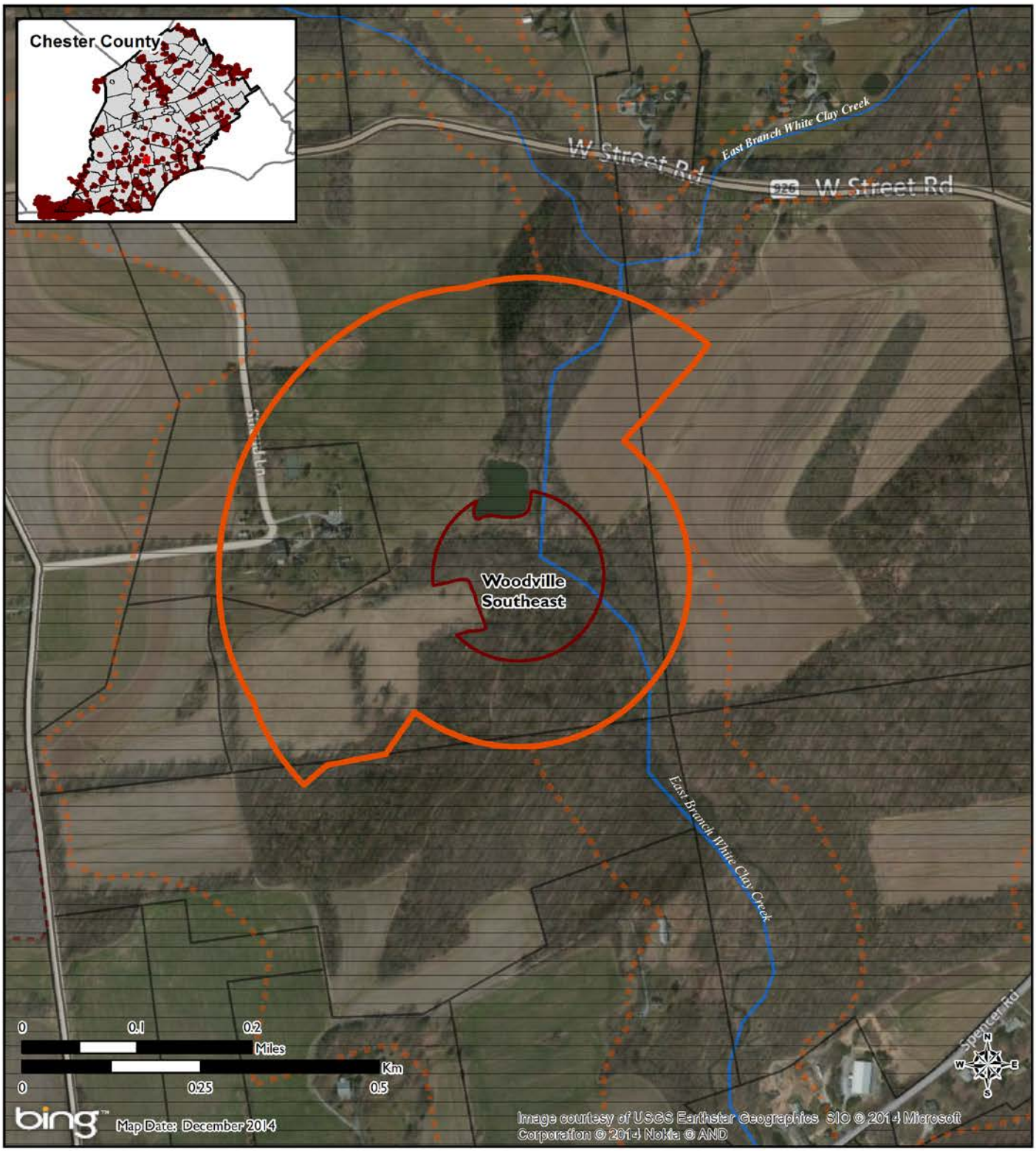
The following steps are recommended to ensure the persistence of these species at this site:

- Protect the existing forested areas from logging and disturbance along the forest edge. Maintaining as many intact habitats as possible, given the location within an agricultural area, will help to preserve habitat for as many species as possible.

- Maintain a vegetated buffer along White Clay Creek and its tributaries, and expand it with native vegetation wherever possible. Limit the use of pesticides and herbicides used along the roads and fields to protect the water quality.
- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *London Grove Township*
USGS quads: *West Grove*
Previous CNHI reference: *East Branch White Clay Creek*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Easement*



Woodville Southeast Natural Heritage Area

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***
- ***Conservation Lands***

Woodville Woods NHA

PNHP Significance Rank: *State*

Site Description

Woodville Woods NHA is a moist wooded slope dominated by beech and tulip poplar. This woodlot is a small fragment of habitat less than 30 acres in size and is located in an agricultural landscape. A tributary to East Branch White Clay Creek flows through the western end of this site. The forested hillside provides habitat for **puttyroot**, a plant 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]
Puttyroot (*Aplectrum hyemale*)	G5	S3	PR (PR)	4/26/1992	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.

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

In Pennsylvania, puttyroot is most commonly found in the southeastern counties and grows in moist woodlands and on forested slopes and stream banks. Puttyroot produces leaves that are visible through the fall and winter. The leaves wither in late spring, and the plant flowers in May and June.

Threats and Stresses

This NHA is a small fragment of wooded habitat that can be sensitive to activities within and adjacent to the area. Invasive species are common in this woodlot and may negatively impact native species.

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

- Invasive species are present in many areas of this site and may displace native vegetation, including species of concern.
- Logging will further fragment the existing forest and alter the conditions of the habitat needed by the species of concern.
- Over-browsing by white-tailed deer impacts all of the native vegetation and structure of the habitat.

Conservation Recommendations

Part of this site is managed under a conservation easement held by the Brandywine Conservancy. An agricultural easement covers the rest of the NHA. Minimizing disturbance will help preserve the habitats at this site. Improvement of the forested riparian buffer adjacent to this NHA will help to protect the quality of the stream and surrounding habitat.

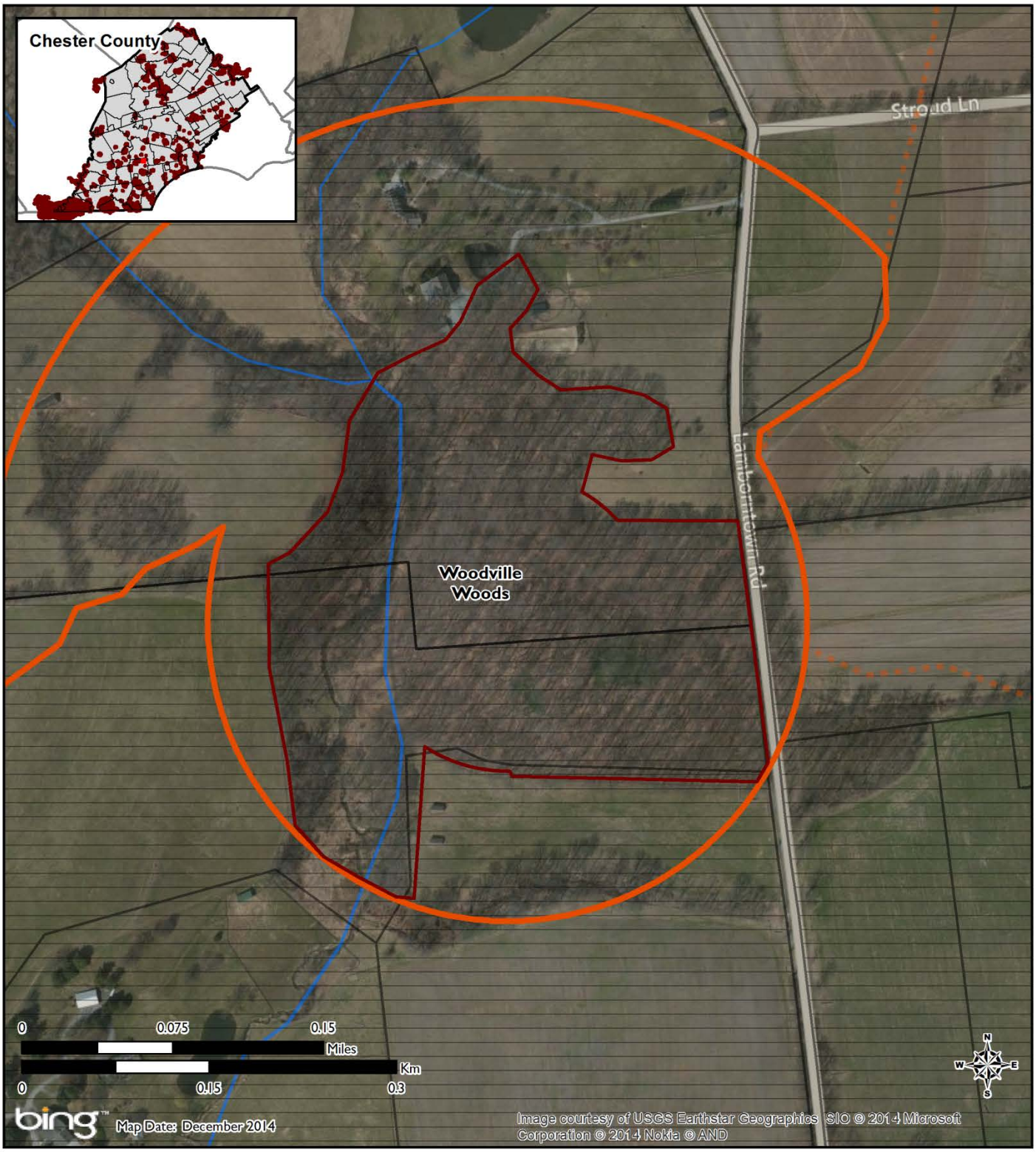
The following steps are recommended to ensure the persistence of these species at this site:

- Attempt to control the introduction and spread of invasive species. Remove invasives when possible, especially species that have not yet established a stronghold, which will be easier and more effective than targeting established populations.

- Protect the existing wooded areas from logging. Avoid fragmenting the habitat with roads, houses, or other disturbances in order to preserve habitat for as many species as possible.
- Monitor deer density and maintain it at a level that is able to be supported by the landscape.

Location

Municipalities: *London Grove Township*
USGS quads: *West Grove*
Previous CNHI reference: *Woodville Woods*
Associated NHAs: *None*
Overlapping Protected Lands: *Brandywine Conservancy Easement, Agricultural Easement*



Woodville Woods
Natural Heritage Area

This forested site supports a population of the state rare plant, puttyroot.

Significance Rank:
STATE

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Areas

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