POTTER COUNTY
NATURAL HERITAGE INVENTORY

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Prepared for:

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

This project was funded through grants supplied by the DCNR Wild Resource Conservation Program and the U.S. Fish and Wildlife Service State Wildlife Grant Program administered by the PGC.

Copies of this report are available in electronic format through the Pennsylvania Natural Heritage Program website, www.naturalheritage.state.pa.us, and through the Potter County Conservation District.

PREFACE

The Pennsylvania Natural Heritage Program (PNHP) is responsible for collecting, tracking and interpreting information regarding the Commonwealth's biological diversity. County Natural Heritage Inventories (CNHIs) are an important part of the work of PNHP. Since 1989, PNHP has conducted county inventories as a means to both gather new information about natural resources and to pass this information along to those responsible for making decisions about the resources in the county, including the community at large. This County Natural Heritage Inventory focuses on the best examples of living *ecological resources* in Potter County. The county must address historic, cultural, educational, water supply, agricultural and scenic resources through other projects and programs. Although the inventory was conducted using a tested and proven methodology, it is best viewed as a preliminary report on the county's natural heritage. Keep in mind that there will be more places to add to those identified here and that this document can be updated as necessary to accommodate new information.

Consider the inventory as an invitation for the people of Potter County to explore and discuss their natural heritage. Ultimately, it will be up to the landowners and residents of Potter County to determine how these areas might be used and protected. Below are some examples of how the inventory can be used by various groups and people.

Planners and Government Staff. Typically, the planning office in a county administers county inventory projects. Often, the inventories are used in conjunction with other resource information (agricultural areas, slope and soil overlays, floodplain maps, etc.) in review for various projects and in comprehensive planning. Natural Heritage Areas may be included under various categories of zoning, such as conservation or forest zones, within parks and greenways, and even within agricultural security areas. There are many possibilities to provide for the conservation of Natural Heritage Areas within the context of public amenities, recreational opportunities and resource management.

County, State and Federal Agencies. In many counties, Natural Heritage Areas lie within or include state or federal lands. Agencies such as the Pennsylvania Game Commission, the Pennsylvania Bureau of Forestry, and the U.S. Army Corps of Engineers can use the inventory to understand the extent of the resource. Agencies can also learn the requirements of the individual plant, animal, or community elements, and the general approach that protection could assume. County Conservation Districts may use the inventories to focus attention on resources (e.g., high diversity streams or wetlands) and as a reference in encouraging good management practices.

Environmental and Development Consultants. Environmental consultants are called upon to plan for a multitude of development projects including road construction, housing developments, commercial enterprises and infrastructure expansion. Design of these projects requires that all resources impacted be known and understood. Decisions made with inadequate information can lead to substantial and costly delays. CNHIs provide a first look at biological resources, including plants and animals listed as rare, threatened or endangered in Pennsylvania and in the nation. Consultants can see potential conflicts before developing detailed plans and before applying for permits, thus allowing projects to change early on when flexibility is at a maximum. Environmental consultants are increasingly called upon to produce resource plans (e.g., River Conservation Plans) that must integrate a variety of biological, physical, and social information. CNHIs can help define watershed-level resources and priorities for conservation.

Developers. Working with environmental consultants, developers can consider options for development that add value and protect key resources. Incorporating greenspaces, wetlands and forest buffers into various kinds of development can attract homeowners and businesses that desire to have natural amenities nearby, as well as satisfy ordinances requiring openspace set asides. Just as parks have traditionally raised property values, so too can natural areas. CNHIs can suggest opportunities where development and conservation can complement one another.

Educators. Curricula in primary, secondary and college level classes often focus on biological science at the chemical or microbiological level. Field sciences do not always receive the attention that they deserve. Natural areas can provide unique opportunities for students to witness, first-hand, the organisms and natural communities that are critical to maintaining biological diversity. Teachers can use County Natural Heritage Inventories to show students where and why local and regional diversity occur and to aid in curriculum development for environment and ecology academic standards. With proper permission and arrangements, students can visit Natural Heritage Areas and establish appropriate research or monitoring projects.

Conservation Organizations. Organizations that have as part of their missions the conservation of biological diversity can turn to the inventory as a source of prioritized places in the county. Such a reference can help guide internal planning and define the essential resources that can be the focus of protection efforts. Land trusts and conservancies throughout Pennsylvania have made use of the inventories to do just this sort of planning and prioritization, and are now engaged in conservation efforts on highly significant sites in individual counties and regions.

ACKNOWLEDGEMENTS

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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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Introduction

Our natural environment is key to human health and sustenance. A healthy environment provides clean air and water; supports fish, game, and agriculture; and furnishes renewable sources of raw materials for countless aspects of our livelihoods and economy. The first steps in ensuring protection of our natural environment are to recognize environmentally sensitive or ecologically important areas and to provide information regarding their sensitivities to various land use activities.

A County Natural Heritage Inventory is designed to identify and map areas that sustain species of special concern, exemplary natural communities, and broad expanses of intact natural ecosystems that support important components of Pennsylvania's native species biodiversity. Its purpose is to provide information to help county, state, and municipal governments, private individuals, and business interests plan development with the preservation of an ecologically healthy landscape for future generations in mind.

Natural Heritage Inventory Mapping

To provide the information necessary to plan for conservation of biodiversity at the species, community, and ecosystem levels, two types of Natural Heritage Areas, as well as designations from the Important Bird Area and Important Mammal Areas Projects are included in the report.

Natural Heritage Areas

Biological Diversity Area (BDA):
An area containing plants or animals of special concern at state or federal levels, exemplary natural communities, or exceptional native diversity. BDAs include both the immediate habitat and surrounding lands important in the support of these special elements.

Conservation Planning Application:
BDAs are mapped according to their sensitivity to human activities. "Core" areas delineate essential habitat that cannot absorb significant levels of activity without substantial impact to the elements of concern. "Supporting Natural Landscape" include areas that maintain vital ecological processes or secondary habitat that may be able to accommodate some types of low-impact activities.

Landscape Conservation Area (LCA):
A large contiguous area that is important because of its size, open space, habitats, and/or inclusion of one or more BDAs. Although an LCA includes a variety of land uses, it typically has not been heavily disturbed and thus retains much of its natural character.

Conservation Planning Application:
These large regions in relatively natural condition can be viewed as regional assets; they improve quality of life by providing a landscape imbued with a sense of beauty and wilderness, they provide a sustainable economic base, and their high ecological integrity offers unique capacity to support biodiversity and human health. Planning and stewardship efforts can preserve these functions of the landscape by limiting the overall amount of land converted to other uses, thereby minimizing fragmentation of these areas.

Other Conservation Areas

Important Mammal Areas (IMA):
The Important Mammal Areas Project (IMAP) is being carried out by a broad-based alliance of sportsmen, conservation organizations, wildlife professionals, and scientists. Areas nominated must fulfill at least one of five criteria developed by the Mammal Technical Committee of the Pennsylvania Biological Survey (www.pawildlife.org/imap.htm).

Conservation Planning Application:
Planning for these areas should consider how best to maintain their value as mammal habitat. The value of these sites may be associated with high mammalian diversity, high-density populations, occurrence of species of special concern, or educational potential. Stewardship plans are in the process of being completed for all IMAs in the state.

Important Bird Area (IBA):

The Pennsylvania Audubon Society administers the Pennsylvania IBA Program and defines an IBA as "a site that is part of a global network of places recognized for their outstanding value to bird conservation." An IBA can be large or small, public or private and must meet one of several criteria http://www.audubon.org/chapter/pa/pa/iba/. Potter County does not contain any IBAs.

Methods

Fifty-one out of sixty-seven county inventories have been completed in Pennsylvania to date. The Potter County Natural Heritage Inventory followed the same methodologies as previous inventories, which proceeded in the following stages:

- site selection
- ground survey
- data analysis

Site Selection

A review of the Pennsylvania Natural Diversity Inventory (PNDI) database (see Appendix II) determined where sites for special concern species and important natural communities were known to exist in Potter County. Knowledgeable individuals were consulted concerning the occurrence of rare plants and unique natural communities in the county. Geological maps, USGS topographical maps, National Wetlands Inventory maps, USDA soil surveys, recent aerial photos, and published materials were also used to identify areas of potential ecological significance (Reschke 1990). Once preliminary site selection was completed, reconnaissance flights over chosen areas of the county were conducted. Wetlands were of primary interest during fly-overs in Potter County.

Ground Surveys

Areas identified as potential inventory sites were scheduled for ground surveys. After obtaining permission from landowners, sites were examined to evaluate the condition and quality of the habitat and to classify the communities present. Field survey forms (Appendix II, pg. 140) were completed for each site. The flora, fauna, level of disturbance, approximate age of community and local threats were among the most important data recorded for each site. Sites were not ground surveyed in cases where permission to visit a site was not granted, when enough information was available from other sources, or when time did not permit.

Data Analysis

Data obtained during the 2004, 2005, and 2006 field seasons were combined with prior existing data and summarized. All sites with species or communities of statewide concern, as well as exceptional examples of more common natural communities, were selected as Biological Diversity Areas (BDAs). Spatial data on the elements of concern were then compiled in a geographic information system (GIS) format using ESRI ArcGIS 9 software.

The boundaries defining each BDA were based on physical and ecological factors, and specifications for species protection provided by jurisdictional government agencies. The BDAs were then assigned a significance rank based on size, condition, rarity of the unique feature, and quality of the surrounding landscape. Landscape Conservation Areas were designated around landscape features that provide a uniting element within a collection of BDAs, or large blocks of contiguous forest identified using GIS-based spatial analysis. County municipalities served as the organizing unit for the data.

Results

Fifty-five areas of ecological significance are recognized in the Potter County Natural Heritage Inventory—46 Biological Diversity Areas and nine Landscape Conservation Areas (Figure 1, Table 1). Spatial distribution of Natural Heritage Areas across the county is shown in Figure 1. Significance ranks (exceptional, high, notable, and county) of Natural Heritage Areas in order of their contribution to the protection of the biological diversity and ecological integrity of the region are given in Table 1. For a full explanation of these ranks, see Table 4 on pg. 21. Natural Heritage Areas are categorized by significance.

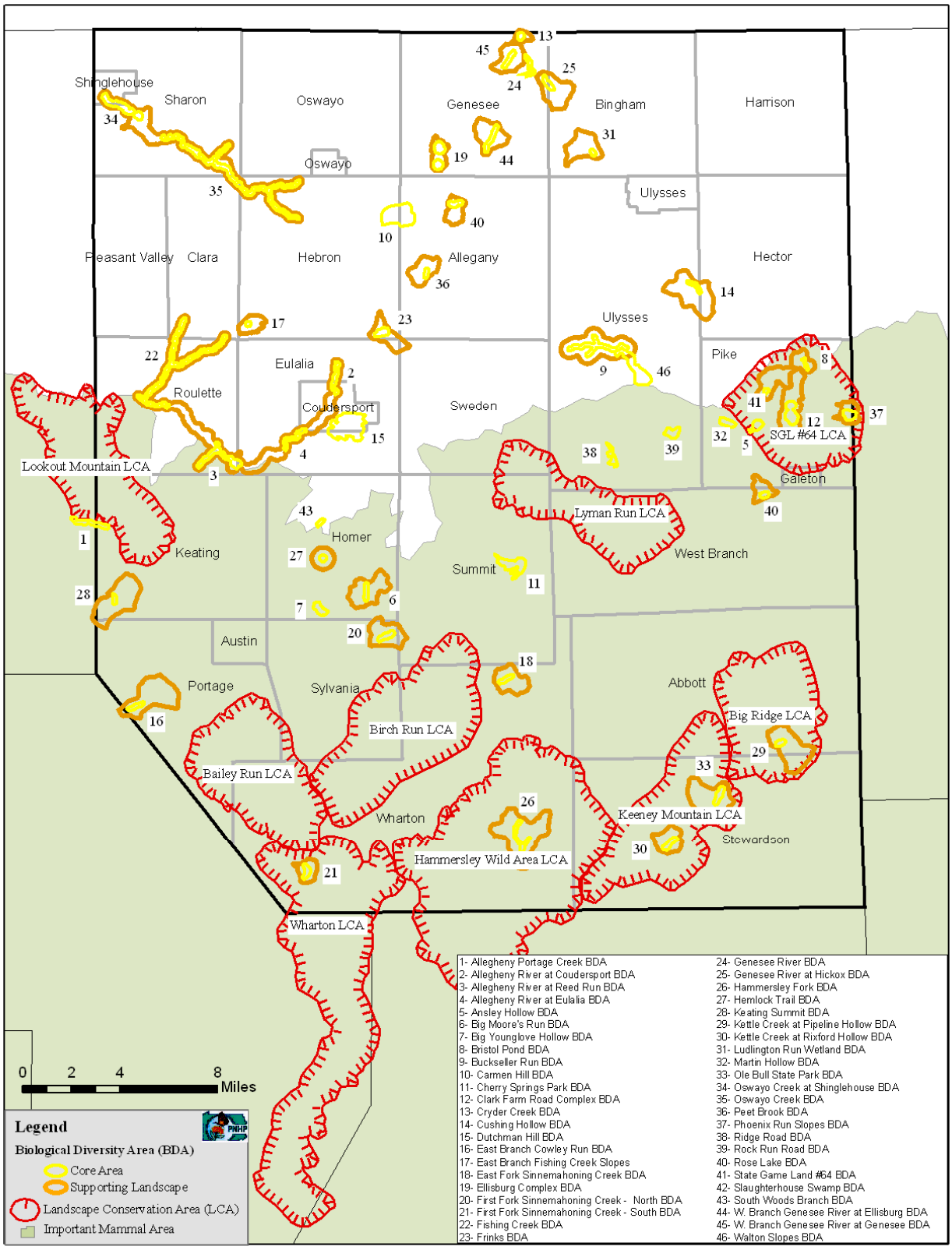


Figure 1. Biological Diversity Areas, Landscape Conservation Areas, and Important Mammal Areas in Potter County.

Table 1. Natural Heritage Areas categorized by significance

Site	Municipality	Description	Page No.
Exceptional Significance			
Allegheny River at Reed Run BDA	Eulalia Twp, Roulette Twp	Aquatic habitat occupied by two animal species of concern and high quality hemlock palustrine forest community adjacent to the Allegheny River.	91
First Fork Sinnemahoning Creek – North BDA	Summit Twp, Sylvania Twp	Aquatic habitat in East Fork Sinnemahoning Creek that supports four dragonfly species of concern.	109
First Fork Sinnemahoning Creek – South BDA	Wharton Twp	Aquatic habitat in East Fork Sinnemahoning Creek that supports four dragonfly species of concern.	124
Hammersley Wild Area LCA	Stewardson Twp, Wharton Twp	Landscape containing approximately 33,000 acres of contiguous forest, a BDA, and an Exceptional Value stream that is occupied by a wide-ranging animal species of concern.	27
Keeney Mountain LCA	Abbott Twp, Stewardson Twp	Landscape containing over 14,000 acres of contiguous forest, two BDAs, and an Exceptional Value stream.	27
Oswayo Creek at Shinglehouse BDA	Sharon Twp	Aquatic habitat in Oswayo Creek that supports two mussel species of concern.	96
Oswayo Creek BDA	Clara Twp, Hebron Twp, Sharon Twp	Oswayo Creek and adjacent wetland habitat that supports six animal species of concern and stalked bulrush, a plant species of concern.	95
State Game Land #64 LCA	Pike Twp	Landscape containing approximately 13,000 acres of contiguous forest, five BDAs, and an Exceptional Value stream.	28
W. Branch Genesee River at Genesee BDA	Genesee Twp	Aquatic habitat and adjacent wetlands that support four dragonfly species of concern and an animal species of special concern.	53
Wharton LCA	Wharton Twp	Landscape containing over 26,000 acres of contiguous forest, a BDA, and an Exceptional Value stream that is occupied by a wide-ranging animal species of concern.	28
High Significance			
Allegheny River at Eulalia BDA	Eulalia Twp	Aquatic habitat in Allegheny River occupied by two animal species of concern.	45
Bailey Run LCA	Portage Twp, Sylvania Twp, Wharton Twp	Landscape containing approximately 13,000 acres of contiguous forest and an Exceptional Value stream that is occupied by a wide-ranging animal species of concern.	27
Big Moore's Run BDA	Homer Twp	Aquatic habitat in Big Moore's Run, an Exceptional Value stream, that supports the larvae of the northern pygmy clubtail, a dragonfly species of concern.	65

Table 1. (continued)

Site	Municipality	Description	Page No.
High Significance			
Big Ridge LCA	Abbott Twp, Stewardson Twp	Landscape containing over 11,000 acres of contiguous forest, a BDA, and an Exceptional Value stream.	27
Big Younglove Hollow BDA	Homer Twp	Rich, mesic, forested slope occupied by great-spurred violet, a plant species of concern.	65
Birch Run LCA	Summit Twp, Sylvania Twp, Wharton Twp	Landscape containing over 17,000 acres of contiguous forest and an Exceptional Value stream that is occupied by a wide-ranging animal species of concern.	27
Buckseller Run BDA	Ulysses Twp	Streambank habitat along Buckseller Run within the Susquehannock State Forest that supports the northern water shrew, an animal species of concern.	113
Cryder Creek BDA	Genesee Twp	Floodplain forest along Cryder Creek that supports two plant species of concern, backward sedge and stalked bulrush.	49
Dutchman Hill BDA	Eulalia Twp	Rich, mesic, forested slope occupied by the West Virginia white butterfly, an invertebrate species of concern.	46
East Branch Cowley Run BDA	Portage Twp	Aquatic habitat in East Branch Cowley Run, an Exceptional Value stream that supports the northern pygmy clubtail, a dragonfly species of concern.	87
East Fork Sinnemahoning Creek BDA	Wharton Twp	Aquatic habitat in East Fork Sinnemahoning Creek that supports the larvae of the northern pygmy clubtail, a dragonfly species of concern.	123
Fishing Creek BDA	Clara Twp, Roulette Twp	Aquatic habitat in Fishing and East Branch Fishing Creeks occupied by two animal species of concern.	92
Frinks BDA	Eulalia Twp, Hebron Twp, Sweden Twp	High quality hemlock palustrine forest that supports creeping snowberry, a plant species of concern.	59
Genesee River BDA	Bingham Twp, Genesee Twp	Graminoid/shrub wetland community along Genesee River that provides habitat for backward sedge, a plant species of concern.	51
Hammersley Fork BDA	Wharton Twp	Aquatic habitat in Hammersley Fork, an Exceptional Value stream that supports the larvae of the northern pygmy clubtail, a dragonfly species of concern.	125
Hemlock Trail BDA	Homer Twp	Mixed hemlock riparian forest that is occupied by Swainson's thrush, an animal species of concern.	66

Table 1. (continued)

Site	Municipality	Description	Page No.
High Significance			
Kettle Creek at Pipeline Hollow BDA	Abbott Twp	Graminoid marsh within floodplain forest community along Kettle Creek, an Exceptional Value stream that supports stalked bulrush, a plant species of concern.	35
Kettle Creek at Rixford Hollow BDA	Stewardson Twp	Aquatic habitat in Kettle Creek, an Exceptional Value stream, which supports harpoon and northern pygmy clubtails, two dragonfly species of concern.	101
Martin Hollow BDA	Pike Twp	Rich, mesic, forested slope occupied by great-spurred violet, a plant species of concern.	81
Ole Bull State Park BDA	Stewardson Twp	Aquatic habitat in Kettle Creek, an Exceptional Value stream, which supports northern pygmy clubtail, a dragonfly species of concern.	101
Phoenix Run Slopes BDA	Pike Twp	Forested seep upslope from Phoenix Run that supports mountain starwort, a plant species of concern.	79
Ridge Road BDA	Ulysses Twp	Rich, mesic, forested slope occupied by great-spurred violet, a plant species of concern.	116
Rock Run Road BDA	Ulysses Twp	Rich, mesic, forested slope occupied by great-spurred violet, a plant species of concern.	116
Slaughterhouse Swamp BDA	Pike Twp, West Branch Twp	Graminoid wetland that supports backward sedge, a plant species of concern.	121
State Game Land #64 BDA	Pike Twp	Headwater graminoid wetland community occupied by downy willow-herb, a plant species of concern.	80
Walton Slopes BDA	Ulysses Twp	Rich, mesic, forested slope occupied by great-spurred violet, a plant species of concern, and West Virginia white butterfly, an animal species of concern.	117
W. Branch Genesee River at Ellisburg BDA	Genesee Twp	Aquatic habitat in West Branch Genesee that supports harpoon clubtail, a dragonfly species of concern.	52
Notable Significance			
Allegheny Portage Creek BDA	Keating Twp	Aquatic habitat in Allegheny River occupied by American brook lamprey, an animal species of concern.	71
Allegheny River at Coudersport BDA	Eulalia Twp	Aquatic habitat in Allegheny River occupied by American brook lamprey, an animal species of concern.	45
Ansley Hollow BDA	Pike Twp	Open habitat bordered by upland deciduous forest that supports Fernald's hay sedge, a plant species of concern.	77

Table 1. (continued)

Site	Municipality	Description	Page No.
Notable Significance			
Bristol Pond BDA	Pike Twp	Reservoir formed by the impoundment of the headwaters of Johnson Brook, an Exceptional Value stream, which supports a pair of pied-billed grebes.	78
Carmen Hill BDA	Allegany Twp, Hebron Twp	Upland, open roadside habitat occupied by cranesbill, a plant species of concern.	37
Cherry Springs Park BDA	Summit Twp	Rocky, open habitat adjacent to maintained pipeline right-of-way occupied by common claybank tiger beetle, an invertebrate species of concern.	105
Clark Farm Road Complex BDA	Pike Twp	Seasonal pool complex, a unique type of wetland habitat that dries out during a portion of the year.	78
Cushing Hollow BDA	Hector Twp, Ulysses Twp	Aquatic habitat in a tributary to Pine Creek that supports the larvae of the northern pygmy clubtail, a dragonfly species of concern.	114
Ellisburg Complex BDA	Genesee Twp	Seasonal pool complex, a unique type of wetland habitat that dries out during a portion of the year.	50
Genesee River at Hickox BDA	Genesee Twp	Aquatic habitat in Genesee River occupied by American brook lamprey, an animal species of concern.	52
Keating Summit BDA	Keating Twp	Rocky, roadside habitat occupied by an animal of concern.	71
Lookout Mountain LCA	Keating Twp, Roulette Twp	Landscape containing over 13,000 acres of contiguous forest.	27
Ludlington Run Wetland BDA	Bingham Twp	Graminoid wetland habitat adjacent to maintained pipeline right-of-way occupied by backward sedge, a plant species of concern.	41
Lyman Run LCA	Summit Twp, Sweden Twp, Ulysses Twp, West Branch Twp	Landscape containing over 11,000 acres of contiguous forest.	28
Peet Brook BDA	Allegany Twp	High quality hemlock palustrine forest along Peet Brook.	37
Rose Lake BDA	Allegany Twp	Rose Lake, Potter County's only natural lake, that is occupied by small beggar-ticks, a plant species of concern.	38

Table 1. (continued)

Site	Municipality	Description	Page No.
Notable Significance			
South Woods Branch BDA	Homer Twp	Open habitat along South Woods Branch occupied by an animal species of concern.	69
Local Significance			
East Branch Fishing Creek Slopes	Hebron Twp	Remnant patch of older white pine forest.	59

Discussion and Recommendations

Status of natural features today

The landscape and waterways of Potter County have undergone considerable change over the course of human settlement, most notably from timber extraction and agriculture. During the timber boom in the early twentieth century, much of the forest in the county underwent general clear-cutting for lumber, tanning material, and chemical wood. Throughout the county, the condition of ecological resources today closely reflects the history of human land use.

Forest Communities. Natural communities have redeveloped across large swaths of the landscape previously used for timber extraction. In the southern half of the county, large areas of contiguous forest provide abundant habitat for forest-dwelling species. These forested areas also help to maintain water quality in streams.

The condition of forest communities varies across the county. While many areas have regenerated into a broad spectrum of natural forest communities, some areas remain fragmented by roads, artificial clearings from oil and gas development, and utility right-of-ways. Additionally, overbrowsing by deer poses a threat to biological diversity and forest regeneration in many regions of the county.

Despite the variable condition of the forests, their contiguity is a great asset to the county's ecological integrity and is regionally important in sustaining mid-Atlantic populations for many animal species. While a number of generalist species can succeed and reproduce in small patches of forest, many species can only utilize large, unbroken tracts of forest. Because several of the forested areas in Potter County today are large and contiguous, they support species which are declining in other areas of the state and the continent due to lack of habitat.

The forests of Potter County have the potential for even greater contribution to biodiversity in the future. Some species can only find appropriate habitat in old-growth forests, because the structures they need for shelter or the food sources they require are not present in younger forests. While there are few areas in Potter County today that are considered old growth, the large expanses of younger forests provide the potential for future development of this habitat type.

Wetland/Aquatic Communities. Unique communities including forested seepage wetlands, shrub swamps, emergent wetlands, and seasonal pools occur in conjunction with specific topographic or geologic conditions. Although these communities occupy a comparatively small portion of the natural landscape, they are of particular value to the county's biodiversity because of the species they support. Groups of specialist species—such as amphibians that breed only in seasonal ponds, or plant species that live only in wetlands—that would otherwise not be present in the county inhabit these communities. One-half of Pennsylvania's wetlands have been lost or substantially degraded. Wetland and aquatic species that depend on these habitats are likewise declining.

Planning for biodiversity and ecological health tomorrow

Provision for the future health of ecological resources in Potter County will require a combination of efforts to steward specific sites that host unique species and communities, broader-scale planning to maintain the unique contiguity of its forested regions, and restoration efforts to alleviate water pollution and restore ecological function to damaged landscapes and waterways.

Forest Communities. In the forested landscapes, objectives for large-scale planning should include maintaining and increasing contiguity and connectivity of natural land. Contiguity is important for the enhanced habitat values outlined above; however, for many species, it is equally critical that natural corridors are maintained that connect forests, wetlands and waterways. For example, many amphibians and dragonflies use an aquatic or wetland habitat in one phase of their life then migrate to an upland, forested habitat for their adult life. Either habitat alone cannot be utilized unless a corridor exists between them.

Municipal and regional land use plans can support maintenance of forest contiguity by encouraging residential or commercial projects to re-develop in existing town centers or re-use previously altered landscapes, rather than orienting new infrastructure through unfragmented natural landscapes.

Wetland/Aquatic Communities. Potter County's waterways, ranging from remote mountain streams in the south to the Allegheny River, include some of Pennsylvania's most scenic features. Objectives for large-scale planning should include restoration of water quality in the county's northern waterways through a reduction in the release of pollutants into runoff, including sediments, nutrients, and chemical contaminants.

Stewardship or restoration of native forest communities in riparian buffers along waterways will greatly improve water quality and enhance the habitat value for various aquatic and semi-aquatic species. Attending to the basic ecological functions of streams and wetlands will pay dividends by ensuring the continued availability of quality water for human communities, enabling the restoration of healthy fisheries, and enhancing the quality of life for which the region is known.

Evaluating proposed activity within Natural Heritage Areas

A very important part of encouraging conservation of the Natural Heritage Areas identified within the Potter County Natural Heritage Inventory is the careful review of proposed land use changes or development activities that overlap with Natural Heritage Areas.

Always contact the Potter County Planning Commission. The County Planning Commission should be aware of all activities that may occur within Natural Heritage Areas in the county so that they may interface with the County Conservation District and other necessary organizations or agencies to better understand the implications of proposed activities. They can also provide guidance to the landowners, developers, or project managers as to possible conflicts and courses of action.

The Potter County Natural Heritage Inventory is *not* meant to be used as a substitute for environmental review, since information is constantly being updated as natural resources are both destroyed and discovered. Applicants for building permits and Planning Commissions should conduct free, online, environmental reviews to inform them of project-specific potential conflicts with sensitive natural resources. Environmental reviews can be conducted by visiting the Pennsylvania Natural Heritage Program's website, at http://www.naturalheritage.state.pa.us/.

If conflicts are noted during the environmental review process, the applicant is informed of the steps to take to minimize negative effects on the county's sensitive natural resources. If additional information on species of special concern becomes available during environmental review, the review may be reconsidered by the jurisdictional agency.) In general, the responsibility for reviewing natural resources is partitioned among agencies in the following manner:

- *U.S. Fish and Wildlife Service* for all federally listed plants or animals.
- *Pennsylvania Game Commission* for all state and federally listed terrestrial vertebrate animals.
- *Pennsylvania Fish and Boat Commission* for all state and federally listed reptiles, amphibians, aquatic vertebrate and invertebrate animals.
- *Pennsylvania Bureau of Forestry* for all state and federally listed plants.
- *Pennsylvania Natural Heritage Program (PNHP)* for all natural communities, terrestrial invertebrates and species not falling under the above jurisdiction.

If a ground survey is necessary to determine whether significant natural resources are present in the area of the project, PNHP or an agency biologist will recommend a survey be conducted. PNHP, through the Western Pennsylvania Conservancy, or other knowledgeable contractors can be retained for this purpose. Early consideration of natural resource impacts is recommended to allow sufficient time for thorough evaluation. Given that some species are only observable or identifiable during certain phases of their life cycle (i.e., the flowering season of a plant or the flight period of a butterfly), a survey may need to be scheduled for a particular time of year.

If the decision is made to move forward with a project in a sensitive area, WPC can work with municipal officials and project personnel during the design process to develop strategies for minimizing the project's ecological impact while meeting the project's objectives. The resource agencies in the state may do likewise. However, early consultation and planning as detailed above can provide for a more efficient and better integrated permit review, and a better understanding among the parties involved as to the scope of any needed project modifications.

Viewshed near Hammersley Fork Wild Area, 2005

INTRODUCTION

Our natural environment is key 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.

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" (Ostroumov 2002). 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: genes, 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 (Naeem et al. 1999).
>
> 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" (Massachusetts Executive Office of Environmental Affairs. 2001). 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" (Massachusetts Executive Office of Environmental Affairs. 2001). 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 all the living and non-living elements of an ecosystem are interconnected and interdependent, it is essential to conserve native biodiversity at all these scales (genes, species, natural communities, and landscapes) if ecosystems are to continue functioning.

Pennsylvania's natural heritage is rich in biodiversity and the state includes many examples of high quality natural communities and large expanses of natural landscapes. More than 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 fraction 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 the 3500 species of animals and vascular plants that have been documented in the state, more than one in ten are imperiled, 156 have been lost since European settlement, and 351 are threatened or endangered (PA 21st Century Environment Commission 1998). Many of these species are imperiled because available habitat in the state 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 (Dahl 1990). According to the Pennsylvania Department of Environmental Protection (DEP), 60 percent of those Pennsylvania lakes that have thus far been assessed for biological health are listed as impaired. Of 83,000 miles of stream in Pennsylvania, almost 70,000 miles have been assessed for water quality and nearly 11,000 miles have been designated as impaired due to abandoned mine discharges (AMD), acid precipitation, and agricultural and urban runoff (PA DEP 2004). 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; and among freshwater mussels— one of the most globally imperiled groups of organisms— 18 of Pennsylvania's 67 native species are extinct and another 22 are imperiled (Goodrich et al. 2003).

Prior to European settlement, over 90 percent of Pennsylvania's land area was forested. Today, 60 percent of the state is still forested, but much of this forest is fragmented by non-forest uses such as roads, utility right-of-ways, agriculture, and housing: only 42 percent is interior forest habitat, and some of the species that depend upon interior forest habitat are in decline (Goodrich et al. 2003). In addition to habitat fragmentation, forest pests, acid precipitation (which causes nutrient leaching and stunted growth), overbrowsing by deer, and invasive species also threaten forest ecosystem health.

The Pennsylvania Natural Heritage Program (PNHP) assesses the conservation needs of animal and vascular plant species native to Pennsylvania. While Pennsylvania also hosts a diversity of other life forms such as mosses, fungi, bacteria, and protists, too little is known of these species to assess their conservation status. The goals of this report are to identify areas important in sustaining biodiversity at the species, natural community, and landscape levels and provide that information to more fully inform land use decisions. Using information from PNHP, County Natural Heritage Inventories (CNHIs) identify areas in the county 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. The areas that support these features are identified as Biological Diversity Areas (BDAs). At a broader scale, CNHIs recognize landscape-level features termed Landscape Conservation Areas (LCAs). LCAs identify areas of relatively intact natural landscape such as large areas of forest unbroken by roads or other fragmenting features; areas which function as a corridor connecting patches of natural landscape; and regions in which a high number of other biodiversity features are concentrated.

A description of each area's natural features and recommendations for maintaining their viability are provided for each BDA and LCA. Also, in an effort to provide as much information as possible focused on planning for biodiversity conservation, this report includes species and natural community fact sheets, references and links to information on invasive exotic species, and information from other conservation planning efforts such as the Important Mammal Area Project. Together with other land use information, this report can help to guide the planning and land management necessary to maintain the ecosystems on which our natural heritage depends.

OVERVIEW OF POTTER COUNTY NATURAL FEATURES

Climate, topography, geology, and soils play an important role in the development of ecosystems (forests, fields, wetlands) and physical features (streams, rivers, mountains) that occur across a landscape. Disturbance, both natural and anthropogenic, has also been influential in forming and altering many of the region's ecosystems, causing extinction of some species and the introduction of others. These combined factors provide the framework for conducting a County Natural Heritage Inventory. The following sections provide a brief overview of the natural features of Potter County.

Climate

The climate in Potter County is cool and humid. Rainfall precipitation averages 41 inches annually and is fairly evenly distributed throughout the year (Goodman et al. 1958). Frontal storms are the most common source of precipitation, although thunderstorms are prevalent in summer. Average seasonal snowfall for Potter County is 47 inches and about one-third of the annual precipitation falls as snow, although seasonal snowpack rarely persists through the winter (Goodman et al. 1958).

Physiography and geology

A physiographic province is a geographic region of similar geologic structure and climate, with a unified geomorphic or surficial history. A region's topography and climate, along with bedrock type, significantly influence soil development, hydrology, and land use patterns of an area. Both physiography and geology are important to plant community distribution and pattern, which in turn influences animal distribution. Because of the differences in climate, soils, and moisture regimes, certain plant communities would be expected to occur within some physiographic provinces and not others.

Potter County, one of the central northern tier counties, has an area of 1,092 square miles. Over three-fourths of the land lies within the Deep Valleys Section of the Appalachian Plateau Physiographic Province; the remaining area falls within the Glaciated High Plateau Section of this province (Figure 2). As its name implies, the Deep Valleys Section is distinguished by many deep, steep-sloped valleys separated by narrow, flat to sloping uplands created by a dendritic drainage system. In the deepest valleys, the amount of topographic relief can be more than 1,000 feet. The Glaciated High Plateau Section is characterized by broad to narrow, rounded to relatively flat, elongate uplands dissected by steep to shallow valleys. The highest point in the county is 2,568 feet above sea level and is located east of Kaple Hill in Summit Township. The lowest point is 1,000 feet where the First Fork of Sinnemahoning Creek crosses into Clinton County. The tops of the plateau average from 2,000 to 2,500 feet while the valleys average from 1,200 to 1,650 feet.

Sedimentary rock of Devonian age consisting of gently folded sandstone, siltstone, shale, and conglomerate, with very minor amounts of calcareous rock, is prevalent in Potter County. Distribution of Pennsylvanian rocks within the county is scattered and less common (Schultz 1999). The Wisconsin ice sheet covered approximately the northern quarter of the county and the drift border enters the country from the north and extends southeasterly across the pronounced ridge and valley topography. There are almost no terminal or recessional moraines, very few masses of ground moraine, and few small areas of outwash deposits in the form of kame terraces (Denny 1951). The southern portion of the county is characterized by steep valleys and knob-topped hills and ridges created by a trellis drainage system (Schultz 1999).

Soils

A soil association is a natural grouping of soils based on similarities in climatic or physiographic factors and soil parent materials. It may include a number of soil types provided they are all present in significant proportions (Canadian Soil Information System 2003). The soils of Potter County have been described in Soil Survey of Potter County, Pennsylvania (Goodman et al. 1958). The nine soil associations recognized within the county are shown in Figure 3 and described in Table 2.

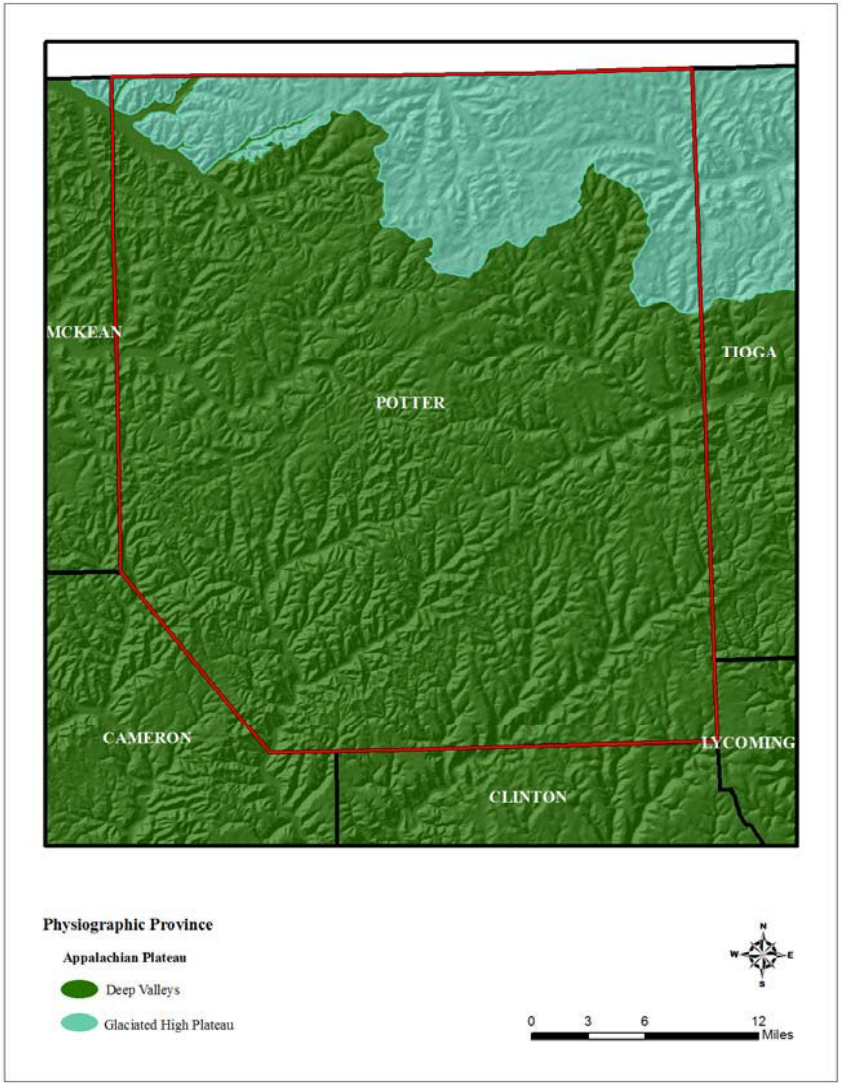


Figure 2. Physiographic provinces of Potter County.

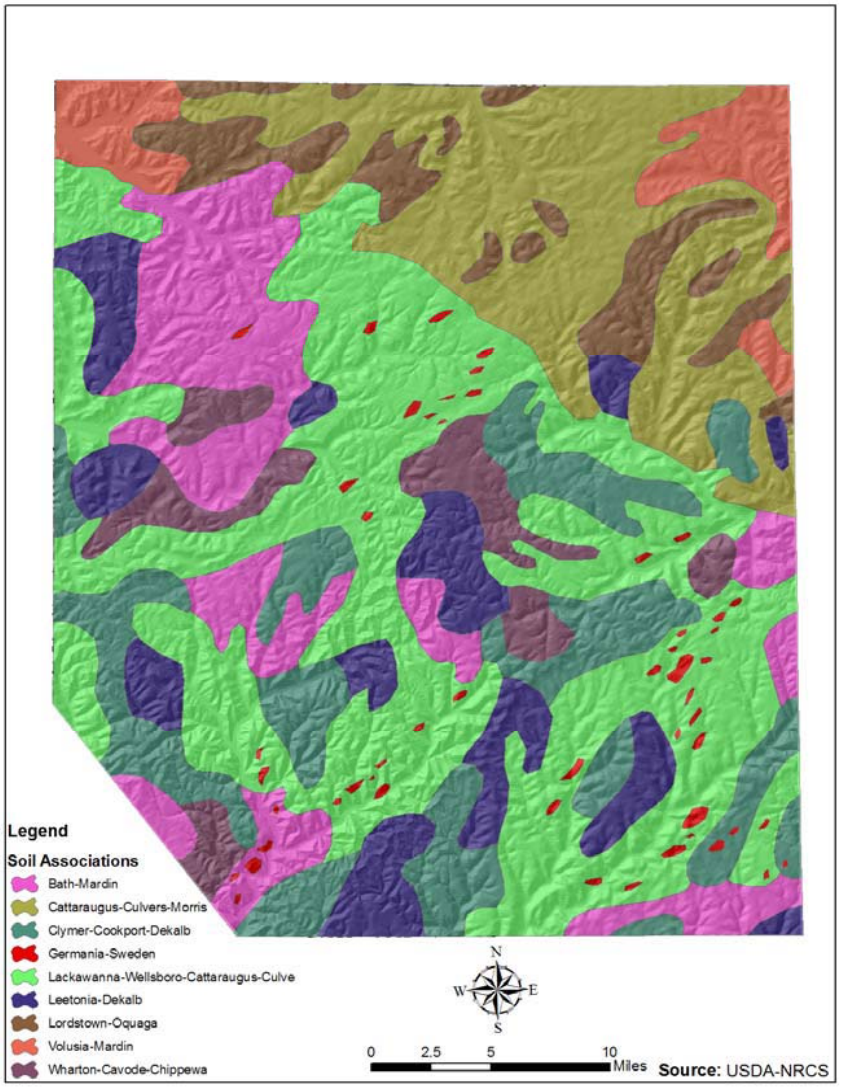


Figure 3. Soil associations of Potter County.

Table 2. Soil associations of Potter County.

Soil Association	Description	Land Use
Bath-Mardin	Yellow and brown, very acidic and deep, well drained to moderately well drained	Most areas of this association are used for cultivated crops, such as potato and berry farms.
Cattaragus-Culvers-Morris	Developed from deep reddish-brown glacial till and frost worked materials (periglacial)	Most areas of this association are suitable for crops; some wet morris soils require drainage and are used for pasture and grain.
Clymer-Cookport-Dekalb	Occurs on deep to shallow, yellowish or yellowish-brown residual accumulations; acidic and droughty	Most areas of this association are forested except for few small areas cleared for agricultural development.
Germania-Sweden	Generally well-drained and strongly acidic, yellowish-red, occurs on colluvium and terrace deposits along valley walls and near ridgetops in isolated nooks	This association is suitable for cultivated crops but only occurs in small areas throughout the county.
Lackawanna-Wellsboro-Cattaraugus-Culvers	Deep, reddish glacial till and frost-worked materials; occur mainly in valleys and low uplands	This association is generally suitable for agricultural development, although many areas are forested.
Leetona-Dekalb	Coarsest and most droughty soils in county; extremely acidic and sandy, includes many large stones and boulders of quartz conglomerate	Most areas of this association are forested; some less stony and medium-textured Dekalb soils can be used for cultivated crops.
Lordstown-Oquaga	Shallow to bedrock, found in highlands and areas with exposed bedrock	Most of this soil association is forested, but some areas are used for cultivated crops and timber, and small family farms.
Volusia-Mardin	Mottled grey and yellow and brown; developed from glacial till; plastic and sticky and slightly limy in the subsoil	These soils are well suited for production of hay and pasture, and for dairy farming and raising livestock.
Wharton-Cavode-Chippewa	Moderately deep residual accumulations from dark-brown or grey shale and siltstone; sticky and plastic soils	This association is poorly suited for cultivated crops, best suited for hay, pasture or timber. Cleared areas can be used for livestock, but most areas are best suited for forest.

Water Resources

The waters of Potter County drain into the three principal watersheds of the eastern United States (also known as the triple divide): Atlantic Coast, Gulf Coast, and St. Lawrence River (Figure 4). Over half the county is drained by streams and rivers flowing to the Atlantic Coast via the West Branch of the Susquehanna River. One-third of the drainages in the county flow to the Gulf of Mexico via the Allegheny River, which has its headwaters in Potter County and joins the Monongahela River in Pittsburgh to form the Ohio River. The Genesee River drains less than 100 square miles of the county to the north to the St. Lawrence. There is only one small natural lake within the county's border, Rose Lake, which has an area of approximately two acres and is the headwaters of one branch of the Genesee River.

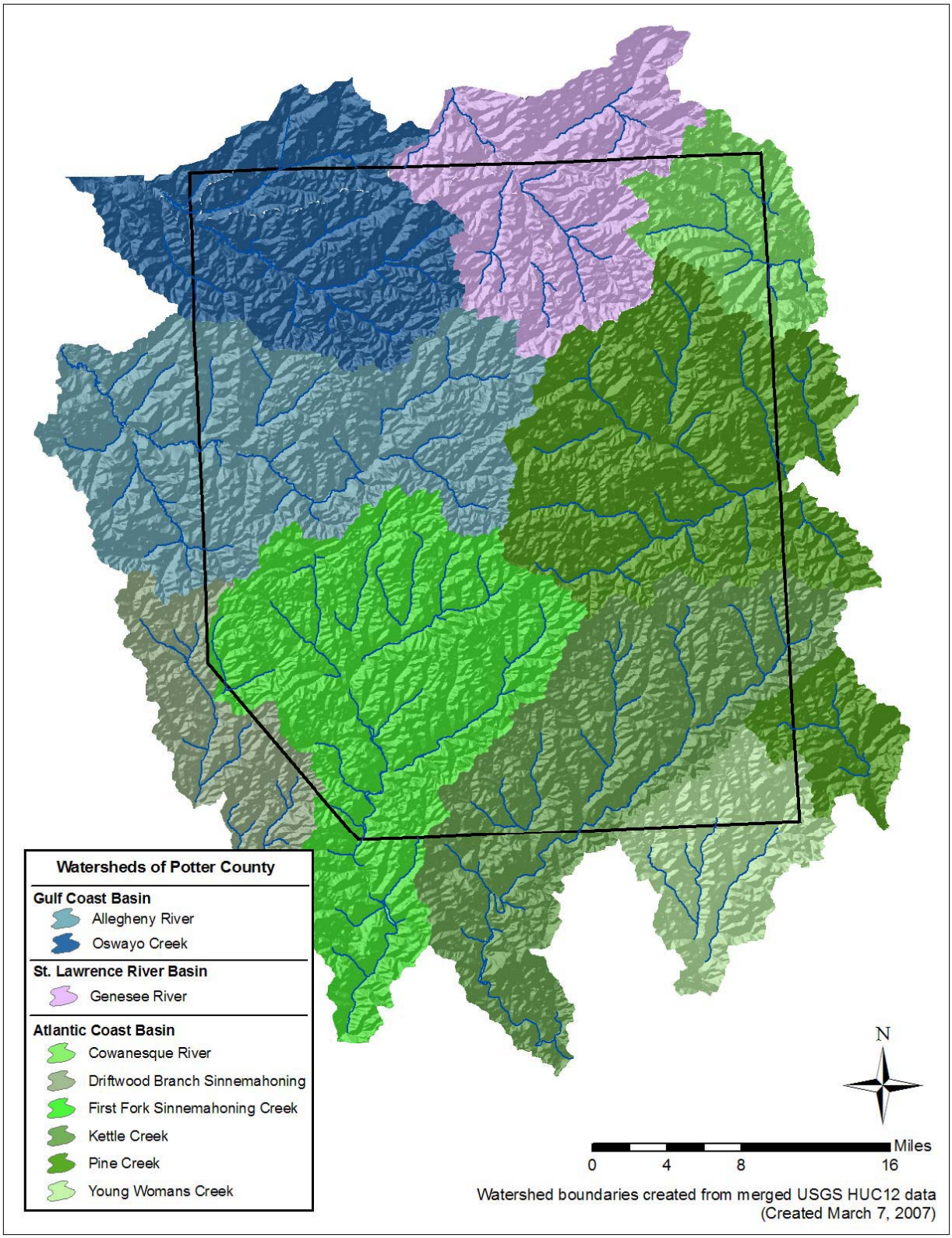


Figure 4. Major watersheds and basins of Potter County.

Vegetation

Forest Communities

Potter County lies within the Northern Appalachian Highland division of the Hemlock – White Pine - Northern Hardwoods region that is part of the Deciduous Forest Formation (Braun 1950). This largely forested county has over three-quarters (86%) of its land or 593,000 acres in forest cover (Penn State Timber Market Report 1993). Of this acreage, 43 percent of the forest is in public land, 39 percent is privately owned, and 18 percent is owned by forest industry. The ridgelines and slopes in the southern part of the county hold the largest contiguous blocks of forest. As is true for other sections of the Appalachian Plateau Physiographic Province, these forests are composed largely of second and third growth forest stands; there are few known areas of old-growth forest in the county.

The forest vegetation of the upland has been profoundly modified by lumbering and fire and therefore bears little resemblance to the original cover of oak-chestnut forest types. After the loss of the American chestnut (*Castanea dentata)* in the 1930's, oak came to dominate the forests on the ridges. Such is still the case in many areas, but with widespread loss due to gypsy moth (*Lymantria dispar*) infestation and further logging, forest compositions are again changing. Chestnut oak (*Quercus prinus)* and other oak species (*Q.* spp.), along with sassafras (*Sassafras albidum*), eastern white pine (*Pinus strobus*) and a mix of heaths, e.g., blueberry and huckleberry (*Vaccinium* spp.*)* and mountain laurel (*Kalmia latifolia)*, occupy the driest sites, especially high elevation southern and western exposures (Braun 1950). These oak-pine communities sometimes become dwarfed in the places where thin soils, extreme exposure to wind and sun, and low moisture combine.

Moving downslope from the highest elevations, the diversity of vegetation increases with higher moisture levels. Red and white oak (*Quercus* spp.*),* along with black cherry (*Prunus serotina),* black birch (*Betula lenta*), red maple (*Acer rubrum)*, striped maple (*Acer pensylvanicum*), and witch hazel (*Hamamelis virginiana*) become dominant. Herbaceous growth becomes more prominent where the heath layer thins. Hemlock-beech forest, which has been interpreted as the most nearly natural climax forest of the region, occupies the lower slopes and grades into a beech-maple variant above (Braun 1950).

On south-facing slopes, species characteristic of more southerly regions are found such as white oak (*Quercus alba*), tuliptree (*Liriodendron tulipifera*), sassafras, black birch and chestnut oak. The mesic forest communities of sugar maple (*Acer saccharum*), American basswood (*Tilia americana*), white and northern red oak (*Quercus rubra*), tuliptree, and cucumber magnolia (*Magnolia acuminata*) become established on the lower slopes. Often on northern slopes and in water gaps, eastern hemlock and eastern white pine (*Pinus strobus)* will mix with the usually deciduous slope forests. Yellow birch (*Betula alleghaniensis*), beech (*Fagus grandifolia*), rhododendron, and mountain laurel are very common in these cool, moist ravine communities that are distinctly like the northern conifer-hardwood forests of the Northeast. The herbaceous vegetation is typically that of northern forests, with common wood-sorrel (*Oxalis montana*), Canada mayflower (*Maianthemum canadense*), roundleaf yellow violet (*Viola rotundifolia*), and whorled wood aster (*Aster acuminatus*) prominent among the many northern species.

Thickets and open stands of aspens (*Populus* spp.), pin cherry (*Prunus pensylvanica*), and hawthorns (*Crataegus* spp.) form pioneer communities in disturbed areas. Sprout stands of sugar maple, beech, and red maple occupy some of the logged but not destructively burned areas. Hay-scented fern (*Dennstaedtia punctilobula*) may form large patches or sometimes a continuous ground cover in open aspen and sprout woods. The extent of remaining forest within the broad valleys of northern Potter County, and within Pennsylvania as a whole, is very small. Rich, alluvial soils deposited from streams and deep colluvial soils from the erosion of the lower slopes of the ridges have made the valleys in the county prime agricultural and grazing areas.

Wetland Communities

Wetlands provide essential habitat for many plant and animal species, as well as valuable ecosystem services such as water filtration and flood control. The ecological character of a wetland is influenced by local soil type, disturbance history, bedrock composition, and hydrological regime. In Potter County, many of the wetlands are associated with rivers and streams and include floodplain forests, and shrub/graminoid swamps. Two other wetland types known from the area are seepage swamps and seasonal pools. Wetlands resulting from excavations and impoundments are also present in the landscape, but were not included in this study because they typically do not host as rich or distinctive an assemblage of native species as do natural wetlands.

Floodplain forests occur along rivers and streams in low-lying areas and receive disturbances from floodwaters including erosion, scouring by ice and debris, and/or deposition of considerable quantities of sediment and debris. In north central Pennsylvania, these forests are characterized by species such as silver maple, sycamore (*Platanus occidentalis*), black willow (*Salix nigra*), green ash (*Fraxinus pennsylvanica*), and box-elder (*Acer negundo*). Shrubs and vines common to these forests include spicebush (*Lindera benzoin*), silky dogwood (*Cornus amomum*), Virginia creeper (*Parthenocissus quinquefolia*), and poison-ivy (*Toxicodendron radicans*). Floodplain forests serve as a protective buffer against erosion; help 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.

Shrub swamps in Potter County also occur along rivers and streams and include dense shrub thickets adjacent to graminoid marshes. Common shrubs in these wetlands include specked alder (*Alnus incana*) and silky willow (*Salix sericea*). Graminoid marshes in the county are frequently formed as successional communities following beaver dams or other impoundments and are typically rich in species diversity. Common herbs in these marshes include common duckweed (*Lemna minor*), giant duckweed (*Spirodela polyrrhiza*), rice cutgrass (*Leersia oryzoides*), wrinkle-leaf goldenrod (*Solidago rugosa*), jewelweed (*Impatiens capensis*), and various grasses and sedges (*Carex* spp.).

Seepage swamps are relatively small, forested or shrub-dominated wetlands found on lower slopes where water emerges at the surface in a diffuse flow. These seep areas are frequently dominated by hemlock, yellow birch and red maple, with a thick understory of rhododendron, swamp azalea (*Rhododendron viscosum*), spicebush, and/or highbush blueberry (*Vaccinium corymbosum*). Common herbs in these seepage wetlands include skunk-cabbage (*Symplocarpus foetidus*), violets, mannagrasses (*Glyceria* spp.), various sedges (*Carex* spp.), and ferns, including cinnamon fern *(Osmunda cinnamomea*), royal fern (*O. regalis*), and sensitive fern (*Onoclea sensibilis*). Sphagnum (*Sphagnum* sp.*)* and other mosses typically form a thick mat in these wetlands.

Clark Farm Road Complex BDA, 2005

Seasonal pools are wetlands that fill annually from precipitation, surface water runoff, and rising groundwater (Kenney and Burne 2000). The pools typically become completely dry through evaporation by late spring or summer. Since these ponds dry up during a portion of the year, they cannot support fish populations. During the brief time the pools contain water, and in the absence of fish, they become important breeding areas for a multitude of amphibian species, many of which breed solely in seasonal pools.

Disturbance

Disturbances to habitats, whether natural or man-made, are pivotal in shaping many natural communities. The nature, scale, and frequency of disturbance are influential in the evolution and occurrence of natural communities and associated rare species. Examples of natural and anthropogenic disturbance events are presented below in Table 3.

Table 3. Examples of natural and anthropogenic disturbances (adapted from Scott et al. 1999)*.

Natural Events	Anthropogenic Events
fire	residential development
disease epidemic	road, trail, railroad line
flood	telephone line, utility line
drought	dam, canal
hurricane/tornado	commercial development
landslide	modern agriculture
ice storm	mining
	logging
	grazing

*Entries in italics connote reversible disturbances, while those in roman usually represent long-term disturbances.

Natural

Natural disturbances, such as fire and flooding, can benefit certain natural communities and species. For example, periodic fires are needed to maintain pitch pine (*Pinus rigida*) and scrub oak (*Quercus illicifolia*) barrens. Burns in such areas stimulate new growth in these species and exclude 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 hold excess water, thus reducing the scale of flooding downstream.

In contrast, deer have been responsible for a number of negative impacts on Pennsylvania flora and fauna (Rhoads and Klein 1993). Overbrowsing can result in a lack of forest regeneration, a reduction in the diversity and density of forest understory, decreased songbird diversity, and a direct loss of rare plants (Yahner 1995). For example, forests that were once dominated by oak are now converting to red maple in large part because of deer pressure (Abrams 1998).

Anthropogenic

In many cases, human-caused disturbance has been clearly destructive to natural habitats and the species associated with them. In Potter County, logging and agriculture have played a major role in altering the landscape. Although some species, including several rare species, are aided by on-site disturbance (e.g.,clearing or mowing), in general, human-caused disturbance negatively impacts natural systems. With wide-ranging anthropogenic disturbance, some plant and animal species may be completely extirpated from an area because they cannot compete or survive under newly created conditions. Human disturbances are a permanent part of the landscape, but decisions about the type, timing, and extent of future disturbances are important to the natural ecological diversity that remains.

OVERVIEW OF POTTER COUNTY ANIMAL COMMUNITIES

Mammals of Potter County

Potter County has a diversity of habitat types that are used by Pennsylvania's mammal fauna. Although less than 50% of the county's area lies in public lands, development throughout the region remains low and conservation of wildlife and habitats high. As a predominantly forested county, tourism from both hunting and non-hunting remains one of the area's leading economic concerns. White-tailed deer (*Odocoileus virginianus*) and black bear (*Ursus americanus*) are significant game species within the county. Other important game species include the gray and fox squirrel (*Sciurus carolinensis, S. niger*), rabbits, and fur-bearer species such as foxes, bobcat (*Lynx rufus*), mink (*Mustela vison*) and other weasels. The habitats that support these species also support a diverse and important non-game mammal fauna. Many of the mammal species occurring throughout Potter County are habitat generalists. Examples are the northern short-tailed shrew (*Blarina brevicauda*) and several other shrew and mole species, white-footed mouse (*Peromyscus leucopus*) and several other rodent species, as well as skunks (*Mephitis mephitis*), opossum(*Didelphis marsupialis*), and coyote (*Canis latrans*).

Other species have fairly restricted habitat needs and are considered habitat specialists. They may be restricted to grasslands, forest interior, upper elevation ridgelines, wetlands and streams or, during part of their life cycle, to specific habitats such as caves and mines. Habitat specialists are often more sensitive to habitat disturbances and loss than habitat generalists. Examples of habitat specialists include meadow voles (*Microtus pennsylvanicus*) (grasslands and meadows), fishers (*Martes pennanti*) (forest interiors), Allegheny woodrats (*Neotoma magister*), (upper elevation ridges), muskrats (*Ondatra zibithicus*) and beavers (*Castor canadensis*) (wetlands and streams) and most, if not all, of the bat species (caves and mines). The fisher and river otter (*Lontra canadensis*) have been reintroduced by the Pennsylvania Game Commission in portions of their range in Pennsylvania where habitat necessary to their existence still occurs. Due to these species expanding their range into other portions of the state, they now occur in Potter County.

Forest Species

Several species that historically occurred within the region are of special concern due to population declines within other parts of the state or throughout their natural range in the United States. The list includes species such as the Allegheny woodrat, eastern small-footed bat (*Myotis leibii*), and northern flying squirrel (*Glaucomys sabrinus*). These species are very dependant on large, undisturbed forest habitats as well as specific habitat types. One species that remains unreported from Potter County but may occur during the summer months is the federally endangered Indiana bat (*Myotis sodalis*), a species that requires large blocks of mature forest.

Wetland and Stream Species

Wetlands and streams play a major role in providing habitat for mammals as well as serving as corridors for dispersal throughout the county. One species found around small streams in Potter County is the northern water shrew (*Sorex palustris albibarbis*), a species rarely observed in Pennsylvania. This species was once thought to be extremely rare but recent evidence seems to indicate that it is much more widespread in the northern tier counties of Pennsylvania than previously thought. One of the larger shrew species, the northern water shrew utilizes pools along smaller tributaries that empty into moderate to larger sized streams. Since its diet consists primarily of macroinvertebrates such as caddisflies, stoneflies, mayflies, and other aquatic insect species, it most likely depends on clean, high quality streams and wetlands and may serve in the future as an "indicator species", a species that may alert us to arising environmental problems such as acid mine drainage or acid rain.

Cave-dwelling Species

Bats are a common component of the forests of Potter County, most often encountered during the summer months along the streams and open bodies of water that occur throughout the county. The eastern small-footed bat (*Myotis leibii*) has recently been discovered using rock outcrops and cliffs as summer roosts. Rocky ridges may provide roost sites for this species as it raises its young. During the winter months, bats most likely disappear from the majority of the county as the caves and mines that are important to them during the winter are lacking. Hibernating bat species such as the little brown bat (*Myotis lucifugus*) and big brown bat (*Eptesicus fuscus*) likely migrate either to large mines in New York or south to caves occurring in the central portion of Pennsylvania.

Grassland/Scrub-shrub Species

Grasslands, in the form of meadows and other open habitat types, are found within the valleys and along the plateaus of Potter County. The most common mammal occurring in these habitats is the meadow vole (*Microtus pennsylvanicus*). Meadow voles are sometimes found in grassy forest clearings within large tracts of forest, having made their way there along forest roads, pipelines and other right-of-ways. Several other species of mammal are known to occur within grasslands, including the eastern cottontail rabbit (*Sylvilagus floridanus*), woodchuck (*Marmota monax*), and red fox (*Vulpes vulpes*). Another type of non-forested habitat is scrub-shrub, which commonly consists of scrub oak, blueberry and other low-growing plants. These habitats are extremely important to several species as either foraging areas or nesting sites. Black bear, Appalachian cottontail (*Sylvilagus obscurus*), and snowshoe hare (*Lepus americanus*) often occur along upper elevation forests in areas where soils are thin and the climate fairly dry.

The Northern Allegheny Plateau Important Mammal Area (IMA), the largest IMA in Pennsylvania, spans nine counties, including the southern portion of Potter County, and covers approximately 4 million acres. See pg. 29 under Landscape Level Results Section for more information on this IMA and the IMA Project.

Birds of Potter County

Pennsylvania is an important state for birds because it encompasses a wide range of habitats within its border that extends from the Great Lakes to nearly the Atlantic Coast. Approximately 400 species have been observed in the state, including 186 species that have been known to regularly breed (Pulcinella 1997). Extensive forests provide breeding habitat for many declining bird species in the Northeast and a large number of raptors and songbirds travel along its ridgetops during spring and fall migration. Potter County is particularly important for breeding forest bird communities since it contains vast expanses of state forestland in the southern two-thirds of the county. Wetland communities, riparian corridors, and floodplain forests are also important to bird life in the northern, glaciated portion of the county (see description of Potter County vegetation in previous section).

Forest Bird Communities

Forest interior species – As forested landscapes are fragmented into smaller patches due to development, roads, and timber harvesting, some bird populations have been shown to decline (Askins et al. 1991). These birds are considered forest interior species and require large blocks of core or contiguous interior forest (300 feet from an edge) in order to breed (Robbins, Dawson, and Dowell 1989). Forest fragmentation negatively affects their nesting success because of increased predation by animals that use edges for hunting and increased brood parasitism by brown-headed cowbirds (*Molothrus ater*) which use perches along edge to prospect for nest of other species in which to lay their eggs (Robinson 1994). Forest interior species include a variety of owls, hawks, woodpeckers, thrushes, vireos, and warblers.

A significant amount of interior or core forest remains in Potter County as indicated by the delineation of nine landscape conservation areas (LCAs) that are greater than 10,000 acres in size (See Results Section on pg. 23). Examples of forest interior species that breed in these LCAs include broad-winged hawk (*Buteo platypterus*), barred owl (*Strix varia*), hairy and pileated woodpeckers (*Picoides villosus* and *Dryocopus pileatus*), Acadian flycatcher (*Empidonax virescens*), wood thrush (*Hylocichla mustelina*), ovenbird (*Seiurus surocapillus*), black-throated green warbler (*Dendroica virens*), black-and-white warbler (*Mniotilta vaira*), and scarlet tanager (*Pairanga olivacea).*


Scarlet tanager, Hawrot 2004

Conifer-dependent species – Conifers, such as eastern white pine (*Pinus strobus*) and eastern hemlock (*Tsuga canadensis*), are important as habitat components in a forested landscape and as habitat features for nest sites. Three species of conservation concern in Pennsylvania that are found in large forest blocks of Potter County are also conifer dependent or require conifer-dominated habitats in order to successfully breed. These include northern goshawk (*Accipiter gentilis),* northern saw-whet owl (*Aegolius acadicus*), and Swainson's thrush (*Catharus ustulatus*). Due to collection pressure, the localities of northern goshawk occurrences are not given in this report. See the northern goshawk fact sheet on pg. 14 for information on this species.

Other examples of conifer-dependent forest birds that breed in Potter County include red-breasted nuthatch (*Sitta canadensis*), winter wren (*Troglodytes troglodytes*), hermit thrush (*Catharus fuscescens*), solitary vireo (*Vireo solitarius*), and blackburnian warbler (*Dendroica fusca*). The northern migration of the hemlock woolly adelgid (*Adelges tsugae*) in Pennsylvania is having a major impact on the health of hemlock trees in the state and subsequently poses a threat to these conifer-dependent species.

Whenever possible, fragmentation of large contiguous forest tracts (at least 7,500 acres in size) should be avoided. Uneven-aged forests with a well-developed woody and herbaceous understory should be maintained. Care should be taken not to increase feeding opportunities for cowbirds; therefore roads, trails, and other disturbance corridors should be narrow and edges of openings kept in brush or long grass over 6

inches tall (no mowing). Wildlife trees or trees with special characteristics which often results from damage or disease, such as snags, and residuals trees that remain after forest harvesting, serve many wildlife functions including foraging sites, cavities, hunting perches, and shelter, and should be preserved.

Wetland Bird Communities

In Pennsylvania, 56 percent of all state bird species of special concern are wetland obligate species and an even higher percentage of these species use wetlands at some point during their life cycle (Gross 2002). Potter County has wetland habitats that range in size from small seasonal pools to larger shrub swamps along rivers and streams. Wetlands and riparian zones provide breeding and foraging habitat for various raptors such as osprey (*Pandion haliaetus)* and bald eagle (*Haliaeetus leucocephalus*) and other wetlands species such as waterfowl, shorebirds, herons, rails, bitterns, and several swallow and sparrow species. The red-shouldered hawk (*Buteo lineatus*) forages and nests almost exclusively along wooded streams and floodplains, habitat types common to Pennsylvania. Wading birds, such as great blue herons (*Ardea herodias*), use clumps of dead trees surrounded by water for their rookeries. Many of these wetland species are secretive, cryptic, and hard to flush making these habitats difficult areas to survey. In Potter County, common wetland bird species are great blue heron, green heron (*Butorides striatus*), common yellowthroat (*Geothlypis trichas)*, swamp sparrow (*Melosipza georgiana*), and red-winged blackbird (*Agelaius phoeniceus*).

Wetlands and riparian zones are an imperiled habitat across the state (Dahl 1990). Conservation and management of wetland habitats are critical to sustain healthy populations of breeding birds as well as general ecosystem viability. Immediate needs include the preservation of emergent wetlands that provide nesting, feeding, and wintering habitats. Wetlands should be protected from draining and filling, pollution, siltation, and invasion by exotic plant species. In riparian areas, floodplain forests should be maintained by limiting harvesting within the riparian zone since these forests typically have large old trees that are occupied by many cavity-dependent and bark-utilizing species, and provide nesting sites for raptor species and colonial waterbirds.

Grassland Bird Communities

Historically, most of the Northeast was forested except for scattered openings that existed along river floodplains, wetlands, beaver meadows, and heathlands. Fires set by lightning strikes or burning and clearing by Native Americans also opened up forested areas. With European colonization during the 1800s, grasslands became widespread as land was cleared for pastures and hayfields, and grassland species flourished. Today, as farmland reverts back to forest and agricultural landscapes are being replaced by housing and business developments, species dependent on grasslands are declining.

Grassland habitat in Potter County consists primarily of agricultural land such as hay fields and pastures, and maintained areas such as airfields. Many grassland birds associated with open areas are experiencing declines due to habitat loss and modern agricultural practices (Jones and Vickery 1997). In parts of western Pennsylvania where open areas are maintained as grassland habitat or farmers are participating in the Conservation Reserve Enhancement Program (CREP), several grassland-dependent species such as northern harrier (*Circus cyanus*), killdeer (*Charadrius vociferous*), eastern meadowlark (*Sturnella magna*), grasshopper sparrow (*Ammodramus savannarum*), and field sparrow (*Spizella pusilla*) have been able to maintain small strongholds.

Large-scale planning should include restricting mowing during the breeding season, managing grazing using a rotational system, periodic burns, and limiting development in those areas where grassland-dependent species are known to reside. The creation of additional grassland habitats should not be a primary activity for biodiversity conservation.

There are currently no Important Bird Areas (IBAs) located in Potter County. See pg. 19 for a description of the Pennsylvania IBA Program.

Northern Goshawk (*Accipiter gentilis*)

What it is:

The northern goshawk is a large forest raptor that hunts a variety of prey including squirrels, hares, grouse, crows, woodpeckers, and songbirds. It has long, broad wings and a long tail. Its upperparts are slate-grey to brown-grey, with a black cap and white line on the head. Underneath, it is white to light grey with fine grey vermiculation and black streaks. The tail has indistinct black bands on top and sometimes a thin white band at the end. Males and females have similar coloration. Juveniles have brownish coloration. Average total length is 55 centimeters for males and 61 centimeters for females. They usually have only one brood per year with 2-4 eggs laid from mid to late April.

Photo by David Fox, Western Pennsylvania Conservancy

Where it is found:

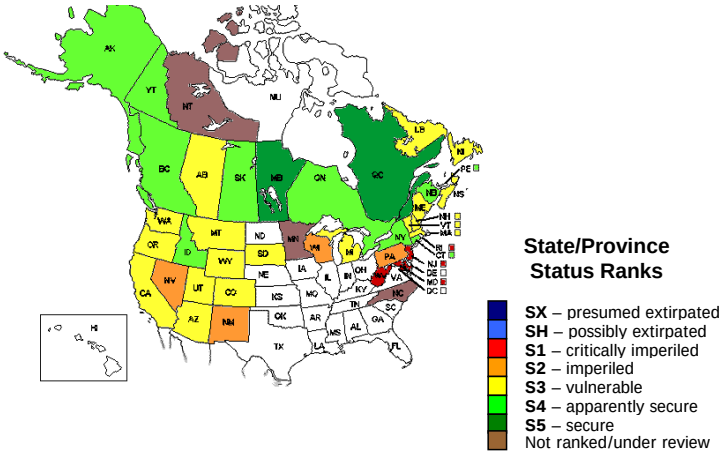
The distribution of the northern goshawk extends across North America from Alaska to Labrador south to western Mexico in the west and to Maryland in the east. Pennsylvania is close to the edge of its range. Winter migrations are irregular, with most of the population overwintering in the breeding range and some individuals moving slightly south, probably in search of prey. Approximately every 10 years, most of the population migrates south, coinciding with dips in the populations of snowshoe hares and grouse. Goshawks breed in deciduous, coniferous and mixed forests. In the eastern U.S., the species prefers mature, mixed hardwood – hemlock forest. Most breeding records in Pennsylvania are from the Allegheny High Plateau, with some from the Ridge and Valley and the Allegheny Mountains. During the winter their habitat preferences are less specific and they are observed throughout the state.

Why it is rare:

This species may have always been rare in Pennsylvania, however by 1900 they were seen less frequently. Their decline was probably due to timbering, the extinction of the passenger pigeon - a formerly abundant food source, and human persecution. Bounties were paid for goshawks until 1951 in Pennsylvania. The species has become more common since the regeneration of forests in Pennsylvania.

North American State/Province Conservation Status

Map by NatureServe



Conservation considerations:

Habitat degradation and loss are the largest threats to the species today. Additionally, timbering activities near nest sites during the breeding season can cause the parents to abandon the nest. Establishing a protected area around known nesting sites to reduce disturbance may increase nest success.

Pennsylvania Natural Heritage Program

NatureServe conservation status ranks: G5 - secure globally, **S2S3B, S3N** – critically imperiled in Pennsylvania

References:

- McWilliams, G.M. and D.W. Brauning, 2000. The Birds of Pennsylvania. Cornell, New York, Cornell Univeristy Press. 479 p.
- NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: March 6, 2007).
- Squires, J. R., and R. T. Reynolds. 1997. Northern Goshawk (*Accipiter gentilis*). In The Birds of North America, No. 298 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.

Amphibians and Reptiles of Potter County

Pennsylvania's heterogeneous landscapes create a great diversity of habitats for a wide range of unique reptile and amphibian species, also known as herpetofauna. The ranges of most Pennsylvania herpetofauna are restricted to certain regions of the state, a testament to the varied topography and physiographic provinces within the region. Today, the Commonwealth is home to 72 native herptile species, including species associated with glaciated regions of the Canadian Shield, the lower regions of the Appalachians, western prairies, and the eastern plain. Potter County is unique in that it still harbors large tracts of contiguous forest in the southern two-thirds of the county that provides habitat for both generalist and specialist reptiles and amphibians of the state. The array of habitats within these large forested blocks serves both.

Many generalists—species that occur in a variety of habitats and are adapted to survival in different environmental conditions—are the most regularly encountered reptiles and amphibians in the state. Examples of these species types are the eastern garter snake (*Thamnophis sirtalis*), the red-spotted newt (*Notophthalmus viridescens*), the bull and green frogs (*Rana catesbeiana*, *R. clamitans*), and the painted and snapping turtles (*Chrysemys picta*, *Chelydra serpentina*). Along with these generalist species, Potter County includes several less common species of amphibians and reptiles—habitat specialists that have restricted ranges or require specific habitats or environmental conditions.

Amphibians

Portions of the county support complexes of ephemeral/fluctuating natural pools, more commonly known as seasonal pools. These wetlands are critical to a group of amphibians that rely on the wet/dry annual cycle that eliminates the possibility of fish populations being established, such as the wood frog (*Rana sylvatica*), and Jefferson and spotted salamanders (*Ambystoma jeffersonianum* and *A. maculatum*). The four-toed salamander (*Hemidactylum scutatum*) is not a seasonal pool obligate but is often found in association with these habitats, particularly in the margins of seeps, springs, streamsides, and seasonal pools where sphagnum moss is found above cool, clear water. In addition to this species, many frogs and toads that are not seasonal pool obligates can also be found using these habitats, including the American toad (*Bufo amercianus*), spring peeper (*Pseudacris crucifer*), and the grey tree frog (*Hyla versicolor*).

The pickerel frog (*Rana palustris*) and northern leopard frog (*Rana pipiens*) require heavily vegetated streams and creeks. Once one of North America's most common species of frog, the northern leopard frog has rapidly disappeared from much of its range for mysterious reasons. Many herpetologists are now concerned with the future of this species.

The terrestrial woodland salamanders depend on canopied forests with adequate amounts of leaf litter. Their role in limiting the numbers of leaf-decomposing invertebrates has been shown to be significant in maintaining a rich layer of organic matter on the forest floor. The red-backed, slimy, valley and ridge, and Wehrle's salamanders (*Plethodon cinereus, P. glutinosis, P. hoffmani, P. wehrlei*) are the most common woodland species throughout the county's forests. The numerous woodland waterways and small mountain streams of Potter County provide habitat for the brook salamanders, such as northern and mountain dusky salamanders (*Desmognathus fuscus, D. ochrophaeus*), northern two-lined and long-tailed salamanders (*Eurycea bislineata, E. longicauda*) and the northern spring salamander (*Gyrinophilus porphyriticus*). In the cold-water drainages of the county, the brilliant northern red salamander (*Pseudotriton ruber*) can be found under leaf litter and rocks in seeps and spring heads. All of the streamside salamanders require high water quality and forested stream edges.

The largest salamander on the continent, the hellbender (*Cryptobranchus alleganiensis*), may still be found in moderately sized creeks where suitable habitat exists. Hellbender populations have been declining very rapidly due to decreases in water quality and introductions of aggressive non-native crayfish. Another strictly aquatic salamander, the mudpuppy (*Necturus maculosus*), inhabits many of the same habitats as the hellbender. This salamander may reach a foot in length and retains its gills throughout the adult stage. This is the only amphibian species in Pennsylvania that regularly keeps its gills throughout all life stages.

Amphibians as a whole are particularly sensitive to toxins. Consequently, acid mine drainage is detrimental to the salamanders, including the hellbender and mudpuppy, that inhabit affected streams.

Reptiles

The semi-aquatic wood turtle (*Glyptemys insculpta*) inhabits wooded creeks and rivers, and can be locally common in areas. Nests are generally laid in suitable soft substrates along waterways that are easily targeted by overpopulations of raccoons, skunks, and opossums. The eastern box turtle (*Terrapene carolina*) was likely gone from Potter County by the time of European settlement. Box turtle remains are a common find in archeological digs from western New York State, and it is thought that this species was extirpated from these regions by over collecting by Native Americans. Many of Pennsylvania's turtle populations are nearly void of juvenile turtles, indicating that there is little successful reproduction occurring. The northern coal skink (*Eumeces anthracinus*) is the only lizard species known to occur in Potter County. This species occurs in dry habitats with an abundance of cover objects and basking areas, such as sun-exposed rocks and dead woody debris. This species is particularly susceptible to localized extinction because of their small, isolated populations. . Due to collection pressure, the localities of coal skink occurrences are not given in this report. See the **coal skink fact sheet** on pg. 17 for information on this species.


Mountain earth snake, Hawrot 2006

The northern black racer (*Coluber constrictor*), black rat snake (*Elaphe allegheniensis*), and milk snake (*Lampropeltis triagulatum*) are fairly common species in the state, and can be found in a variety of habitats across the county. These species prey upon small mammals including mice and squirrels. The northern water snake (*Nerodia sipedon*) is a widespread resident of Potter County that hunts along open waterways, searching for amphibians and small fish. Pennsylvania accounts for about 90 percent of the global range for the shorthead garter snake (*Thamnophis brachystoma*), a globally vulnerable species due to its restricted range. The shorthead garter snake feeds exclusively on earthworms. The smooth green snake (*Liochlorophis vernalis*) is difficult to locate because its camouflage allows it to virtually disappear into vegetation. Though this snake is rarely seen, the species is thought to be secure in the state. Several small and secretive snake species in the county include the red-bellied snake (*Storeria occipitomaculatum*), the ring-necked snake (*Diadophus punctatus*), the mountain earth snake (*Virginia pulchra*), and the eastern worm snake (*Carphophis amoenus*). The red-bellied snake and the ring-necked snake are rather common and can be found beneath rocks and decaying wood and bark. The mountain earth snake and eastern worm snake are thought to be "vulnerable" in the state because of their restricted ranges. In fact, the majority of the mountain earth snake's range is in Pennsylvania. More survey work is needed for these species in the state.

The timber rattlesnake (*Crotalus horridus*), a species of special concern in Pennsylvania, has long been persecuted due to its venomous nature, although there has never been a human fatality in Pennsylvania from a rattlesnake bite. The forested ridges of Potter County provide good habitat for this species and there are several records of this species in the south. Rattlesnakes use a wide range of forested habitats, but primarily occur on rocky slopes where they can find refuge in spaces between the boulders as well as thermoregulate in the sunny openings. Hibernacula, or dens, are often found under canopy cover usually located within several hundred meters of an open basking site. Timber rattlesnakes are considered a game species by the Pennsylvania Fish and Boat Commission and can be collected with an appropriate PFBC permit. Due to collection pressure, the localities of timber rattlesnake occurrences are not given in this report. See the **timber rattlesnake fact sheet** on pg. 18 for information on this species.

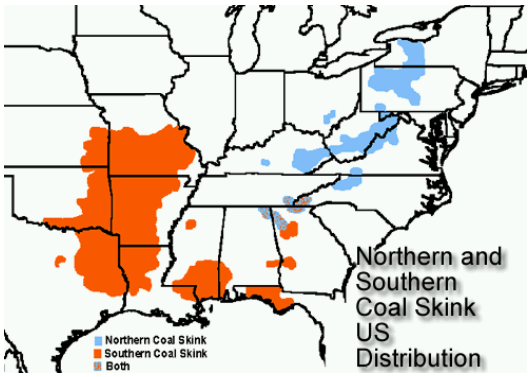
Northern Coal Skink (*Eumeces anthracinus anthracinus*)

What it is:

The northern coal skink (*Eumeces anthracinus anthracinus*) is one of four native lizards in Pennsylvania. Adults may reach up to 18 centimeters in overall length. The northern coal skink has a brown body with a pair of lighter yellowish lines on either side, running from behind the eye down the length of the body to the tail. These pairs of lighter lines enclose two darker chocolate-colored bands. This species has only four yellowish longitudinal lines on the top of its head as opposed to the five stripes on the other species of Pennsylvanian skinks. Juveniles will have brilliant blue tails and breeding males may have swollen heads that become reddish. Occasionally, completely black individuals, known as melanistic, are recorded from Pennsylvania. Northern coal skinks are active insectivores, foraging among the rocks, logs and leaf litter for various insects. As with all of Pennsylvania's lizards, they are usually quick to flee and frequently avoid capture. Should a predator capture an individual, coal skinks will readily autotomize or "release" their tails to distract predators while they make a speedy escape. Tails will regrow but are quite often less robust than the originals. Mating occurs in the spring and by June, eight to nine eggs are laid in depressions in the ground concealed under bark, rocks or logs. The female will tend the nest until hatching in late July or August. Northern coal skinks have generally entered hibernation by early fall.

Where it is found:

The northern coal skink's non-contiguous range extends from western New York State, south to North Carolina and as far west as eastern Kentucky. The southern subspecies of the coal skink ranges from Georgia and the panhandle of Florida west to eastern Kansas, Oklahoma and Texas. Although the northern coal skink typically inhabits moist woods, the species tends to be found frequenting the driest microhabitats within the landscape. Open areas with abundant rocks and logs are ideal spots for the skinks to bask and feed. Small streams have been known to become refugia for fleeing skinks and unlike Pennsylvania's other lizards, the coal skink has been known to dive underwater to avoid capture.



Map courtesy of the Center for Reptile and Amphibian Conservation Management

Conservation considerations:

Little is known about the northern coal skink in Pennsylvania. However, the species does appear to occur in isolated pockets of habitat and in fairly small numbers. This patchy occurrence can make populations vulnerable to extirpation due to habitat alteration and destruction. Intense surveys are required before we can grasp the true status of the northern coal skink in Pennsylvania.

PNHP
Pennsylvania Natural Heritage Program

NatureServe conservation status ranks: G5 – secure worldwide; S3 – vulnerable in Pennsylvania

References:

- Hulse, A.C., C.J. McCoy and E.J. Censky. 2001. Amphibians and Reptiles of Pennsylvania and the Northeast. Cornell University Press, New York. 419pp.
- Shaffer, L.L, 1991. Pennsylvania Amphibians & Reptiles. Pennsylvania Fish Commission, Harrisburg, PA. 161pp.
- McCoy, C.J. 1985. Northern Coal Skink (*Eumeces anthracinus anthracinus* Baird) in: Genoways, H.H. and F. J. Brenner (eds.) Species of Special Concern in Pennsylvania. Special Publication of the Carnegie Museum of Natural History, Number 11:285-87.

Timber Rattlesnake (*Crotalus horridus*)

What it is:

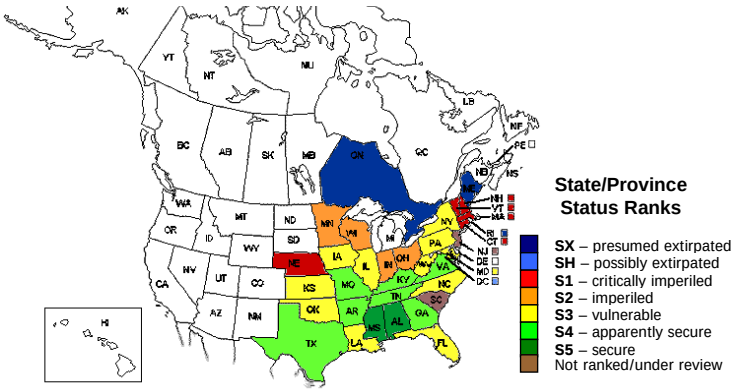
The timber rattlesnake is the largest venomous snake native to Pennsylvania, growing up to 189 centimeters long. Its base color ranges from yellow-brown to dark brown with darker blotches or bands running down its back. Its underside is a mottled cream or yellow-brown color. The scales on its back are ridged, giving the snake a rough appearance.

The timber rattlesnake's head is large and triangular. Its pupils are elliptical. There are heat sensitive pits on either side of its head between the eye and the nostril, which are used snake uses to help detect its prey. These pits mark it as a pitviper, a member of the group of snakes that includes copperheads and cottonmouths. Timber rattlesnakes are ambush predators that primarily prey on small mammals.

While timber rattlesnakes are long-lived, they are also slow to reach sexual maturity and do not reproduce very frequently: females give birth for the first time in their sixth year, and may have additional litters every two to five years, depending on food availability.

A timber rattlesnake
Western Pennsylvania Conservancy 2003

North American State/Province Conservation Status
Map by NatureServe



Where it is found:

Timber rattlesnakes are generally found in upland forest habitats with areas of rocky outcropping, far from human disturbance. One of the snakes' key habitat requirements is den space for winter hibernation, which can last more than half the year (October – early May). The snakes prefer crevices in steep rocky slopes or outcroppings facing southwest, which receive direct sunlight during the winter. During the spring and summer months, timber rattlesnakes will generally forage for prey within a home range surrounding their dens, but may move to other hunting grounds in quick bursts of activity, up to a mile per day. Males generally need about 500 acres of home territory; females need only 100 acres if they are not pregnant.

Why it is rare:

Timber rattlesnake populations are declining throughout the northeastern United States; they have been extirpated from Maine, and are critically imperiled in much of New England. A number of human activities are responsible, including historical bounty hunting and ongoing loss of habitat to development.

Conservation considerations:

Relocation to better-quality habitat is generally not recommended because of the high mortality rate of relocated snakes; it is better to protect the snakes in their current habitat. NatureServe recommends protection of an area with a radius of about 2.5 miles around known rattlesnake den sites, and that den locations be kept secret to prevent intentional disturbance or hunting. This species' slow population growth rates and inability to tolerate human activity mean its recovery will likely require serious and committed efforts.

NatureServe conservation ranks: G4 – apparently secure worldwide, **S3S4** – vulnerable in Pennsylvania

References

- Campbell J.A. and W.W. Lamar. 2004. The Venomous Reptiles of North America. Vol. II. Ithaca, NY: Comstock Publishing Association. 549-51.
- Clark R.W. 2004. Timber rattlesnakes (*Crotalus horridus*) use chemical cues to select ambush sites. J. Chem. Ecol., 30(3): 607-17.
- Hulse A.C., C.J. McCoy, and E.J. Chensky. 2001. Amphibians and Reptiles of Pennsylvania and the Northeast. Ithaca, NY: Cornell University Press. 351-5.
- Keenlyne K.D. 1978. Reproductive cycles in two species of rattlesnakes. American Midland Naturalist, 100(2): 368-375.
- Martin W.H. 1992. Phenology of the timber rattlesnake (*Crotalus horridus*) in an unglaciated section of the Appalachian Mountains. In: Biology of the Pitvipers, J.A. Campbell and E.D. Brodie, Jr., eds. Tyler, TX: Selva. 259-77.
- NatureServe. 2005. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.2. NatureServe, Arlington, Virginia. Available at http://www.natureserve.org/explorer. Accessed 14 February 2005.
- Reinert H.K. 1984a. Habitat separation between sympatric snake populations. Ecology, 65(2): 478-86.
- Reinert H.K. 1984b. Habitat variation within sympatric snake populations. Ecology, 65(5): 1673-82.

Pennsylvania Natural Heritage Program

NATURAL HERITAGE AREAS & CONSERVATION PLANNING CATEGORIES

To provide the information necessary to plan for conservation of biodiversity at the species, community, and ecosystem levels, two types of Natural Heritage Areas, as well as designations from two other sources, are included in the report.

Biological Diversity Area (BDA)

BDAs are areas containing plants or animals of special concern at state or federal levels, exemplary natural communities, or exceptional native diversity. BDAs include both the immediate habitat and surrounding lands important in the support of these special elements and are mapped according to their sensitivity to human activities. "Core" areas delineate essential habitat that cannot absorb significant levels of activity without substantial impact to the elements of concern. "Supporting Natural Landscape" areas maintain vital ecological processes or secondary habitat that may be able to accommodate some types of low-impact activities.

Landscape Conservation Area (LCA)

LCAs are large contiguous areas that are important because of their size, open space, habitats, and/or inclusion of one or more BDAs. Although an LCA includes a variety of land uses, it typically has not been heavily disturbed and thus retains much of its natural character. These large regions can be viewed as regional assets: they improve quality of life by providing a landscape imbued with a sense of beauty and wilderness, they provide a sustainable economic base, and their high ecological integrity offers unique capacity to support biodiversity and human health. Planning and stewardship efforts can preserve these landscape functions by limiting the overall amount of land converted to other uses, thereby minimizing fragmentation of these areas.

Important Mammal Area (IMA)

The Important Mammal Areas Project (IMAP) is being carried out by a broad based alliance of sportsmen, conservation organizations, wildlife professionals, and scientists. Areas nominated must fulfill at least one of five criteria developed by the Mammal Technical Committee of the Pennsylvania Biological Survey (http://www.pawildlife.org/imap.htm). Planning for these areas should consider how best to maintain their value as mammal habitat. The value of these sites may be associated with high mammalian diversity, high-density populations, occurrence of species of special concern, or educational potential. Stewardship plans are being completed for all IMAs in the state.

Important Bird Area (IBA)

The Pennsylvania Audubon Society administers the state's IBA Program and defines an IBA as "a site that is part of a global network of places recognized for their outstanding value to bird conservation." An IBA must meet one of several criteria developed by the Ornithological Technical Committee of the Pennsylvania Biological Survey (http://pa.audubon.org/Ibamain.htm). Planning for these areas should consider how best to maintain their value as bird habitat. The value of some large-scale IBAs may be due to the forest interior habitat contained within them; natural communities that have a particular habitat value for birds (e.g., wetlands) are typically the basis for smaller-scale IBAs, therefore, a high degree of protection should be given to these sites. Conservation plans are in the process of being completed for all IBAs in the state.

METHODS

Fifty-one county inventories have been completed in Pennsylvania to date. The methods used in the Potter County Natural Heritage Inventory followed established Pennsylvania Natural Heritage Program procedures, which are based on those used by Anonymous (1985), Reese et al. (1988), and Davis et al. (1990). Natural Heritage Inventories proceed in three stages: 1) site selection based on existing data, map and aerial photo interpretation, recommendations from local experts, and aerial reconnaissance; 2) ground surveys; and 3) data analysis and mapping.

Site Selection

Inventory site selection is guided by information from a variety of sources. A review of the Pennsylvania Natural Heritage Program database (see Appendix I, pg. 139) determined what locations were previously known for species of special concern and important natural communities in Potter County. Local citizens knowledgeable about the flora and fauna of Potter County were contacted for site suggestions. Individuals from academic institutions and state and federal agencies that steward natural resources (e.g., Pennsylvania Game Commission, Pennsylvania Bureau of Forestry, Carnegie Museum of Natural History) were also contacted to obtain information about lands or resources they manage. National Wetland Inventory maps, compiled by the U.S. Fish and Wildlife Service, were used to locate wetlands of potential ecological significance within the county. General information from other sources such as soil maps, geology maps, earlier field studies, and published materials on the natural history of the area helped to provide a better understanding of the area's natural environment.

Aerial photographs were reviewed to identify sites for ground survey. Initial study of aerial photos revealed large-scale natural features (e.g., contiguous forest, wetlands), disturbances (e.g., utility line right-of-ways, timbered areas) and a variety of easily interpretable features. Once preliminary site selection was completed, reconnaissance flights over chosen areas of the county were undertaken. Information about sites concerning their extent, quality, and context within the landscape can be gathered easily from the air. Wetlands and contiguous blocks of forest were of primary interest during fly-overs in Potter County. Based on aerial photo interpretation and aerial surveys, some sites were eliminated from consideration if they proved to be highly disturbed, fragmented, lacked the targeted natural feature, or were purely attributable to human-made features (e.g., impoundments, clearings, farm fields).

Ground Surveys

Areas identified as potential inventory sites were scheduled for ground surveys. Ecologists conducted field surveys throughout Potter County during 2004, 2005, and 2006. After we obtained permission from landowners, sites were examined to evaluate the condition and quality of the habitat and to classify the communities present. Field survey forms (Appendix II, pg. 140) were completed for each site. Boundaries for each site were delineated on electronic versions of USGS 1:24,000 topographic maps using ArcGIS 9.0. If a plant species of special concern was recorded and the population was of sufficient size and vigor, a voucher specimen was collected to be archived in the herbarium of the Carnegie Museum of Natural History. The flora, fauna, level of disturbance, approximate age of forest community, and local threats were among the most important data recorded for each site. Sites were not ground surveyed in cases where landowner permission for site visits was not obtained, or where enough information was available from other sources.

Data Analysis and Mapping

Data on species of special concern and natural communities obtained during the fall of 2004 through the summer of 2006 field seasons were combined with prior existing data and summarized. Plant and animal nomenclature follows that adopted by the Pennsylvania Biological Survey and natural community descriptions primarily follow Fike (1999). All sites with rare species and/or natural communities were selected for inclusion in Biological Diversity Areas (BDAs). Spatial data on the element of concern were then compiled in a GIS format using ESRI ArcGIS 9.0 software. Boundaries defining core habitat and

supporting natural landscape for each BDA were delineated using PNHP conservation planning specifications for the elements of concern. These specifications are based on scientific literature and professional judgment for individual species or animal assemblages and may incorporate physical factors (e.g., slope, aspect, hydrology), ecological factors (e.g., species composition, disturbance regime), and input provided by jurisdictional government agencies. Boundaries tend to 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 wetlands of exactly the same size occurring in the same region may require very different areas to support their functions if one receives mostly ground water and the other receives mostly surface water, or if one supports migratory waterfowl and the other does not. The Natural Heritage Areas were then assigned a significance rank based on their importance to the biological diversity and ecological integrity of Potter County (Table 4). These ranks can be used to help prioritize future conservation efforts.

Table 4. County Natural Heritage Areas Significance Ranks

Ranks	*Description*
Exceptional	Sites that are of exceptional importance for the biological diversity and ecological integrity of the county or region. Sites in this category contain one or more occurrences of state or national species of special concern or a rare natural community type that are of a good size and extent and are in a relatively undisturbed condition. Sites of exceptional significance merit quick, strong, and complete protection.
High	Sites that are of high importance for the biological diversity and ecological integrity of the county or region. These sites contain species of special concern or natural communities that are highly ranked, and because of their size or extent, and/or relatively undisturbed setting, rate as areas with high potential for protecting ecological resources in the county. Sites of high significance merit strong protection in the future.
Notable	Sites that are important for the biological diversity and ecological integrity of the county or region. Sites in this category contain occurrences of species of special concern or natural communities that are either of lower rank (G and S rank) or smaller size and extent than exceptional or high ranked areas, or are compromised in quality by activity or disturbance. Sites of notable significance merit protection within the context of their quality and degree of disturbance.
Local	Sites that have great potential for protecting biodiversity in the county but are not, as yet, known to contain species of special concern or state significant natural communities. Often recognized because of their size, undisturbed character, or proximity to areas of known significance, these sites invite further survey and investigation. In some cases, these sites could be revealed as high or exceptional sites.

Landscape Conservations Areas (LCAs) were delineated around landscape features that function as a linking element within an aggregation of BDAs, and/or large blocks of contiguous forest. LCAs delineated around contiguous forest were identified by means of GIS analysis, refined through aerial photograph inspection, and selected based on size. Forested areas in Potter County were identified though a classification of 2000 Penn State Land Cover Data, compiled from Landsat TM (thematic mapping) satellite imagery with a resolution of 30 meters (~100 feet) and downloaded from Pennsylvania Spatial Data Access (http://pasda.psu.edu/).

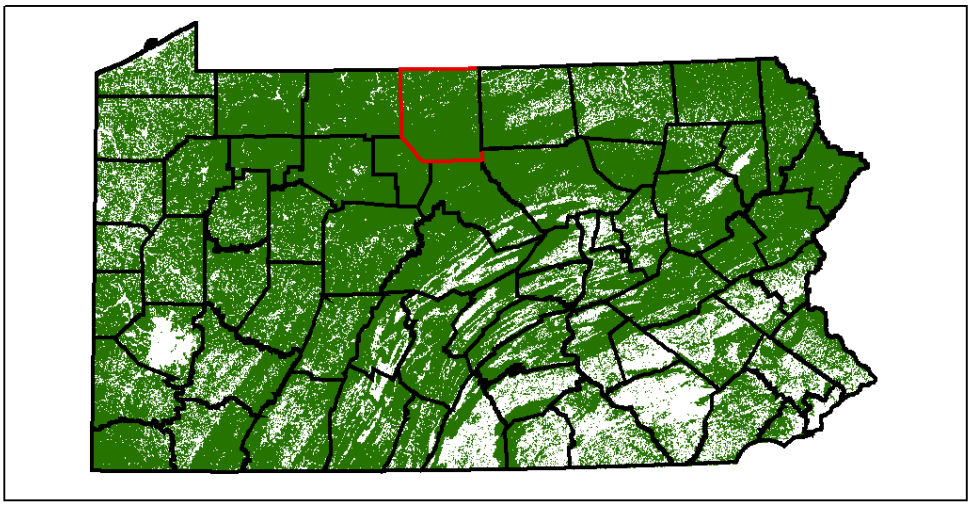
Land cover types used in the analysis were transitional, deciduous, coniferous, and mixed forest; woody wetlands, and emergent herbaceous wetlands. Interstates, U.S. and state highways, state, county and township roads, active railroads, and utility right-of-way locations digitized from aerial photos were considered features that fragment the forest. Analysis to identify contiguous blocks of forest was conducted using the map calculator function of the Spatial Analyst Extension in ArcView 3.2. The results were then compared against aerial photos and any apparent non-forested areas were removed. Forest blocks less than 1 acre were then removed and the remaining blocks were grouped into five size classes: 1-1,000 acres; 1,001-5,000 acres; 5,001-10,000 acres; 10,001-25,000 acres; and 25,001-33,181 acres. A detailed description of the GIS analysis is available upon request.

Hemlock palustrine forest, Peet Brook BDA, 2005

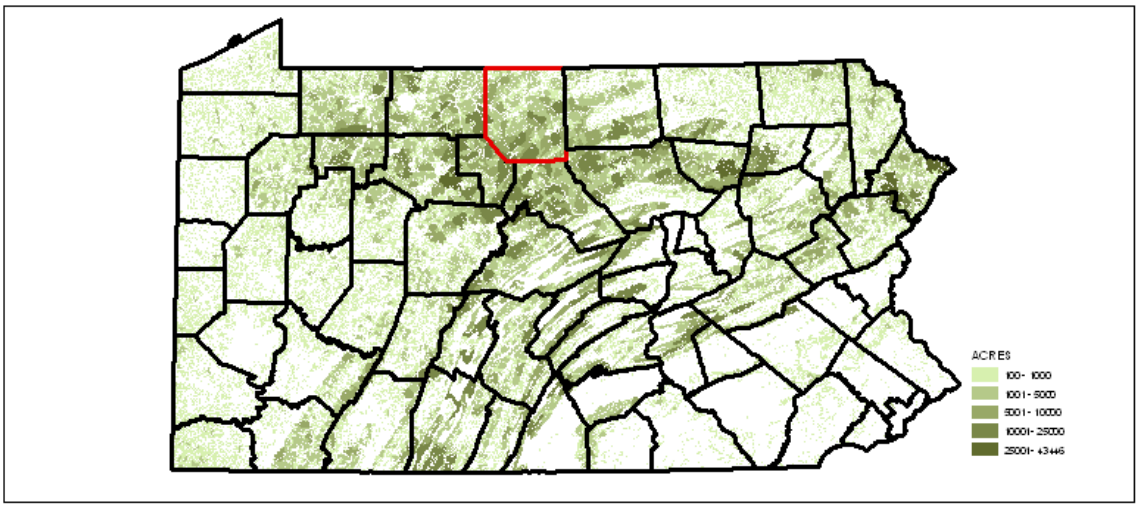
RESULTS

Landscape-scale Conservation

Prior to European settlement, forest covered more than 90% of Pennsylvania (Goodrich et al. 2003). Today, 62% of the state is forested, comprising an area of over 17 million acres (Figure 5a; Goodrich et al. 2003, Myers et al. 2000). However, much of this forest exists as relatively small islands isolated by surrounding linear features such as roads, utility right-of-ways, all-terrain vehicle and snowmobile trails, and railroads, as well as non-forest lands. Figure 5b shows forested areas greater than one acre that remain after fragmentation by interstate, US, and state highways; state and local roads; public forest roads; utility right-of ways; and active railroads. The forests blocks represent potential contiguous habitat for animals sensitive to all scales of fragmenting features, such as amphibians and interior forest birds. The acreage size classes shown in this figure roughly correspond to area-sensitive species requirements.



a. Forested areas in Pennsylvania derived from the 2000 Penn State Land Cover Data.



b. Forested areas, greater than one acre, that remain after fragmentation by interstates, state and local roads, active railroads, and utility right-of-ways.

Figure 5. Forested areas of Pennsylvania before (a) and after fragmentation due to human created features (b).

A number of studies have looked at the effects of roads and other linear features on the landscape. Ecological impacts of these fragmenting features include: (1) direct mortality of wildlife from vehicles; (2) disruption of wildlife dispersal; (3) habitat fragmentation and loss; (4) imposition of edge effects; (5) spread of exotic species; (6) alteration of the chemical environment.

Roads can be a significant source of mortality for a variety of animals. Amphibians may be especially vulnerable to road-kill because their life histories often involve migration between wetland and upland habitats, and individuals are inconspicuous. One study conducted in southeastern Pennsylvania documented over 100 road-killed salamanders and frogs on a single-mile stretch of road during one rainy night in the spring breeding season (Goodrich et al. 2003). Large and mid-sized mammals are particularly susceptible to vehicle collisions on secondary roads, while birds and small mammals are most vulnerable on wider, high-speed highways (Forman and Alexander 1998). In Upper St. Clair Township, Pennsylvania, over the last four years, white-tailed deer mortality due to road-kills was approximately four times higher than mortality due to hunting (Upper St. Clair Township Department of Deer Management). Six hundred thirty seven bobcats (*Lynx rufus*) were reported as road-kills in Pennsylvania from 1985 to 2000 (Goodrich et al. 2003). A 10-year study of road mortality in New Jersey recorded 250 raptors representing 12 species along a 90-mile section of road (Loos and Kerlinger 1993, cited in Goodrich et al. 2003).

Animals may alter their behavior in the presence of a road. One study found that small forest mammals (e.g., eastern chipmunk, eastern gray squirrel, and deer mouse) were reluctant to venture onto road surfaces where the distance between forest margins exceeded 20 m. The same study concluded that a four-lane divided highway might be as effective a barrier to the dispersal of small forest mammals as a body of fresh water twice as wide (Oxley et al. 1974). A study conducted in North Carolina found that black bears shift their home ranges away from areas with high road densities (Brody and Pelton 1989). Traffic noise has been shown to interfere with songbird vocal communication thus affecting their territorial behavior and mating success (Seiler 2001). Roads, wide trails, and grassy corridors can also function as barriers restricting the movement of invertebrates and amphibians. Populations of microhabitat-specific species like land snails and salamanders, that generally require moist habitats, may be isolated by inhospitable, xeric corridors (Williams 1995, Blaustein et al. 1994). Some forest butterflies, like the West Virginia white (*Pieris virginiensis*), will not cross open habitats and its current rarity may be a function of habitat fragmentation and isolation (Williams 1995). Consequences of the isolation of populations include reduced genetic diversity and low recruitment rates that can, in turn, result in local extinctions (Seiler 2001).

Fragmentation of contiguous forested landscapes into smaller, isolated tracts has an effect on plant and animal distribution and community composition. When an extensive forest tract is fragmented, the resulting forest islands may lack the full range of microhabitats 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 (*Seirus 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 1995). Area-sensitive species such as 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 (Squires and Reynolds 1997, Mazur and James 2000, Ciszek 2002, NatureServe 2005).

Along with a reduction in total forested area, forest fragmentation creates a suite of “edge effects” which can extend more than 300 meters into the remaining fragment (Forman and Deblinger 2000). Edge forest is composed of a zone of altered microclimate and contrasting community structure distinct from the interior, or core forest (Matlack 1993). Edges experience increased light intensity, altered insect and plant abundance, a depressed abundance and species richness in macroinvertebrate soil fauna, and a reduced depth of the leaf-litter layer (Yahner 1995, Haskell 2000, Watkins et al. 2003). The macroinvertebrate fauna of the leaf litter is significant for the pivotal role it plays in energy and nutrient cycling; these macroinvertebrates also provide prey for salamanders and ground-feeding birds. A number of studies have shown that the nesting success of

forest-interior songbirds is lower near forest edges than in the interior because of increased densities of nest predators and brood parasites (reviewed in Murcia 1995).

Roads can act as corridors for plant dispersal, and exotic species increase their range by spreading along roadsides (Watkins et al. 2003). Vehicles and road-fill operations transport exotic plant seeds into uninfested areas, and road construction and maintenance operations provide safe sites for seed germination and seedling establishment (Schmidt 1989; Greenberg et al. 1997; Trombulak and Frissell 2000). Road traffic and maintenance of right-of-ways contribute at least six different classes 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, and invertebrates up to 200 meters from roads, as well as vertebrate fauna foraging within the affected zone (Trombulak and Frissell 2000). Deicing salts contribute ions to the soil, altering pH and soil chemical composition, 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 120 meters 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 (Trombulak and Frissell 2000). Storm runoff from roads, particularly where roads abut or cross water bodies, results in the transport of nutrients and sediments into aquatic ecosystems (Trombulak and Frissell 2000). Drifting or misapplied herbicides applied to roadsides and utility right-of-ways to control woody plant growth may damage forest edge and interior plant species (Williams 1995).

Humans are an integral part of natural history, where we 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 provided by utility corridors or disturbance-adapted plants that colonize roadsides. But as is more often the case, species with specific habitat requirements tend to suffer declining numbers 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 area-sensitive species, but they are also important for the maintenance of vital ecosystem processes such as nutrient cycling, pollination, predator-prey interactions, and natural disturbance regimes (Heilman et al. 2002). In addition, large forested areas also serve to filter and regulate the flows of streams within watersheds and store large quantities of carbon as biomass.

Landscape Conservation Areas

According to the National Land Cover Data Set for Pennsylvania (USGS 1999), forest covers roughly 602,000 acres (87%) of Potter County (Figure 6). Hardwood forest accounts for 90 percent of Potter County's forest. The remainder consists of transitional lands—forest clearcuts, farmland reverting to forest, or changes due to fire, flood, etc. (3%), coniferous forest (6%), and mixed conifer-hardwood forest (< 1%). The vast majority of contiguous forest occurs in blocks of less than 1,000 acres (Figure 6). Only 6 percent of the identified forest blocks are larger than 1,000 acres.

Landscape Conservation Areas (LCAs) represent large areas of the landscape that are of higher ecological quality than other areas of similar size in the county. They may include large blocks of contiguous forest, extensive wetland complexes, and/or areas linking rare element occurrences such as those recognized for Biological Diversity Areas. Nine LCAs containing exceptionally large areas of contiguous forest (11,000 to 34,000+ acres) have been identified for Potter County (Figure 1). Because of their size, ownership is typically divided among many entities: individual, corporate, and public (Table 5). The unfragmented forest contained within these LCAs represents a very high percentage of interior forest relative to edge forest. Of the interior forest remaining in Pennsylvania, 70 percent is found in patches of 5,000 acres or less (Goodrich et al. 2003). Given that context, even more emphasis can be placed on the importance of the interior forests within these LCAs.

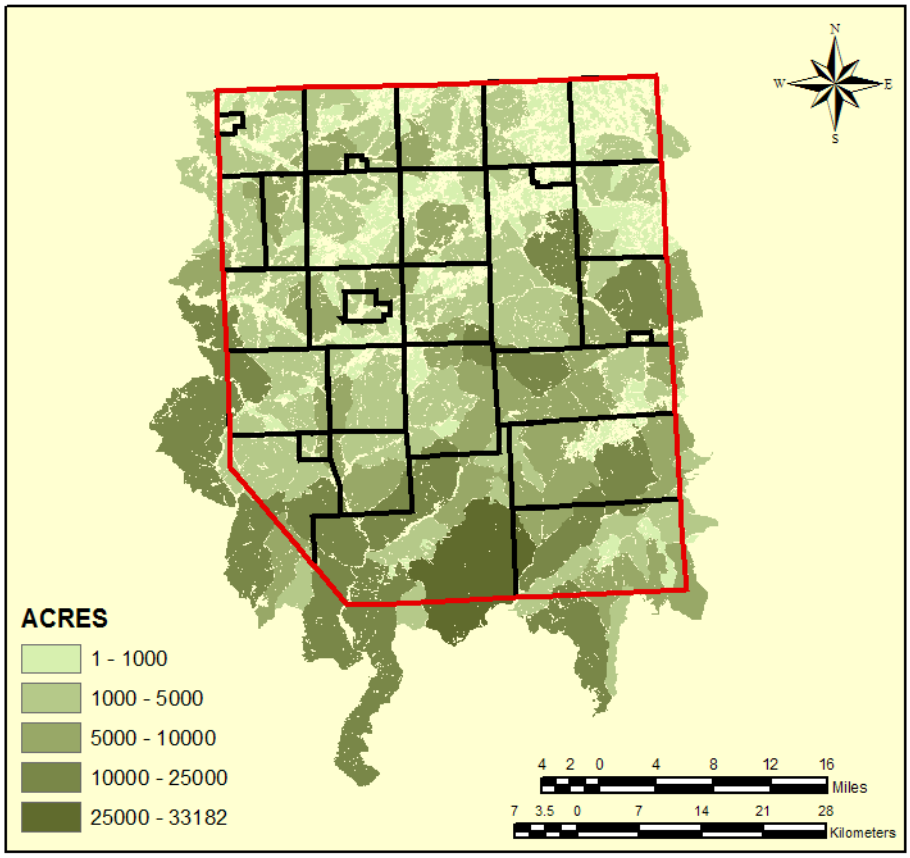


Figure 6. Contiguous forested areas in Potter County greater than one acre.

Table 5. Ownership of lands within Landscape Conservation Areas (LCAs).

LCA	Total Area (Acres)	Private Ownership (%)	Public Ownership (%)		
			State Game Lands	State Parks	State Forests
Bailey Run	13,337	14	0	0	86
Big Ridge	11,817	17	0	0	83
Birch Run	16,276	9	0	0	91
Hammersley Wild Area	34,185	6	0	0	94
Keeney Mountain	14,127	6	0	0	94
Lookout Mountain	13,667	71	0	0	29
Lyman Run	11,006	10	0	1	90
State Game Land #64	11,864	29	51	0	20
Wharton	24,783	16	0	3	84

Bailey Run LCA

Bailey Run LCA has an area of 13,337 acres and is located in the southwestern part of the county, adjacent to Birch Run and Wharton LCAs. State Road 872, First Fork Sinnemahoning Creek, and Bailey Run separate these LCAs. Bailey Run, a DEP-designated Exceptional Value stream, flows through the LCA. Open wetlands along Sinnemahoning Creek form the eastern and southern boundaries. Ridge and Bailey Roads define the western boundary, and the northern boundary extends to Portage Road. Eighty-four percent of the land is part of the Susquehannock State Forest and is managed by the Pennsylvania Bureau of Forestry (Table 5). No Biological Diversity Areas (BDAs) were identified within this LCA.

Big Ridge LCA

Big Ridge Run LCA has an area of 11,817 acres, 83 percent of which is contained in the Susquehannock State Forest (Table 5). All of the streams within the LCA are designated as Exceptional Value by the DEP, including four main drainages: Kettle Creek, Long Run, Indian Run, and Little Indian Run. State Road 144 defines the Big Ridge LCA in the west, a township road forms the eastern boundary, and the southern boundary extends to SR 44. This LCA is directly northeast of Keeney Mountain LCA; SR 144 and Kettle Creek separate the two LCAs. Kettle Creek at Pipeline Hollow BDA, described on pg. 35, is found within the southern portion of the LCA.

Birch Run LCA

Birch Run LCA has an area of 16,276 acres and has two DEP-designated Exceptional Value streams flowing through its core, Birch Run and Right Branch Big Nelson Run. This LCA is composed almost entirely (91%) of Susquehannock State Forest land (Table 5). Fork Road and East Fork Sinnemahoning Creek form the southeastern boundary of the LCA. State Road 872 and First Fork Sinnemahoning Creek separate this LCA from Bailey Run LCA to the west. No BDAs were identified within this LCA.

Hammersley Wild Area LCA

Hammersley Wild Area LCA is Potter County's largest unfragmented forest tract at 34,185 acres. This LCA encompasses Hammersley Wild Area, managed by the Pennsylvania Bureau of Forestry. Ninety-four percent of the LCA is public land (Table 5). The boundaries are defined by McConnell and Red Ridge Roads to the north, by Trout Run Road in the west, and by Windfall Run and Cross Fork Run in the east. Cross Creek separates this LCA from Keeney LCA to the east. All of the streams found within this LCA are designated as Exceptional Value by the DEP including Hammersley Fork, a stream that runs through the center of the LCA. Hammersley Fork BDA, described on pg. 125, is contained within this LCA.

Keeney Mountain LCA

Keeney Mountain LCA is 14,127 acres in size and falls between Hammersley Wild Area LCA and Big Ridge LCA. Cross Fork Creek and a township road separate this area from Hammersley Wild Area LCA to the west. Little Kettle Creek and SR 144 separate this LCA from Big Ridge LCA to the east. Hungry Hollow Road forms the boundary in the north. Most of the land within this LCA is in public ownership (94%)—sections of the Susquehannock State Forest and Ole Bull State Park lie within this LCA (Table 5). All of the streams found within this site are designated as Exceptional Value by the DEP. Two BDAs are located along Kettle Creek within this LCA, Kettle Creek at Rixford Hollow and Ole Bull State Park. These BDAs are described on pg. 101.

Lookout Mountain LCA

Lookout Mountain LCA is 13,667 acres in size and is delineated around a forest tract that lies in both Potter and McKean Counties. Only a little more than a quarter of the land is publicly owned (29%) and is part of the Susquehannock State Forest (Table 5). The LCA lies between two waterways – the Allegheny River and Allegheny Portage Creek. Other boundaries of this site include Card Creek Road in the east, SR 155 in the west, and Reed Run Road to the south. No BDAs were identified within this LCA.

Lyman Run LCA

Lyman Run LCA is the smallest of the nine LCAs in Potter County with an area of 11,006 acres (Table 5). Ninety-one percent of this LCA lies within public land of the Susquehannock State Forest and Lyman Run State Park. Site boundaries include Billy Lewis Road to the west, Lyman Run Road to the north, SR 2002 to the south, and SR 2004 to the east. Lyman Run and adjacent shrub/graminoid wetlands are located along the northern boundary. Sunken Branch and West Branch Pine Creek flow along the southern boundary. No BDAs were identified within this LCA.

State Game Land #64 LCA

State Game Land #64 LCA has an area of 11,864 acres and is the only LCA located in northern Potter County, just north of US Highway 6 (Table 5). Seventy-one percent of the land is publicly owned: most of State Game Lands #64/208 are contained within this site, as well as sections of the Susquehannock State Forest (Table 5). SR 1005 forms the eastern boundary of this LCA and Meeker and Stoneylick Roads form the northern boundary. Pine Creek, part of which is designated as an Exceptional Value stream by the DEP, flows along the southern boundary. Johnson Brook, also an Exceptional Value stream, flows though the center of State Game Land #64 LCA. This LCA contains five BDAs: Ansley Hollow, Bristol Pond, Clark Farm Road Complex, Phoenix Run Slopes, and State Game Land #64. See pgs. 77 through 81 for descriptions of these areas.

Wharton LCA

Wharton LCA is the second largest tract of unfragmented forest in Potter County, with an area of 24,783 acres. This LCA is found along the southern border of Potter County and much of the site is within Clinton County. Lushbaugh Run, a DEP-designated Exceptional Value stream, is also located in the Potter County section of the LCA. Eighty-seven percent of the land is publicly managed by the Susquehannock State Forest, Sinnemahoning State Park, and Elk State Forest. Township roads along Bailey Run and First Fork Sinnemahoning Creek separate this LCA from Bailey Run LCA. Trout Run Road forms the northern boundary and a portion of the eastern boundary of the site and separates Wharton LCA from Hammersley Fork LCA. First Fork Sinnemahoning – South BDA, described on pg. 124, is contained in the Potter County portion of this site.

Bird species observed in these nine LCAs include ruffed grouse, red-tailed hawk, yellow-bellied sapsucker, downy woodpecker, American crow, great crested flycatcher, Acadian flycatcher, least flycatcher, willow flycatcher, eastern wood pewee, yellow-billed cuckoo, brown creeper, red-breasted nuthatch, white-breasted nuthatch, black-capped chickadee, golden-crowned kinglet, hermit thrush, veery, Swainson's thrush, American robin, red-eyed vireo, blue-headed vireo, yellow-throated vireo, northern parula, yellow-rumped warbler, worm-eating warbler, blackburnian warbler, ovenbird, hooded warbler, black-throated green warbler, black-throated blue warbler, black-and-white warbler, magnolia warbler, chestnut-sided warbler, American redstart, Nashville warbler, common yellowthroat, mourning warbler, ovenbird, scarlet tanager, cedar waxwing, brown-headed cowbird, indigo bunting, dark-eyed junco, rose-breasted grosbeak, and purple finch. See Appendix VII, pg. 152 for a list of scientific names.

<u>Threats and Stresses to all LCAs</u>

Potential threats and stresses to species and natural communities identified within individual Biological Diversity Areas (BDAs) found within Landscape Conservation Areas (LCAs) are described in the "Results by Municipalities" section. Consequently, threats and stresses listed below pertain largely to contiguous forested landscapes represented by LCAs. Activities such as development, road building, large-scale timber harvesting, extension of utility right-of-ways, and wind farms that result in forest fragmentation will reduce the contiguity that makes these LCAs ecologically significant. Fragmenting landscape features range from all-terrain vehicle trails to state highways and their effects depend largely on a specific animal or plant species' threshold for disturbance. The structure of a forest, along with size and contiguity, determines the suitability and quality of habitat for wildlife. A number of macroinvertebrates, birds, and mammals depend

on the subcanopy, shrub, and herbaceous layers. Overbrowsing by white-tailed deer has eliminated the tree seedling and sapling, shrub layers, and has greatly reduced herbaceous species diversity in large areas of forest in Pennsylvania. The longer overbrowsing occurs, the more difficult it becomes to restore the original vegetation, in part because seed and other propagule supplies have been greatly reduced or eliminated (Latham et al. 2005).

Recommendations for all LCAs

A significant portion of the land encompassed by these LCAs is under public ownership (Table 5), which presents land managers with the opportunity to coordinate sustainable management as well as biodiversity conservation. The Bureau of Forestry, responsible for managing a significant portion of land within these LCAs, recognizes sustainability as the overarching goal of the management of state forests. The Pennsylvania Game Commission, which manages a small portion of the lands contained within these LCAs, focuses on management practices aimed at enhancing habitat for wildlife. It is recommended that both of these agencies take into consideration the uniqueness of the contiguous forest contained within these areas and manage for older forests through longer rotations and silvicultural practices that enhance structure.

A number of resources, listed in Appendix IX, are available to private landowners interested in sustainably managing their forestlands for biodiversity conservation, forest health, and forest products including timber, mushrooms, and high-value medicinal herbs. A good place to start is the Forest Stewardship Program, which assists landowners in developing a forest management plan based on their envisioned goals for their land. See Appendix IX for sustainable forestry information sources. Landowners interested in bringing deer numbers back into balance with their habitat may want to consider enrolling in the Pennsylvania Game Commission's Deer Management Assistance Program.

Forest fragmentation can be minimized by utilizing existing disturbed areas for new projects (e.g., wind farms) rather than clearing additional forest, by consolidating roads and right-of-ways where multiple routes exist, and by restoring unused cleared areas such as abandoned roads or railroad tracks to forest. When planning development, it is preferable to avoid complete division of the LCA to minimize impacts. Contiguity could be improved by establishing forested corridors at least 300 meters (1000 feet) wide between LCAs that are separate. The impact of individual features such as wells, roads, right-of-ways, or other clearings can also be minimized by the use of ecologically informed best management practices in construction and maintenance.

Important Mammal Areas

Potter County includes a portion of one large Important Mammal Area (IMA), Northern Allegheny Plateau (Figure 7).

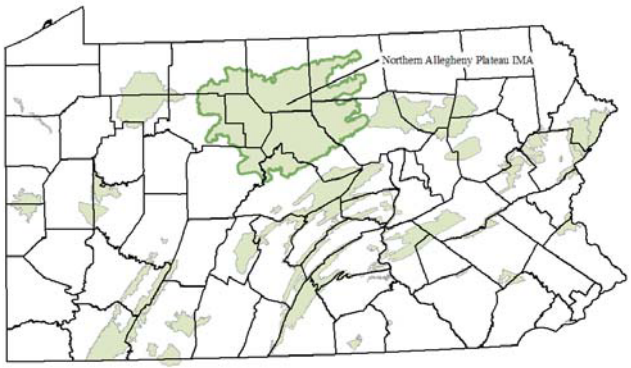


Figure 7. Important Mammal Areas (IMAs) in Pennsylvania and the location of the Northern Allegheny Plateau IMA.

Northern Allegheny Plateau

Note: The following information is adapted from the Important Mammal Areas Assessment Reports, 2005.

This large area of northcentral Pennsylvania is the state's largest IMA, spanning nine counties and covering approximately 4 million acres. It includes most of the region north of Interstate 80, west of Pine Creek Gorge, and north of SR 219. Given the size of this IMA, it includes a full range of habitats and types of human disturbance. Nonetheless, it represents the last large block of unfragmented forest habitat (mostly northern hardwoods) remaining in the state. Within this region, there are specific focal areas that are important for specific mammal species. Numerous State Game Lands are included.

The region is home to many moderate-to large-sized mammals, including fisher (Fish Dam Wild Area reintroduction site), elk, black bear, bobcat, porcupine, mink, coyote, snowshoe hare, Appalachian cottontail, northern river otter, and beaver. Small mammals include northern water shrews, northern flying squirrels, Allegheny woodrats, and least weasels. Fox squirrels are likely to occur here. Focal areas include West Branch Susquehanna River (northern water shrew, Allegheny woodrat, elk), Pine Creek Gorge (northern water shrew, Allegheny woodrat, northern river otter, fisher), Two Rock Run fire area (Appalachian cottontail), Fish Dam Wild Area (black bear, coyote, first reintroduction site of fisher), and the Benezette elk viewing area.

This area satisfies the following IMA criteria:

- The site supports diverse or unique communities of mammals.
- The site supports high-density mammal populations.
- The site supports species or subspecies listed as endangered or threatened by the Pennsylvania Biological Survey.
- The site supports species or subspecies that are declining or vulnerable nationally or listed as candidate species by the Pennsylvania Biological Survey.
- The site is important for public education.

<u>Conservation Concerns</u>
Major threats to the mammals and their habitats are overbrowsing (by white-tailed deer) and natural diseases.

Important Bird Areas

There are no IBAs located in Potter County.

RESULTS (continued)

Biological Diversity Areas (Listed by Municipality)

Detailed maps and descriptions of each Biological Diversity Area (BDA) follow, organized by township. For each township, land-use cover is provided (Table 6), followed by a map, summary table of Natural Heritage Areas, and full report. Biological Diversity Areas, Landscape Conservation Areas, and Public Lands are indicated on the municipality maps. Public Lands are public properties established and managed to a large extent for natural resources and include state game lands, state forests, and state parks. Townships are arranged alphabetically; boroughs are included with the appropriate township due to their small size.

Summary Table Conventions

A summary table of sites precedes each map. Biological Diversity Areas, Landscape Conservation Areas, and other Conservation Areas are listed.

- A categorical designation of a site's relative significance is listed after the site name. Table 1 (pg. xii) has a summary of sites by significance category. Definitions of the significance categories are outlined in Table 4 (pg. 22).
- Listed under each site name are any state-significant natural communities and species of special concern that have been documented within the area.
    - See Appendix III (pg. 140) for a list of natural communities recognized in Pennsylvania.
    - Some species perceived to be highly vulnerable to intentional disturbance are referred to as “animal of special concern” or “plant of special concern” rather than by their species name.
    - The PNHP rarity ranks and current legal status (detailed in Appendix IV, pg. 146) are listed for each community and species.
- The text that follows each table discusses the natural qualities of the site and includes descriptions, potential threats, and recommendations for protection.

Table 6. Percent land-use cover by municipality derived from the 2001 National Land Cover Data

Municipality	Coniferous Forest	Mixed Forest	Deciduous Forest	Transitional	Emergent Wetland	Open Water	Residential/ Commercial	Pasture/ Hay	Row Crops	Area (acres)
Abbott Township	9.8	0.6	80.8	1.3	0.1	0	0	3.5	4	44,836
Alleghany Township	3.2	0.6	71.1	3.8	0	0.1	0.1	9	12.1	25,976
Bingham Township	4.4	0.7	61.6	4.2	0	0.2	0.1	14.1	14.6	22,881
Clara Township	2.2	0.2	83.2	2.8	0	0	0	5.6	5.9	12,581
Eulalia Township	5	0.6	77.2	2.7	0	0.1	0.3	6.1	8	19,936
Genesee Township	3.7	0.7	68.7	3.8	0	0.1	0.3	10.9	11.7	22,827
Harrison Township	2.5	0.6	52.3	4.7	0	0.2	0.3	19.5	19.9	23,326
Hebron Township	3.7	0.5	74.2	2.8	0	0	0.2	7.9	10.6	27,999
Hector Township	4.4	0.2	75.8	3.5	0	0.1	0.1	9.4	6.5	26,330
Homer Township	3.8	0.4	83.2	2.5	0	0.1	0	4.3	5.9	20,483
Keating Township	5	0.4	83.6	2.4	0	0	0.1	3.8	4.7	26,596
Oswayo Township	3.2	0.4	76.4	2.9	0	0.1	0.1	7.1	9.7	23,915
Pike Township	6.6	0.5	84.3	1.3	0	0.2	0	3.3	3.8	23,501
Pleasant Valley Township	1	0.1	82.5	3.4	0	0	0	6.5	6.5	12,610
Portage Township	5.2	0.1	91	1	0	0	0.1	1.3	1.3	24,400
Roulette Township	5.2	0.8	71.9	3.2	0	0.1	1.7	8.6	8.6	20,891
Sharon Township	4	0.7	68.2	4	0	0.1	0.7	11	11.4	21,803
Stewardson Township	9.6	0.5	87.1	0.7	0.1	0.1	0.1	0.9	0.9	47,589
Summit Township	5.2	0.1	87.1	1.7	0	0	0	2.3	3.4	31,540
Sweden Township	5.7	0.7	70.2	3.2	0	0.1	0.2	7.9	11.8	21,688
Sylvania Township	7.9	0.3	84.2	1.9	0	0.1	0	2.4	3.2	19,001
Ulysses Township	3.7	0.4	76.9	3.6	0	0.1	0.1	6.3	8.9	48,328
West Branch Township	6.5	0.4	82.1	1.8	0	0.2	0.1	3.6	5.2	39,831
Wharton Township	7	0.3	88.1	1	0.1	0.1	0.1	1.5	1.9	72,558
Austin Borough	6.6	0.6	81.2	1.5	0	0	3.6	3.1	3.4	2,588
Coudersport Borough	4.7	1	60	2.5	0	0.2	15.4	6.5	9.6	3,605
Galeton Borough	5.8	2.5	44.6	2.5	0.1	1.7	27.4	9.3	6.1	829
Oswayo Borough	6.4	0.6	61.1	3.8	0	0	4.4	14.8	8.9	884
Shinglehouse Borough	1.5	1.4	44.9	5.5	0	0.1	13.9	14.8	17.9	1,336
Ulysses Borough	1.8	1.3	36.9	4.8	0	0.2	2.2	22	30.7	2,599

Viewshed of southern Potter County, 2005

Abbott Township

	PNHP Rank		Legal Status			
	Global	State	Federal	State	Last Seen	Quality
NATURAL HERITAGE AREAS:						
Kettle Creek at Pipeline Hollow BDA		*High Significance*				
stalked bulrush (*Scirpus pedicellatus*)	G4	S1		PT	8/25/2005	E
Big Ridge LCA		*High Significance*				
Keeney Mountain LCA		*Exceptional Significance*				

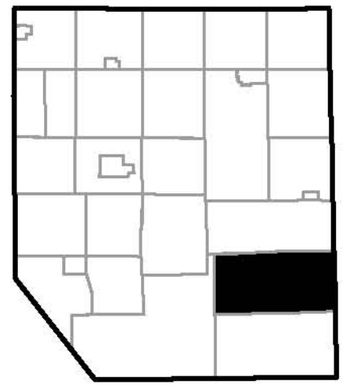
OTHER CONSERVATION AREAS: Northern Allegheny Plateau IMA

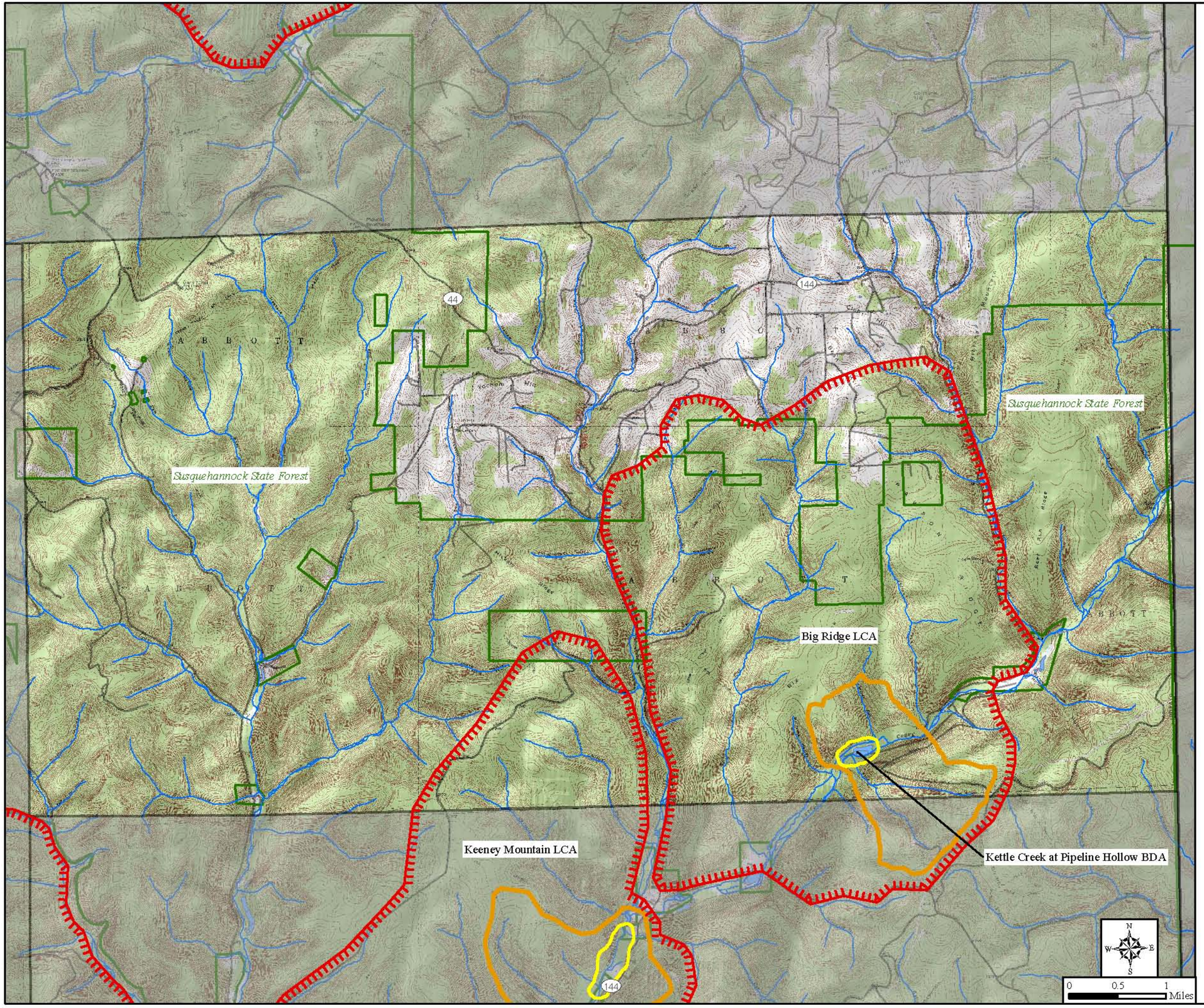
Potter County
Natural Heritage Inventory
Abbott Township

Biological Diversity Area:
Kettle Creek at Pipeline Hollow

Landscape Conservation Area:
Big Ridge LCA
Keeney Mountain LCA

Managed Land:
Susquehannock State Forest





Legend

Biological Diversity Area
- Core Area
- Supporting Landscape

Landscape Conservation Area
Streams
NWI Wetlands
Managed Land

ABBOTT TOWNSHIP

Abbott Township is located in eastern Potter County, bordered by Tioga County. Over 90 percent of the township is forested, with a small amount of agricultural development (8%) in the northeastern corner of the municipality (Table 6). Cross Fork, Kettle Creek, Little Kettle Creek, and Long Run, as well as their tributaries, are the major drainages in Abbott Township and have been designated as Exceptional Value (EV) streams. The headwaters of most streams originate in large forested areas, which may provide a buffer against pollutants such as sediments and chemicals. Susquehannock State Forest occupies much of the township except for the northeastern corner. The Northern Allegheny Plateau Important Mammal Area (IMA) covers all of Abbott Township.

Kettle Creek at Pipeline Hollow BDA

This site, located along Kettle Creek, a DEP-designated Exceptional Value stream, contains pockets of graminoid marsh within floodplain habitat that supports a population of **stalked bulrush** (*Scirpus pedicellatus*), a plant species of concern. Stalked bulrush is an obligate wetland species found primarily in floodplains and stream valleys (Rhoads and Block 2000). Its distribution extends from Newfoundland to New Jersey and west to Missouri and Ontario. In Pennsylvania, stalked bulrush is found in central northwestern counties, which are in the southern edge of its range. It is considered critically imperiled in Pennsylvania, but globally common.

The core of this BDA includes an open, savannah-like black cherry (*Prunus serotina*) forest with a few eastern white pines (*Pinus strobus*) in the understory. The herbaceous layer is dominated by bristly dewberry (*Rubus hispidus*) and arrowleaf tearthumb (*Polygonum sagittatum*). Other species include blue vervain (*Verbena hastata*), common boneset (*Eupatorium perfoliatum*), pearly everlasting (*Anaphalis margaritacea*), milkweed (*Asclepias* sp.), jewelweed (*Impatiens* sp.), beggar-ticks (*Bidens frondosa*), goldenrod (*Solidago* sp.), cottongrass bulrush (*Scirpus cyperinus*), Bailey's sedge (*Carex baileyi*), soft rush (*Juncus effusus*), deer-tongue witchgrass (*Panicum clandestinum*), and leafy bulrush (*Scirpus polyphyllus*). The supporting landscape for this BDA is upland mixed deciduous forest within the immediate watershed. Little development occurs within the site except for a few hunting camps and an old overgrown dirt road that runs parallel to the creek.

Threats and Stresses

The largely contiguous forest found within the immediate watershed of this site is important in maintaining the water quality of Kettle Creek, natural nutrient cycles in its associated streams, and the health of adjacent habitats. Removal of forest cover on steep slopes is especially problematic because of the potential for increased runoff and erosion following storm events. The most immediate threat may be if travel was resumed on the abandoned road that runs along the creek. Runoff from dirt and gravel roads in close proximity to the wetlands can contribute to physical degradation of the site.

Conservation Recommendations

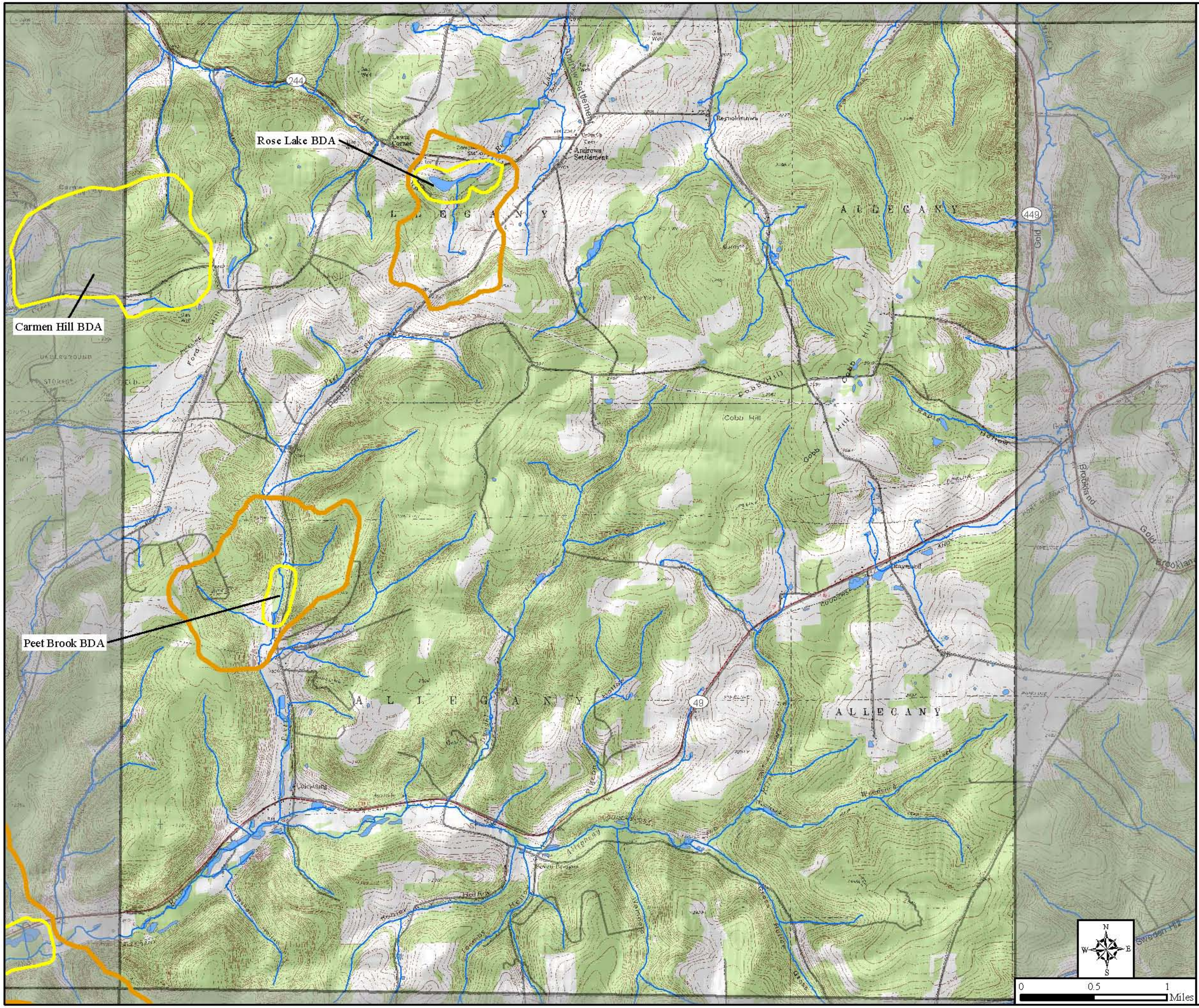
The Pennsylvania Bureau of Forestry continues to develop and implement best management practices (BMPs) to minimize and prevent water pollution, as well as support and engage in research to restore degraded surface and groundwater resources. Landowners should refer to the Bureau's State Forest Resources Management Plan (available online at http://www.dcnr.state.pa.us/forestry/sfrmp/water.htm) for management guidelines pertaining to aquatic and riparian ecosystems. Preserving the riparian corridors along waterways is key to maintaining high water quality. Timbering and road development or other construction activities should be kept well away from the riparian corridors in order to avoid degrading important aquatic and streamside habitat.

Allegany Township

	PNHP Rank		Legal Status			
	Global	State	Federal	State	Last Seen	Quality
NATURAL HERITAGE AREAS:						
Carmen Hill BDA		*Notable Significance*				
cranesbill (*Geranium bicknellii*)	G5	S1		PE	2001	C
Peet Brook BDA		*Notablel Significance*				
hemlock palustrine forest	--	S3			8/30/2005	E
Rose Lake BDA		*Notable Significance*				
small beggar-ticks (*Bidens discoidea*)	G5	S3		N	9/3/1995	B
OTHER CONSERVATION AREAS:	none					

Potter County Natural Heritage Inventory

Allegany Township



Biological Diversity Area:

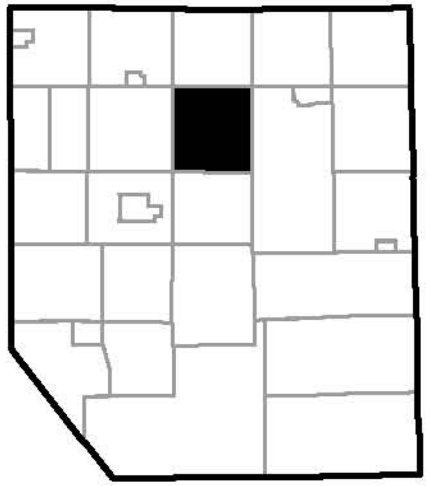
Carmen Hill
Peet Brook
Rose Lake

Landscape Conservation Area:

None

Managed Land:

None



Legend

Biological Diversity Area

Core Area
Supporting Landscape
Landscape Conservation Area
Streams
NWI Wetlands
Managed Land

ALLEGANY TOWNSHIP

Allegany Township is located in central Potter County. Three-quarters of the township is forested, with some large contiguous forest tracts remaining (Table 6). Agriculture is 21 percent of the total land use in the township (Table 6). The Allegheny River and Oswayo Creek are the major drainages in the township. Some of the headwater streams to these waterways originate in the large tracts of forest, which may provide a buffer against sediments and chemicals that would otherwise enter into the stream. However, most streams flow next to agricultural areas, which do little to filter out pollutants. All of the land within this township is privately owned. No public lands or Important Mammal Areas (IMAs) are found within this municipality.

Carmen Hill BDA

Upland and roadside habitat forms the core for this BDA that supports three small populations of **cranesbill** (*Geranium bicknellii*), a plant species of special concern. Oswayo Creek, a DEP-designated Exceptional Value stream, naturally forms the southern border of this site. Small tracts of forest are found between open habitats where the plants were observed. Cranesbill is a Pennsylvania endangered plant species that is only found in a few counties throughout the state. Its range extends throughout the northern U.S. and Canada and as far south as California and Virginia. It is rare in open woods, fields, and on rocky ledges (Rhoads and Block 2000). Cranesbill is considered globally common, but imperiled in Pennsylvania.

The Saulter Preserve, maintained by the Potter County Conservation District, is a 57-acre parcel of land managed for environmental educational purposes, such as demonstration of watershed conservation measures. This county-owned preserve is contained entirely within the Carmen Hill BDA.

Threats and Stresses

Threats to cranesbill may be minimal at this site since this plant appears to occur in disturbed habitats and may naturally have a low number of occurrences in the state. However, alteration or destruction of the plant, such as direct application of herbicides or de-icing chemicals, is a concern. Displacement by invasive exotic plant species that typically colonize disturbed habitats may be a threat.

Conservation Recommendations

Non-native, invasive plants should be removed from the site. Roadside maintenance crews should be informed of the presence of the rare species, and application of chemicals should be carefully managed to avoid direct application to the rare plants. Mowing of roadsides within the site should not occur until after the plants have flowered and seeds have matured (mid-June) to ensure a viable seed bank for the next generation.

Peet Brook BDA

The core of this site is delineated around a **hemlock palustrine forest** community along Peet Brook and a 100 meter buffer (~300 foot) intended to capture additional potential habitat for amphibians the wetland may support. The canopy is dominated by eastern hemlock (*Tsuga canadensis*) with red maple (*Acer rubrum*), yellow birch (*Betula alleghaniensis*), and eastern white pine (*Pinus strobus*) present as lesser components. Understory species observed at the site include American beech (*Fagus grandifolia*), eastern white pine, eastern hemlock, striped maple (*Acer pensylvanicum*), blueberry (*Vaccinium* sp.), and blackberry (*Rubus* sp.). The forest floor has the pit and mound microtopography characteristic of hemlock palustrine forests in northern Pennsylvania, with many of the pits holding standing water and dominated by sphagnum mosses (*Sphagnum* spp.). The herbaceous layer is sparse under the dense canopy, and includes teaberry (*Gaultheria procumbens*), northern starflower (*Trientalis borealis*), Canada mayflower (*Maianthemum canadense),* wood-sorrel (*Oxalis* sp.), American golden saxifrage (*Chrysosplenium americanum*), crooked-stem aster (*Aster prenanthoides*), marshpepper smartweed (*Polygonum hydropiper*), goldthread (*Coptis trifolia*), a violet (*Viola* sp.), intermediate wood fern (*Dryopteris intermedia*), sensitive fern (*Onoclea sensibilis*), interrupted fern (*Osmunda claytoniana*), and partridge-berry (*Mitchella repens*). Other species along the edge of the wetland are white turtlehead (*Chelone glabra*), jewelweed (*Impatiens capensis*), wild sarsaparilla

(*Aralia nudicaulis*), buttercup (*Ranunculus* sp.), rough bedstraw (*Galium asprellum*), and Jack-in-the-pulpit (*Arisaema triphyllum*).

The brownwater streams flowing from this wetland are high in tannins and naturally low in pH, with the potential of supporting unique aquatic fauna, particularly insects. Tannins are complex organic acids released during the decay of plant materials (Colburn 2004). Organic acids can serve as food for bacteria and some animals, they can buffer water from inputs of mineral acids (such as those present in acid precipitation), and in some cases they can bind metals and prevent them from having adverse effects on aquatic organisms (Colburn 2004).

The supporting landscape extends to the boundary of the immediate watershed hydrologically linked to the wetland. This watershed is largely forested, with two small fields within its boundary. The forest is predominantly deciduous, with hemlocks largely confined to the wetland and along Peet Brook. The intact condition of the landscape within the watershed serves to enhance the ecological value of the wetland and stream communities by maintaining water quality and wetland health, as well as providing a large contiguous forest throughout which native species can move and disperse.

Threats and Stresses

The westward invasion of the hemlock woolly adelgid (*Adelges tsugae*) poses a serious potential threat to this site (PA Bureau of Forestry 2006). Infestations of this insect pest can result in high levels of hemlock mortality, opening up the forest canopy and thus altering the amount of light, evaporation, and transpiration within this wetland. A gas pipeline right-of-way passes through the northern portion of the site. The areas along this right-of-way are considerably drier than the bulk of the wetland to the south, suggesting that it has altered the local hydrology.

Conservation Recommendations

Any land management decisions regarding the watershed supporting the hemlock palustrine forest should take into consideration potential impacts to the wetland, including alterations to the light, temperature, and hydrologic regimes. Periodic monitoring for hemlock woolly adelgid is recommended, as well as further surveys to document amphibian and insect species utilizing the wetland.

Rose Lake BDA

Potter County's only natural lake, Rose Lake, forms the core of this BDA that supports **small beggar-ticks** (*Bidens discoidea*), a plant species of special concern. Beggar-ticks inhabits wetland areas including bogs and seasonal pools. It is found from Quebec to Florida and west to Ontario and Texas (NatureServe 2006). In Pennsylvania, the plant is found primarily in the northeast and northwest counties. The beggar-ticks is considered vulnerable in the state, but globally secure.

Rose Lake is approximately two acres in size and is the headwaters of one branch of the Genesee River. The plants were found in exposed glacial till at the eastern edge of the lake. The area surrounding the lake is largely in agricultural and residential development with gas wells and a compressor station nearby. A few woodlots and small tracts of forest are found within the immediate watershed surrounding the core habitat.

Threats and Stresses

Extreme changes to lake water level or brine discharge from a natural gas spill at the site represent the greatest threats to Rose Lake's water quality and subsequently to the beggar-ticks' health. Non-point source pollution from agricultural development and residential areas (e.g., road runoff) within the immediate watershed of the lake also pose a threat. Open habitat along the northern edge of the lake is mowed occasionally and this activity many indirectly harm the plants by decreasing the amount of suitable habitat in which this species can disperse.

Conservation Recommendations

Remaining forest cover in the immediate watershed surrounding Rose Lake should be left intact to provide a buffer against non-point source pollutants such as sediments and chemicals. Establishing riparian buffers adjacent to the lake and encouraging local landowners to properly manage agricultural nutrients would aid in lessening the input of runoff into the lake and help to limit the eutrophication of streams that flow into the lake. The U.S. Environmental Protection Agency's (EPA) *Agricultural Management Practices for Water Quality Protection* module (available online at http://www.epa.gov/watertrain/agmodule/) outlines eight basic types of agricultural practices that are suitable for reducing or minimizing water quality impacts as part of a watershed approach to management. These practices are often called Best Management Practices, or BMPs.

Rose Lake BDA, 2006

Bingham Township

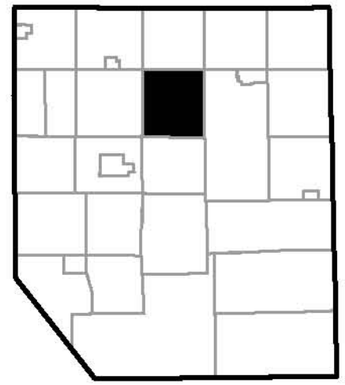
	PNHP Rank		Legal Status			
	Global	State	Federal	State	Last Seen	Quality
NATURAL HERITAGE AREAS:						
Genesee River BDA		*Notable Significance*				
backward sedge (*Carex retrorsa*)	G5	S1		PE	7/14/2005	A
Ludlington Run Wetland BDA		*Notable Significance*				
backward sedge (*Carex retrorsa*)	G5	S1		PE	9/7/2005	CD
OTHER CONSERVATION AREAS:	none					

Potter County
Natural Heritage Inventory
Bingham Township

Biological Diversity Area:
Ludlington Run Wetland
Genesee River

Landscape Conservation Area:
None

Managed Land:
None



Genesee River BDA

Ludlington Run Wetland BDA

Legend

Biological Diversity Area
- Core Area
- Supporting Landscape

Landscape Conservation Area
Streams
NWI Wetlands
Managed Land

0 0.5 1 Miles

BINGHAM TOWNSHIP

Bingham Township is located in northern Potter County, bordered by New York. As with other municipalities in the northeastern portion of Potter County, this township has much agricultural development (29%) relative to others in the county (Table 6). Bingham Township has the second least amount of forest (67%) in the county (Table 6). The forests in the western half of the township have remained relatively intact; however, agriculture and roads have fragmented forests in the eastern half of the township. The Genesee River and Turner Creek are the major drainages in the township. While some streams have their headwaters in heavily forested areas, many streams are flowing through highly fragmented areas that do not provide a buffer to pollutants such as sediments and chemicals. All of the land within Bingham Township is privately owned. No public lands or Important Mammal Areas (IMAs) are found within this municipality.

Genesee River BDA

This Natural Heritage Area is discussed under Genesee Township (pg. 49). Part of the marsh habitat of this BDA falls in Bingham Township and any negative affects on hydrology should be minimized.

Ludlington Run Wetland BDA

The core of this BDA includes a small wetland pocket adjacent to a pipeline right-of-way that supports a small population of **backward sedge** (*Carex retrorsa*), a plant species of special concern. Backward sedge, a Pennsylvania endangered plant species, is found in various counties throughout the state in swampy woods, wet meadows, and along streams banks. Its range spans across northern North America from the Northwest Territories to Quebec, south to Nevada and New Jersey. It is rare in the southernmost parts of its range, which includes Pennsylvania. Globally, the species is considered common.

Dominant herbaceous species found in the small graminoid wetland include goldenrod (*Solidago* sp.), forget-me-knot (*Myosotis* sp.), black-girdle bulrush (*Scirpus atrocinctus*), sensitive fern (*Onoclea sensibilis*), jewelweed (*Impatiens* sp.), bedstraw (*Galium* sp.), and purple-stemmed aster (*Aster puniceus*). Landscape supporting the core habitat can be described as small forest patches interspersed with agricultural development. Ludlington Run flows along the road that traverses the site north to south. The pipeline right-of-way bisects the site and an old abandoned railroad bed also runs parallel to the road.

Threats and Stresses

Application of herbicides for maintenance of the pipeline right-of-way poses a threat to backward sedge. Mowing would have a lesser impact on the rare plants because of their location just to the south of the maintained area. Given the roadside location of this small population of backward sedge, chemical spraying by roadside maintenance crews and disturbance by foot travel also pose a threat to the species. Displacement by invasive exotic plant species that typically colonize disturbed habitats also may be a threat.

Recommendations

Workers involved in pipeline right-of-way and roadside maintenance activities within the site should be informed of the presence of the rare plant species. The application of herbicides should be avoided and mowing should not occur until after plants have flowered and seeds matured (late July) to ensure a viable seed bank for the next generation. Non-native, invasive plants should be removed.

Clara Township

	PNHP Rank		Legal Status			
	Global	State	Federal	State	Last Seen	Quality
NATURAL HERITAGE AREAS:						
Fishing Creek BDA		*High Significance*				
American brook lamprey (*Lampetra appendix*)	G4	S3		PC	6/7/2005	E
animal of special concern	G5	S1S2		PE	5/4/2005	E
Oswayo Creek BDA		*Exceptional Significance*				
American brook lamprey (*Lampetra appendix*)	G4	S3		PC	6/7/2005	E
animal of special concern	G5	S1S2		PE	8/6/1996	E
harpoon clubtail (*Gomphus descriptus*)	G4	S1S2			6/14/2006	E
northern bluet (*Enallagma annexum*)	G5	S3			6/14/2006	E
Ohio lamprey (*Icthyomyzon bdellium*)	G3G4	S2S3		PC	6/7/2005	E
sable clubtail (*Gomphus rogersi*)	G4	S1			6/14/2006	E
stalked bulrush (*Scirpus pedicellatus*)	G4	S1		PT	7/15/2005	AB

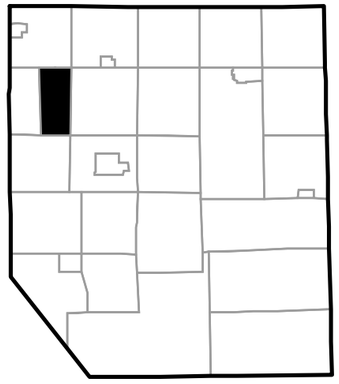
OTHER CONSERVATION AREAS: none

Potter County
Natural Heritage Inventory
Clara Township

Biological Diversity Area:
Fishing Creek
Oswayo Creek

Landscape Conservation Area:
None

Managed Land:
State Game Land #59
State Game Land #204



Legend

Biological Diversity Area
- Core Area
- Supporting Landscape

Landscape Conservation Area
Streams
NWI Wetlands
Managed Land

Oswayo Creek BDA
State Game Land #204
State Game Land #59
Fishing Creek BDA
PLEASANT VALLEY
CLARA
HEBRON
STATE GAME LANDS NO 59
STATE GAME LANDS NO 204
44
244
N
W
E
S
0
0.5
1
Miles

CLARA TOWNSHIP

Clara Township is located in central Potter County and is the smallest township in the county. Nearly 90 percent of the township is forested; however, many tracts have been fragmented by agriculture and roads (Table 6). Agriculture is 11 percent of the total land use in Clara Township, most of it occurring along streams. Clara Creek and Fishing Creek are the major drainages in the township. The headwaters of the streams originate in large forest blocks, which may provide a buffer against pollutants such as sediments and chemicals. State Game Lands #204 and #59 cross into the eastern and western edges of Clara Township, respectively. No Important Mammal Areas (IMAs) were found within this municipality.

Fishing Creek BDA

This Natural Heritage Area is discussed under Roulette Township (pg. 91). The upper watershed of this BDA crosses over into Clara Township and any negative affects on hydrology should be minimized.

Oswayo Creek BDA

This Natural Heritage Area is discussed under Sharon Township (pg. 95). A portion of the upper watershed of this BDA crosses over into Clara Township and any negative affects on hydrology should be minimized.

Eulalia Township

	PNHP Rank		Legal Status			
	Global	State	Federal	State	Last Seen	Quality
NATURAL HERITAGE AREAS:						
Allegheny River at Coudersport BDA		*Notable Significance*				
American brook lamprey (*Lampetra appendix*)	G4	S3		PC	6/7/2005	E
Allegheny River at Eulalia BDA		*Notable Significance*				
American brook lamprey (*Lampetra appendix*)	G4	S3		PC	6/7/2005	E
animal of special concern	G5	S2		PT	6/7/2005	E
Allegheny River at Reed Run BDA		*High Significance*				
American brook lamprey (*Lampetra appendix*)	G4	S3		PC	6/7/2005	E
animal of special concern	G5	S1S2		PE	7/15/2002	E
hemlock palustrine forest	--	S3			--	E
Dutchman Hill BDA		*High Significance*				
West Virginia white (*Pieris virginiensis*)	G3G4	S2S3			5/10/2006	E
Frinks BDA		*High Significance*				
creeping snowberry (*Gaultheria hispidula*)	G5	S3		PR	8/24/2005	C
hemlock palustrine forest	--	S3			--	E

OTHER CONSERVATION AREAS: none

Potter County
Natural Heritage Inventory
Eulalia Township & Coudersport Borough

Biological Diversity Area:

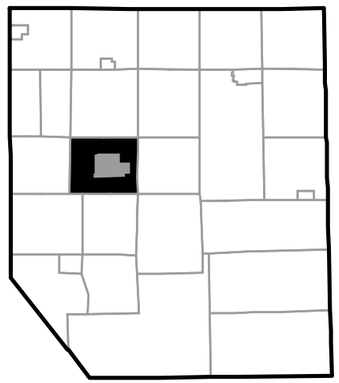
Allegheny River at Coudersport
Allegheny River at Eulalia
Allegheny River at Reed Run
Dutchman Hill
Frinks

Landscape Conservation Area:

None

Managed Land:

Susquehannock State Forest



Frinks BDA
Allegheny River at Coudersport BDA
Susquahannock State Forest
Dutchman Hill BDA
Allehgeny River at Eulalia BDA
Allehgeny River at Reed Run BDA

Legend

Biological Diversity Area

- Core Area
- Supporting Landscape
- Landscape Conservation Area
- Streams
- NWI Wetlands
- Managed Land

0 0.5 1 Miles

EULALIA TOWNSHIP

Eulalia Township, which includes Coudersport Borough, is located in central Potter County. Although more than three-quarters of this township is forested (83%), agriculture, roads, and residential development fragment much of the forest (Table 6, Figure 5). Most of the agricultural development in the township occurs along streams. Coudersport is composed of 66 percent forestland, 16 percent agriculture, and 15 percent residential areas (Table 6). The portion of the Allegheny River that runs through the center of the borough has been heavily channelized, which impedes the natural movement of the river. The Allegheny River, Dingman Run, and Mill Creek are the major drainages in the township. Most of the streams flow along roads and through agricultural areas. A part of the Susquehannock State Forest occupies western Eulalia Township. The Northern Allegheny Plateau Important Mammal Area (IMA) is located in the large tracts of forest of southern Eulalia Township.

Allegheny River at Coudersport BDA & Allegheny River at Eulalia BDA

The sections of the Allegheny River that form the cores of these two BDAs provide habitat for the **American brook lamprey** (*Lampetra appendix*) and another aquatic **animal of special concern**. These species require cool, clear water and inhabit large creeks and small to medium rivers (NatureServe 2006). Eggs of the American brook lamprey are laid in nests in riffles and runs with a gravel/sand substrate and a strong current. Once the larvae hatch, they burrow into the loose substrate of pools or slow-moving water near stream banks, where they feed on plankton. The larval stage may last several years. The animal becomes sexually mature during the period of transformation from larva into adult (NatureServe 2006). In Pennsylvania, this species has only been previously recorded in Monroe, Venango and Warren counties. Its distribution extends from Arkansas to Ontario in the West and from Alabama and North Carolina to Quebec in the east. The Pennsylvania threatened animal of special concern has a distribution that extends from New York to Manitoba in the north to Colorado and Tennessee in the south. In Pennsylvania, it is only found in the western portion of the state. Both species are considered imperiled in the state, but globally secure.

Threats and Stresses

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

Conservation Recommendations

Preserving forested river corridors is key to maintaining high water quality. Timbering and road development or other construction activities should be kept well away from riparian corridors in order to avoid degrading important aquatic and riverside habitat. Although sections of the watersheds beyond the riparian zones have less direct influence on the river ecosystems, a high degree of forest cover should be maintained for additional protection of the water quality and ecological integrity of the aquatic ecosystems. Landowners engaged in timber harvesting within the watershed can refer to *Best Management Practices for Pennsylvania Forests*, a brochure available online at http://pubs.cas.psu.edu/FreePubs/pdfs/uh102.pdf or through the College of Agricultural Sciences, Penn State University, for guidelines aimed at minimizing impacts from timber harvesting.

Allegheny River at Reed Run BDA

This Natural Heritage Area is discussed under Roulette Township (pg. 91). A portion of the watershed of this BDA crosses into Eulalia Township and any negative affects on hydrology should be minimized.

Dutchman Hill BDA

At the core of this site is a rich, mesic, forested slope occupied by **West Virginia white** (*Pieris virginiensis*), a butterfly species of concern in the state. The forest community at this site is northern hardwood and dominated by sugar maple (*Acer saccharum*) and eastern hemlock (*Tsuga canadensis*). The West Virginia white inhabits rich, moist deciduous or mixed deciduous/coniferous woods where abundant stands of their host plants are present. The adults feed on the nectar of spring wildflowers, such as spring beauty (*Claytonia* sp.), toothworts (*Cardamine* spp.), violets (*Viola* spp.), and stonecrop (*Sedum* sp.). Two-leaved toothwort (*Cardamine diphylla*) and cut-leaved toothwort (*Cardamine laciniata*) are the primary preferred food sources for larvae, but the species has also been reported to use other bittercresses (*Cardamine* spp.) and even smooth rockcress (*Arabis serotina*) in Ohio (Allen 1997). The West Virginia white's range extends from Quebec to Wisconsin, south to Alabama. In Pennsylvania, records exist for the species in all western counties except Armstrong and Cameron. The species is absent from the middle to lower central Appalachian portion of the state and is generally absent from southeastern Pennsylvania. The West Virginia white is considered imperiled in the state and vulnerable globally (NatureServe 2006).

Threats and Stresses

This species seems to be reluctant to traverse large forest openings or colonize new areas (Allen 1997, NatureServe 2006); barriers such as uncanopied streams and rivers, power lines, and unshaded paved roads can limit movements. Garlic mustard (*Alliaria officinalis*), an exotic plant in the mustard family, causes direct mortality to the West Virginia white. Female butterflies may oviposit on this mustard species but the plant is toxic to caterpillars when they feed upon it. Gypsy moth spraying and overbrowsing of host plants by large densities of white-tailed deer also pose a threat to this species (NatureServe 2006).

Conservation Recommendations

Monitoring and removing garlic mustard within areas that contain known occurrences of West Virginia white and good stands of toothworts are highly beneficial. Avoiding or minimizing gypsy moth spraying is also recommended. In timbering operations, minimizing activities in early spring months when the host plants could be destroyed would help to maintain habitat for the species. Selective harvesting that maintains at least canopy cover conditions would be preferable to other harvesting practices. Overall, this species would be best conserved in well-managed forests with healthy stands of toothworts and spring ephemeral plants.

Frinks BDA

This Natural Heritage Area is discussed under Hebron Township (pg. 59). The supporting landscape for this forest wetland BDA extends into Eulalia Township. Forest canopy removal should be avoided in this area, and it should be monitored periodically for hemlock woolly adelgid and other invasive species.

Darters (Genus *Ammocrypta, Etheostoma,* and *Percina*)

Description:

Darters are a diverse group of freshwater fish that make up the bulk of the Perch family (Percidae) in eastern North America. They are generally quite small, usually less than ten centimeters long, with small ctenoid, or toothed, scales. Like all percids, darters have two dorsal fins, the foremost of which is spiny. Their pelvic fins, which each have one anterior spine, are located well forward on the thorax. Most darters have smaller teeth than other percids.

Darter species native to Pennsylvania include:

- The **eastern sand darter (*Ammocrypta pellucida*)**, which is considered critically imperiled in Pennsylvania and throughout the Northeast;
- The **spotted darter (*Etheostoma maculatum*)**, which is imperiled in the commonwealth and throughout the Ohio River drainage;
- The **bluebreast darter (*Etheostoma camurum*)**, which is imperiled in the commonwealth and at risk throughout the eastern United States;
- The **gilt darter (*Percina evides*)**, which is considered imperiled to critically imperiled in the commonwealth and throughout the mid-Atlantic states.

The bluebreast darter, *Etheostoma camurum,* and the gilt darter, *Percina evides*
NatureServe - Noel Burkhead & Virginia Dept of Game and Inland Fisheries (*Fishes of Virginia*)

Habitat:

Most darter species have either reduced swim bladders or none at all, which gives them less control of their buoyancy than other percids. Thus they spend most of their time swimming along the bottom of streams and lakes, where they hunt under rocks and pebbles for small crustaceans and insects. Darter species are found in clear streams, ponds, and lakes across North America.

Darters' use of microhabitats within a stream or pond varies with their reproductive cycle. During the mating season, habitat use may be fairly complex, with males establishing and defending territories in riffles, often surrounding rocks or other areas suitable for egg deposition. Females partition their habitat use as well, searching for food in pools, away from the males' territories in the riffles. Some species will migrate upstream at the beginning of the mating season to find breeding habitat.

Threats to Pennsylvania's darters:

Darters are vulnerable to a wide variety of direct and indirect human interference with their environment. They may be harmed by pollutants dumped directly into the water and by polluted runoff from agricultural and residential pesticide or fertilizer applications. Sudden, irregular changes in streamflow caused by hydroelectric dams may significantly harm fish communities as lowering water levels may leave small fish stranded and rising water levels expose small, shallow-water species to predation by larger, deep-water species. Obstructions to fish movement such as dams and weirs may block darters' migration to breeding habitat, disrupting mating behaviors and significantly reducing mating success. Sedimentation and alteration of streambeds can also significantly affect the health of darter populations, which need clear water and specific kinds of substrates.

Conservation considerations:

Preservation of Pennsylvania's rare and endangered darter species will require coordinated efforts on several fronts. Darter populations need protection from water pollution and habitat alteration. They can benefit from protection and expansion of wetlands, which help to clean and clarify runoff water, as well as from the removal of movement barriers such as lowhead dams. Establishing more uniform flow regimes below hydroelectric dams is also likely to improve conditions for darters.

References

- Bain, M.B., J.T. Finn, and H. E. Booke. 1988. Streamflow regulation and fish community structure. Ecology, 69(2): 382-92.
- Cooper, Edwin Lavern. 1983. Fishes of Pennsylvania and the Northeastern United States. University Park, PA: The Pennsylvania State University Press. 243p.
- Kraft, C.E., D.M. Carlson, and S.C. Brown. 2003. The On-line Fishes of New York State [web application]. Version 2.1. Department of Natural Resources, Cornell University, Ithaca, NY. Available at http://fish.dnr.cornell.edu/nyfish/fish.html. Accessed 11 March 2005.
- Lachner, E.A., E.F. Westlake, and P. S. Handwerk. 1950. Studies on the biology of some percid fishes from Western Pennsylvania. American Midland Naturalist, 43(1): 92-111.
- NatureServe. 2004. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.1. NatureServe, Arlington, Virginia. Available at http://www.natureserve.org/explorer. Accessed 11 and 14 March 2005.
- Page, L.M. and B.M. Burr. 1991. Peterson Field Guides Freshwater Fishes. Boston: Houghton Mifflin Company. 273-326.
- Stauffer, J.R., Jr., J.M. Boltz, and L.R. White. 1995. The Fishes of West Virginia. Philadelphia: Academy of Natural Sciences of Philadelphia. 288-338.
- Winn, H.E. 1958. Comparative reproductive behavior and ecology of fourteen species of darters (Pisces-Percidae). Ecological Monographs, 28(2): 155-91.

Pennsylvania Natural Heritage Program

Genesee Township

	PNHP Rank		Legal Status			
	Global	State	Federal	State	Last Seen	Quality
NATURAL HERITAGE AREAS:						
Cryder Creek BDA		*High Significance*				
backward sedge (*Carex retrorsa*)	G5	S1		PE	8/17/2005	B
stalked bulrush (*Scirpus pedicellatus*)	G4	S1		PT	8/17/2005	C
Ellisburg Complex BDA		*Notable Significance*				
ephemeral/fluctuating natural pool	--	S3			4/10/2006	E
Genesee River BDA		*Notable Significance*				
backward sedge (*Carex retrorsa*)	G5	S1		PE	7/14/2005	A
Genesee River at Hickox BDA		*Notable Significance*				
American brook lamprey (*Lampetra appendix*)	G4	S3		PC	6/7/2005	E
W. Branch Genesee River at Ellisburg BDA		*High Significance*				
harpoon clubtail (*Gomphus descriptus*)	G4	S1S2			8/17/2005	E
W. Branch Genesee River at Genesee BDA		*Exceptional Significance*				
animal of special concern	G4	S3			6/14/2006	E
harpoon clubtail (*Gomphus descriptus*)	G4	S1S2			6/14/2006	E
northern pygmy clubtail (*Lanthus parvulus*)	G4	S3S4			6/14/2006	E
ocellated darner (*Boyeria grafiana*)	G5	S3			6/14/2006	E
sable clubtail (*Gomphus rogersi*)	G4	S1			6/14/2006	E

OTHER CONSERVATION AREAS: none

Potter County
Natural Heritage Inventory
Genesee Township

Biological Diversity Area:

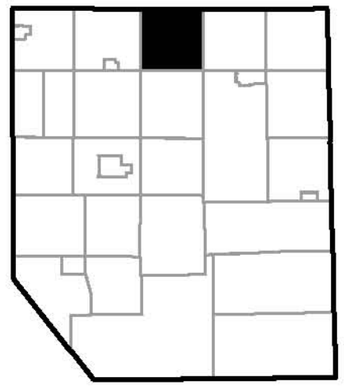
Cryder Creek
Ellisburg Complex
Genesee River
Genesee River at Hickox
W. Branch Genesee River at Ellisburg
W. Branch Genesee River at Genesee

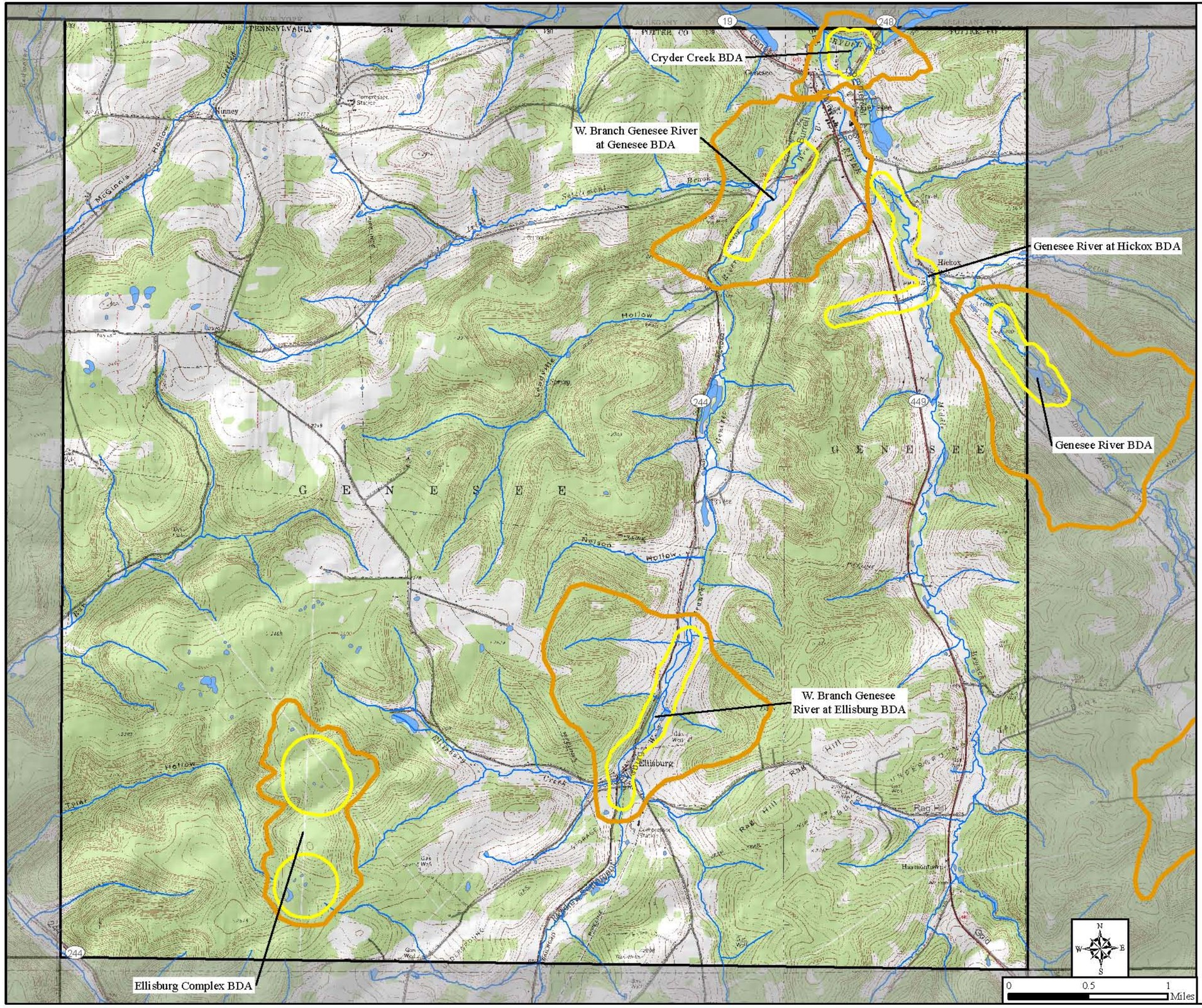
Landscape Conservation Area:

None

Managed Land:

None





Legend

Biological Diversity Area

- Core Area
- Supporting Landscape
- Landscape Conservation Area
- Streams
- NWI Wetlands
- Managed Land

GENESEE TOWNSHIP

Genesee Township is located in northern Potter County, bordered by New York. As with other municipalities in the northern part of the county, most of the forest that remains has been fragmented by agriculture and roads (Table 6, Figure 5). Some larger tracts exist, but areas in northwest and south-central Genesee Township have been fragmented into small forest blocks or cleared entirely. Agriculture is 23 percent of the total land use in the township. The West Branch and the Middle Branch of the Genesee River drain most of the township and many streams flow through agricultural areas that generally do not provide a buffer against pollutants such as sediments and chemicals. All of the land within Genesee Township is privately owned. No public lands or Important Mammal Areas (IMAs) are found within this municipality.

Cryder Creek BDA

At the core of this BDA is high elevation floodplain forest along Cryder Creek with marshy swales that support two plant species of concern, **backward sedge** (*Carex retrorsa*) and **stalked bulrush** (*Scirpus pedicellatus*). Backward sedge, a Pennsylvania endangered plant species, is found in various counties throughout the state in swampy woods, wet meadows, and along streams banks. Its range spans across northern North America from the Northwest Territories to Quebec, south to Nevada and New Jersey. Stalked bulrush, a Pennsylvania threatened plant species, is found in north central counties of Pennsylvania in floodplains and stream valleys (Rhoads and Block 2000). Its distribution extends from Newfoundland to New Jersey and west to Missouri and Ontario. Both plant species reach the southern extent of their ranges in Pennsylvania and are considered critically imperiled species in the state.

The low-lying swale where rare plants were observed is approximately 10 meters (~30 feet) wide and clearly distinct from the surrounding forest. The swale is partially shaded by the adjacent forest but otherwise is mostly clear of trees and shrubs. Dominant trees in the forest include black ash (*Fraxinus nigra*) and black cherry (*Prunus serotina*). In the swale, herbs are dense and dominated by American mannagrass (*Glyceria grandis*). Other herbs present include broad-glumed brome (*Bromus latiglumis*), a variety of sedges (*Carex intumescens, C. lupulina, C. pedunculata, C. radiata, C. tuckermanii*), deer-tongue witchgrass (*Dichanthelium clandestinum*), flat-top white aster (*Doellingeria umbellata*), a wild rye (*Elymus macgregorii*), eastern helleborine (*Epipactis helleborine*), field horsetail (*Equisetum arvense*), white wood-aster (*Eurybia divaricata*), spotted joe-pyeweed (*Eutrochium maculatum*), rough bedstraw (*Galium asprellum*), stiff marsh bedstraw (*G. tinctorium*), jewelweed (*Impatiens capensis*), fringed loosestrife (*Lysimachia ciliata*), ostrich fern (*Matteuccia struthiopteris*), corn mint (*Mentha arvensis*), oswego tea (*Monarda didyma*), true forget-me-not (*Myosotis scorpioides*), sensitive fern (*Onoclea sensibilis*), interrupted fern (*Osmunda claytoniana*), ditch-stonecrop (*Penthorum sedoides*), arrowleaf tearthumb (*Polygonum sagittatum*), Virginia knotweed (*P. virginianum*), clearweed (*Pilea* sp.), Christmas fern (*Polystichum acrostichoides*), cottongrass bulrush *(Scirpus cyperinus)*), hemlock waterparsnip (*Sium suave*), wrinkle-leaf goldenrod (*S. rugosa*), and skunk-cabbage (*Symplocarpus foetidus*).

The supporting landscape for this BDA extends to the boundary of the immediate watershed and is primarily in residential and agricultural development with small patches of forest interspersed throughout. Remaining forest is dominated by sugar maple (*Acer saccharum*) and yellow birch (*Betula alleghaniensis*); musclewood (*Carpinus caroliniana*) is dominant in the understory. The herb layer varies in density. Species include New York fern (*Thelypteris noveboracensis*), northern shorthusk (*Brachyelytrum septentrionale*), Jack-in-the-pulpit (*Arisaema triphyllum*), white-edge sedge (*Carex debilis*), greater bladder sedge (*C. intumescens*), stout wood reedgrass (*Cinna arundinacea*), partridge-berry (*Mitchella repens*), wrinkle-leaf goldenrod (*Solidago rugosa*), and skunk-cabbage (*Symplocarpus foetidus*).

Threats and Stresses

Non-point source pollution from residential and agricultural development within the immediate watershed presents the greatest threat to this wetland. A gas pipeline right-of-way and an abandoned railroad grade pass

through the southern portion of the site. The area to the south of the grade is considerably drier than the bulk of the wetland to the north, suggesting that the railroad grade has altered the local hydrology.

Conservation Recommendations

Any land management decisions regarding the watershed supporting the wetland pocket should take into consideration potential impacts to the wetland, including alterations to the light, temperature, and hydrologic regimes. Landowners should refer to the Pennsylvania Bureau of Forestry's State Forest Resources Management Plan (available online at **http://www.dcnr.state.pa.us/forestry/sfrmp/water.htm**) for management guidelines pertaining to aquatic and riparian ecosystems. Preserving the riparian corridors along waterways is key to maintaining high water quality. Timbering and road development or other construction activities should be kept well away from the riparian corridors in order to avoid degrading important aquatic and streamside habitat.

Ellisburg Complex BDA

The core of this site is delineated around an **ephemeral/fluctuating natural pool**—also known as a seasonal pool complex—located on a relatively high elevation saddle, and a 300 meter (~1000 feet) area intended to capture additional critical habitat for amphibian species that the wetland supports. Seasonal pools, also known as vernal pools, are wetlands that fill annually from precipitation, surface water runoff, and rising groundwater (Kenney and Burne 2000). The pools typically become completely dry through evaporation by late spring or summer. Since these ponds dry up during a portion of the year, they cannot support fish populations. During the brief time the pools contain water, and in the absence of fish, they become important breeding areas for a multitude of amphibian species, such as spotted salamanders (*Abystoma maculatum*) and fairy shrimp (Order Anostraca), many of which breed solely in seasonal pools.

Supporting landscape for this site extends from core habitat to the boundary of the immediate watershed. The forest community is northern hardwood forest, with some black cherry (*Prunus serotina*) and eastern hemlock (*Tsuga canadensis*). Understory is dominated by striped maple (*Acer pensylvanicum*) and American beech (*Fagus grandifolia*). The largely contiguous forest found within the site is important in maintaining water quality of these wetlands and the health of adjacent habitats.

Threats and Stresses

Changes in hydrological pattern, light levels, or the contiguity of surrounding forest habitat may negatively impact the species and natural communities within this BDA. The seasonal pools are fed by surface runoff from the entire watershed area above them. Any activity resulting in earth disturbance could affect the current hydrological pattern at this site and potentially alter conditions within the seasonal pools. Additionally, disruptions to the forest adjacent to ponds may impact amphibian populations associated with the seasonal pools (Semlitsch and Bodie 2003). Conditions on the forest floor, including the presence of woody debris and leaf litter, moisture levels, and temperature, are important to the ability of amphibians to use this habitat.

Conservation Recommendations

Activities that remove forest canopy or result in earth disturbance should be avoided within 500 meters (~1650 feet) of the ponds, in order to avoid disrupting natural hydrological patterns in the ponds and to avoid impacts to potential amphibian populations. Where roads, clearings, or staging areas have already been constructed within this BDA, ditching and other drainage solutions should be directed toward preserving the natural drainage of the site and should provide effective erosion control. Periodic inventories for invertebrates and amphibians should be conducted.

Genesee River BDA

At the core of this BDA is a graminoid/shrub wetland community along the Genesee River that supports a plant species of special concern, **backward sedge** (*Carex retrorsa*). Backward sedge, a Pennsylvania endangered plant species, is found in various counties throughout the state in swampy woods, wet meadows, and along streams banks. Its range spans across northern North America from the Northwest Territories to Quebec, south to Nevada and New Jersey. It reaches the southernmost extent of its range in Pennsylvania. The backward sedge is considered to be a critically imperiled species in the state.

Three subpopulations of backward sedge were observed at the site, two of which were found growing at the edge of dense marsh vegetation along a backwater channel of the Genesee River dominated by reed canarygrass (*Phalaris arundinacea*). The third subpopulation was much larger and occurred in a marsh adjacent to the river. The marsh is dense with herbs dominated by pale mannagrass (*Torreyochloa pallida* var. *fernaldii*) and marsh bedstraw (*Galium palustre*). Other herbs present include a variety of sedges (*Carex crinita, C. intumescens, C. lupulina, C. lurida, C. tuckermanii*), marsh bedstraw (*Galium palustre*), bedstraw (*Galium* sp.), American mannagrass (*Glyceria grandis*), fowl mannagrass (*Glyceria striata*), jewelweed (*Impatiens capensis*), soft rush (*Juncus effusus*), creeping jenny (*Lysimachia nummularia*), mint (*Mentha* sp.), true forget-me-not (*Myosotis scorpioides*), sensitive fern (*Onoclea sensibilis*), arrowleaf tearthumb (*Polygonum sagittatum*), reed canarygrass, fowl bluegrass (*Poa palustris*), rough bluegrass (*Poa trivialis*), broadleaf arrowhead (*Sagittaria latifolia*)–mostly in wetter areas, cottongrass bulrush (*Scirpus cyperinus*), leafy bulrush (*Scirpus polyphyllus*), narrowleaf burreed (*Sparganium emersum*), slender wedgescale (*Sphenopholis intermedia*), stinging nettle (*Urtica dioica* ssp. *gracilis*), and blue vervain (*Verbena hastata*).

The supporting landscape for this BDA extends to the boundary of the immediate watershed and is primarily in agricultural development with small patches of forest interspersed throughout. The banks of the river are marshy thickets that are densely vegetated. They are also quite weedy in places with reed canarygrass and Japanese knotweed (*Polygonum cuspidatum*) as two dominants. Some of the banks are a little less weedy and in places ostrich fern (*Matteuccia struthiopteris*) dominates these marshy areas. Exposed gravel and mud bars are present in drawdown zones on the edge of the river and also in exposed islands. The uplands are dominated by eastern hemlock (*Tsuga canadensis*) in the canopy and musclewood (*Carpinus caroliniana*) in the understory. Other woody plants found at this site include crabapple (*Crataegus punctata*), green ash (*Fraxinus pennsylvanica*), Morrow's honeysuckle (*Lonicera morrowii*), silky willow *(Salix sericea*), a willow (*Salix* x *rubens*), and white meadowsweet *(Spiraea alba*).

Threats and Stresses

The marsh is adjacent to an old railroad grade and although there is some water entering the system from upslope, it appears that the grade may have altered the local hydrology and is partly responsible for the creation of this wetland. Non-point source pollution from agricultural development within the immediate watershed presents the greatest threat to this wetland.

Conservation Recommendations

Any land management decisions regarding the watershed supporting the wetland pocket should take into consideration potential impacts to the wetland, including alterations to the light, temperature, and hydrologic regimes. The Pennsylvania Bureau of Forestry continues to develop and implement best management practices (BMPs) to minimize and prevent water pollution, as well as support and engage in research to restore degraded surface and groundwater resources. Landowners should refer to the Bureau's State Forest Resources Management Plan (available online at **http://www.dcnr.state.pa.us/forestry/sfrmp/water.htm**) for management guidelines pertaining to aquatic and riparian ecosystems. Preserving the riparian corridors along waterways is key to maintaining high water quality. Timbering and road development or other construction activities should be kept well away from the riparian corridors in order to avoid degrading important aquatic and streamside habitat.

Genesee River at Hickox BDA

The section of the Genesee River that lies within this BDA provides habitat for the **American brook lamprey** (*Lampetra appendix*), an aquatic animal species of concern. This species requires cool, clear water and inhabits large creeks and small to medium rivers (NatureServe 2006). Eggs of the American brook lamprey are laid in nests in riffles and runs with a gravel/sand substrate and a strong current. Once the larvae hatch, they burrow into the loose substrate of pools or slow-moving water near stream banks, where they feed on plankton. The larval stage may last several years. The animal becomes sexually mature during the period of transformation from larva into adult (NatureServe 2006). Its distribution extends from Arkansas to Ontario in the West and from Alabama and North Carolina to Quebec in the east. In Pennsylvania, this lamprey species has only been previously recorded in Monroe, Venango and Warren counties and is considered imperiled in the state.

Threats and Stresses

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

Conservation Recommendations

Preserving forested river and stream corridors is key to maintaining high water quality. Timbering and road development or other construction activities should be kept well away from riparian corridors in order to avoid degrading important aquatic and river and streamside habitat. Although sections of the watersheds beyond the riparian zones have less direct influence on the river ecosystems, a high degree of forest cover should be maintained for additional protection of the water quality and ecological integrity of the aquatic ecosystems. Landowners engaged in timber harvesting within the watershed can refer to *Best Management Practices for Pennsylvania Forests*, a brochure available through the College of Agricultural Sciences, Penn State University or online at http://pubs.cas.psu.edu/FreePubs/pdfs/uh102.pdf, for guidelines aimed at minimizing impacts from timber harvesting.

West Branch Genesee River at Ellisburg BDA

This section of the West Genesee River and adjacent natural communities provide habitat for the **harpoon clubtail** (*Gomphus descriptus*), a dragonfly species of concern. Dragonflies, as with other members of the Order Odonata, have three stages in their life cycle: egg, nymph, and adult. Dragonflies lay their eggs in water and this species utilizes riverine habitats and clear, small wooded streams with riffles and sandy substrate for egg laying (Massachusetts Division of Fisheries and Wildlife 2003). After the eggs hatch, the nymphs remain in the water through several instars, feeding on small aquatic organisms until they eventually grow wings and emerge from the water as terrestrial adults (Dunkle 2000). The harpoon clubtail has a range that extends from Nova Scotia to North Carolina and west to Ontario and Kentucky (NatureServe 2006). In Pennsylvania, this dragonfly is found in the Allegheny and Delaware River watersheds and is considered a critically imperiled species. This observation is a new county record for Potter County.

The supporting landscape for this site extends from core habitat to the boundary of the immediate watershed. The river is approximately 6 meters (~20 feet) in width, lined with mud and gravel banks, and with a small beaver pond present. Adjacent to the river are shrub thickets, scrubby forests, upland fields, and a few wetlands. Some of the shrub thickets are dense and dominated by silky willow *(Salix sericea)*. There are also some wet open graminoid marshes dominated by rice cutgrass (*Leersia oryzoides*) and jewelweed (*Impatiens capensis*). Trees are mostly scattered and do not create much of a forest canopy.

Threats and Stresses

The patches of forest found within the immediate watershed of this site are important in maintaining water quality of West Branch Genesee River and the health of adjacent habitats. A forested watershed functions to maintain water quality and natural nutrient cycles in its associated streams and rivers. Removal of forest cover on steep slopes is especially problematic because of the potential for increased runoff and erosion following storm events. Runoff from dirt and gravel roads in close proximity to the wetlands can contribute to physical degradation of the site by siltation and a decrease in dissolved oxygen. Dams as well as channelization also pose a threat to the harpoon clubtail (NatureServe 2006).

Conservation Recommendations

The Pennsylvania Bureau of Forestry continues to develop and implement best management practices (BMPs) to minimize and prevent water pollution, as well as support and engage in research to restore degraded surface and groundwater resources. Landowners should refer to the Bureau's State Forest Resources Management Plan (available online at **http://www.dcnr.state.pa.us/forestry/sfrmp/water.htm**) for management guidelines pertaining to aquatic and riparian ecosystems. Preserving the riparian corridors along waterways is key to maintaining high water quality. Timbering and road development or other construction activities should be kept well away from the riparian corridors in order to avoid degrading important aquatic and streamside habitat.

West Branch Genesee River at Genesee BDA

This section of West Branch Genesee River contains two core areas that support four animal species of special concern: an **animal species of special concern**; and the aquatic larvae of four dragonfly species of concern: the **harpoon, northern pygmy, and sable clubtails (***Gomphus descriptus, G. rogersi,* and *Lanthus parvulus,* respectively**)** and the **ocellated darner (***Boyeria grafiana*). The animal of special concern has a range that extends from Saskatchewan to Illinois in the west and from Nova Scotia to Maryland in the east. In Pennsylvania, it is close to the edge of its southern range, making it a vulnerable species in the state. The larvae of this species feed on the flat-topped aster (*Aster umbellatus*). Although typically considered a wetland species, it can adapt to most areas where the flat-topped aster is present.

Dragonflies have three stages in their life cycle: egg, nymph, and adult. Dragonflies lay their eggs in water and the four species at this site utilize clear, small wooded streams with riffles and sandy substrate for egg laying. After the eggs hatch, the nymphs remain in the water through several instars, feeding on small aquatic organisms until they eventually grow wings and emerge from the water as terrestrial adults (Dunkle 2000). The harpoon clubtail has a range that extends from Nova Scotia to North Carolina and west to Ontario and Kentucky (NatureServe 2006). In Pennsylvania, this dragonfly is found in the Allegheny and Delaware River watersheds and is considered a critically imperiled species. The northern pygmy clubtail has a range that extends from Nova Scotia and Quebec to Tennessee and South Carolina (NatureServe 2006). In Pennsylvania, this dragonfly is found in the upper Allegheny River watershed of the north central region and in the Juniata watershed of Huntingdon County and is considered a vulnerable species. The sable clubtail is found in several counties in central and eastern Pennsylvania. This observation is a new county record for Potter County. Its range extends from Vermont south to Alabama. The ocellated darner's distribution extends from Quebec to Georgia west to Minnesota and Mississippi. It is considered a vulnerable species in Pennsylvania, but globally secure. Adults prefer forested uplands. In contrast to most dragonflies, the adults are active late in the day and prefer shaded areas (Massachusetts Division of Fisheries and Wildlife 2003).

Threats and Stresses

The patches of forest found within the immediate watershed of this site are important in maintaining water quality of West Genesee River and the health of adjacent wetland habitats. A forested watershed functions to maintain water quality and natural nutrient cycles in its associated streams and rivers. Removal of forest cover on steep slopes is especially problematic because of the potential for increased runoff and erosion following storm events. Runoff from dirt and gravel roads in close proximity to the wetlands can contribute

to physical degradation of the site by siltation and a decrease in dissolved oxygen. Dams and channelization also pose a threat to the larvae of the rare dragonfly species (NatureServe 2006). Additional threats to the animal of special concern are the loss of suitable habitat for the host plant, flat-topped aster, and the impact of purple loosestrife (*Lythrum salicaria*), an exotic invasive species, on this plant species (NatureServe 2006).

Conservation Recommendations

The Pennsylvania Bureau of Forestry continues to develop and implement best management practices (BMPs) to minimize and prevent water pollution, as well as support and engage in research to restore degraded surface and groundwater resources. Landowners should refer to the Bureau's State Forest Resources Management Plan (available online at **http://www.dcnr.state.pa.us/forestry/sfrmp/water.htm**) for management guidelines pertaining to aquatic and riparian ecosystems. Preserving the riparian corridors along waterways is key to maintaining high water quality. Timbering and road development or other construction activities should be kept well away from the riparian corridors in order to avoid degrading important aquatic and streamside habitat.

Genesee River BDA, 2005

Sable clubtail (*Gomphus rogersi*)

What it looks like:

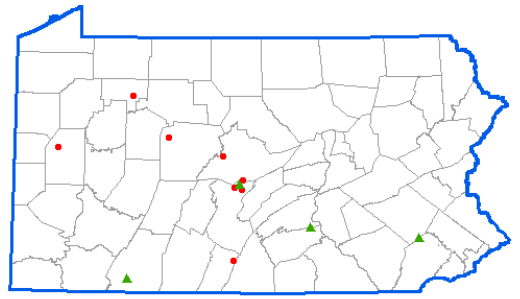
The sable clubtail is a dark-colored dragonfly marked with tones of olive, slate, and extensive areas of black. The veins of this species' wings are black, as is the labrum, or upper lip; the frons, or facial plate, is a paler color. The sides of the thorax are also mostly pale. Adults grow to lengths of 47 to 50 millimeters. Sable clubtail is a member of the subgenus Gomphurus, one of three subdivisions of the large and diverse clubtail genus, Gomphus.
As with all dragonfly species, sable clubtail larvae are aquatic predators. They resemble squat, wingless versions of the adult form, with hooks on their forelegs specialized for burrowing.

Dan Czaplak

Where it is found:

Sable clubtail is documented from Vermont south to Alabama and Georgia. Its preferred habitat is along small, rocky forest streams, especially downstream from woody debris. Adults forage in partially shaded areas along forest edges.

Pennsylvania Distribution by County



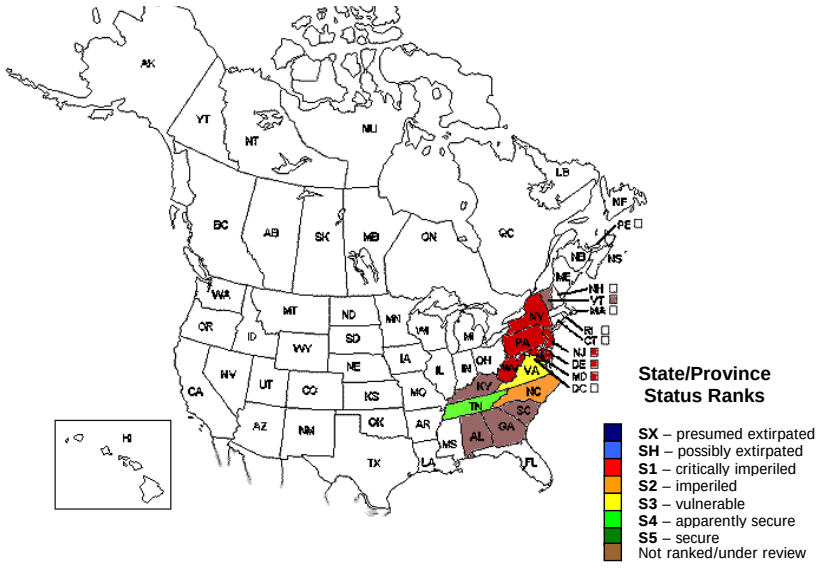
Pennsylvania Natural Heritage Program data 2005

Why it is rare:

Because their life cycle involves both terrestrial and aquatic phases, dragonflies are particularly sensitive to disturbances of stream and lake habitats. Water pollution can harm the larvae; clearing of stream- and lake-shore vegetation deprives the adults of habitat. Though its status is undecided in several states, it is imperiled or critically imperiled in most of the northern half of its range, including Pennsylvania.

North American State/Province Conservation Status

Map by NatureServe



Conservation considerations:

Protection of the sable clubtail will require preservation and restoration of both the terrestrial stream-side habitat of the adult and the aquatic habitat of the larvae. The species can benefit from reduction of fertilizer and pesticide runoff, as well as planting of vegetative buffers along streams.

Pennsylvania Natural Heritage Program

NatureServe conservation status ranks:
G4 – apparently secure worldwide
S1 – critically imperiled within Pennsylvania

References

- Czaplak D. 2005. "Dragonflies" [web page]. Available online at http://odolep.com. Accessed 28 April 2005.
- Dunkle, S.W. 2000. Dragonflies through binoculars: A field guide to the dragonflies of North America. Oxford: Oxford University Press. 266 p.
- NatureServe. 2004. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. Accessed 26 April 2005.
- Needham JG, MJ Westfall, Jr, ML May. 2000. *Dragonflies of North America*. Washington: Scientific Publishers. 939 p.
- New Jersey Odonata Survey. 2003. "NJODES: The Dragonflies and Damselflies of New Jersey" [web site]. Available at http://www.njodes.com/default.htm. Accessed 28 April 2005.

Harrison Township

NATURAL HERITAGE AREAS: None identified

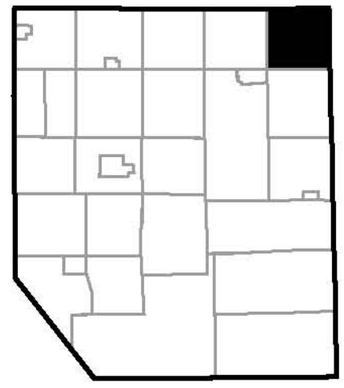
OTHER CONSERVATION AREAS: None identified

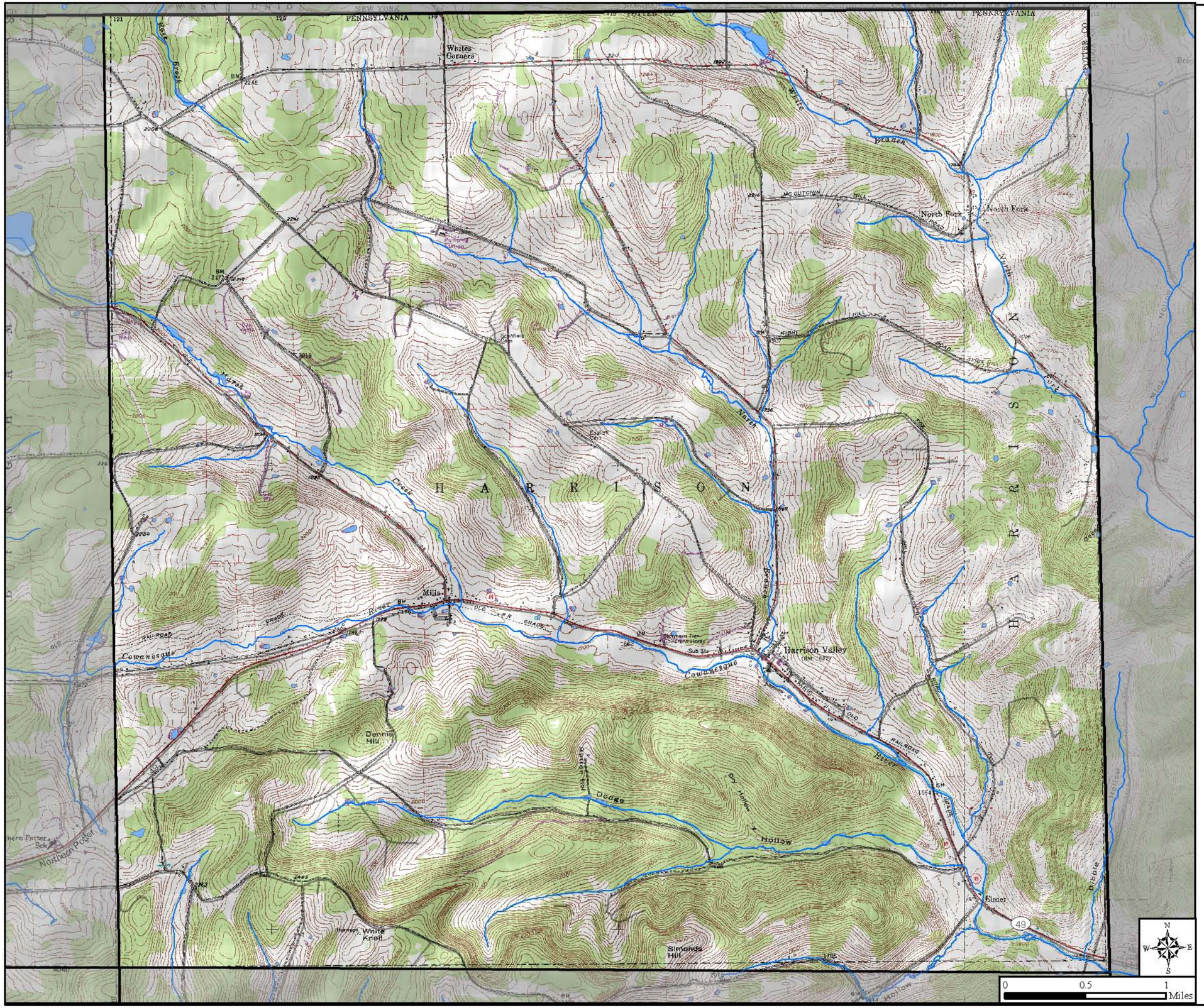
Potter County
Natural Heritage Inventory
Harrison Township

Biological Diversity Area:
None

Landscape Conservation Area:
None

Managed Land:
None





Legend

Biological Diversity Area
- Core Area
- Supporting Landscape
- Landscape Conservation Area
- Streams
- NWI Wetlands
- Managed Land

HARRISON TOWNSHIP

Harrison Township is located in northeastern Potter County, bordered by Tioga County to the east and New York to the north. This township has the highest percentage of agriculture (39%) and the lowest percentage of forests (55%) in Potter County (Table 6). Most of the forests in the township have been fragmented into small, scattered patches. Marsh Creek and the Cowanesque River are the major drainages in the township. Most of the streams flow through agricultural areas that generally do not provide a buffer against pollutants such as sediments and chemicals. All of the land within Harrison Township is privately owned. No public lands or Important Mammal Areas (IMAs) are found within this municipality.

No Natural Heritage Areas were identified within Harrison Township.

Hebron Township

	PNHP Rank		Legal Status			
	Global	State	Federal	State	Last Seen	Quality
NATURAL HERITAGE AREAS:						
Carmen Hill BDA		*Notable Significance*				
cranesbill (*Geranium bicknellii*)	G5	S1		PE	2001	C
East Branch Fishing Creek Slopes BDA		*Local Significance*				
eastern white pine (*Pinus strobus)* forest	--	SNR			6/15/2006	CD
Frinks BDA		*High Significance*				
creeping snowberry (*Gaultheria hispidula*)	G5	S3		PR	8/24/2005	C
hemlock palustrine forest	--	S3			--	E
Oswayo Creek BDA		*Exceptional Significance*				
American brook lamprey (*Lampetra appendix*)	G4	S3		PC	6/7/2005	E
animal of special concern	G5	S1S2		PE	8/6/1996	E
harpoon clubtail (*Gomphus descriptus*)	G4	S1S2			6/14/2006	E
northern bluet (*Enallagma annexum*)	G5	S3			6/14/2006	E
ohio lamprey (*Icthyomyzon bdellium*)	G3G4	S2S3		PC	6/7/2005	E
sable clubtail (*Gomphus rogersi*)	G4	S1			6/14/2006	E
stalked bulrush (*Scirpus pedicellatus*)	G4	S1		PT	7/15/2005	AB

OTHER CONSERVATION AREAS: none

Potter County
Natural Heritage Inventory
Hebron Township

Biological Diversity Area:

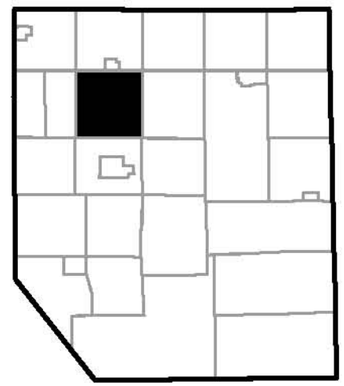
Carmen Hill
East Branch Fishing Creek Slopes
Frinks
Oswayo Creek

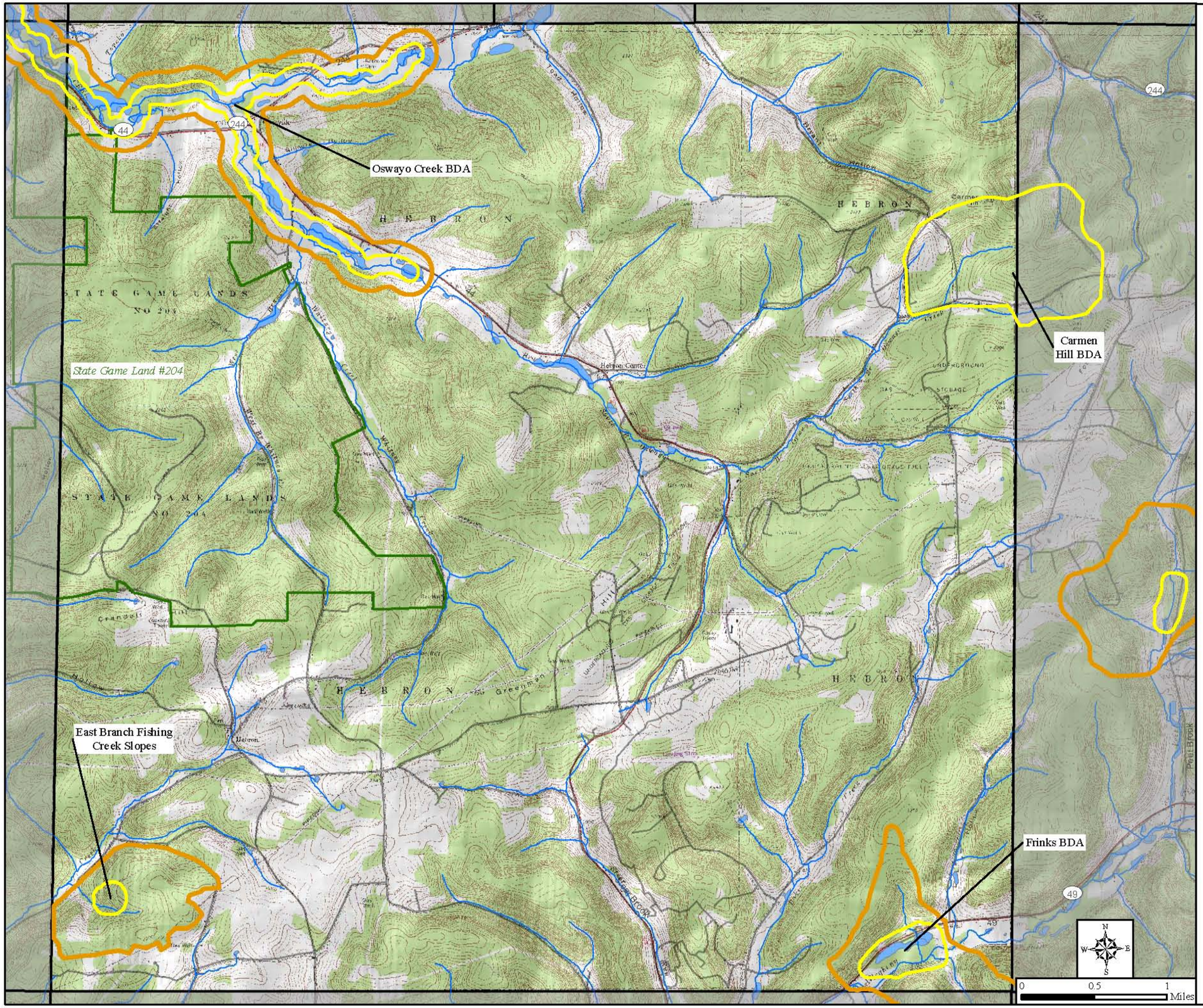
Landscape Conservation Area:

None

Managed Land:

State Game Land #204





Legend

Biological Diversity Area

- Core Area
- Supporting Landscape
- Landscape Conservation Area
- Streams
- NWI Wetlands
- Managed Land

HEBRON TOWNSHIP

Hebron Township is located in central Potter County. Although the township is 78 percent forested, agriculture and roads have fragmented much of the land, especially in the southern part of the township (Table 6, Figure 5). Agriculture is 18 percent of the total land use in Hebron Township. The South Branch of Oswayo Creek and Whitney Creek, two Exceptional Value (EV) streams, are the major drainages in the township. Most of the streams flow through the agricultural areas and along roads, which do not buffer the streams as well as forested areas. State Game Land #204 is located in northwestern Hebron Township. No Important Mammal Areas (IMAs) are found within this municipality.

Carmen Hill BDA

This Natural Heritage Area is discussed under Allegany Township (pg. 37). This upland habitat roadside BDA crosses into Hebron Township. Application of herbicides should be avoided.

East Branch Fishing Creek Slopes BDA

This site has been designated as a BDA in recognition of the pocket of uncommonly mature trees that occur at this location. Potter County contains no old-growth forest, thus this small patch of **eastern white pine forest** (*Pinus strobus* forest) may well represent some of the oldest trees in the county. Approximately twenty eastern white pine trees, about 300 years in age, occupy a mesic, southwest-facing upper slope at this site. There are some woody debris and a few snags. Canopy species include eastern white pine, with sugar maple (*Acer saccharum*), striped maple (*Acer pensylvanicum*), eastern hemlock (*Tsuga canadensis*), black cherry (*Prunus serotina*), and red maple (*Acer rubrum*) as lesser components. American beech (*Fagus grandifolia*) is the dominant understory species. Herb cover is sparse and includes violets (*Viola* spp.), blackberry and raspberry (*Rubus* sp.), Canada mayflower (*Maianthemum canadense*), and hay-scented fern (*Dennstaedtia punctilobula*). Past logging is evidenced by the presence of stumps in a state of advanced decay. The younger forest surrounding the BDA is in second-and-third growth forest and includes some clearcut areas.

Threats and Stresses

This site is located entirely within private land and the owner is aware of the presence of this small remnant of older forest and intends to continue to preserve it. Therefore, this BDA is under no imminent threat. The hemlock woolly adelgid (*Adelges tsugae*) poses a potential threat to the hemlock trees in the region.

Conservation Recommendations

No specific management needs are anticipated, given that the current management program is aimed at sustaining this mature forest patch for its habitat value. Periodic monitoring for the presence of hemlock woolly adelgid is recommended.

Frinks BDA

The core of this site is delineated around a **hemlock palustrine forest** community that supports a small population of **creeping snowberry** (*Gaultheria hispidula*), a plant species of concern in Pennsylvania. The Allegheny River forms the southern border of the hemlock palustrine forest. Creeping snowberry, a state rare plant species, is found in most of Canada and the Northeast extending down the Appalachians as far south as West Virginia. It grows in bogs and wet woods, often on decaying logs across northern Pennsylvania (Rhoads and Block 2000). See the creeping snowberry fact sheet, pg. 61, for more information about this species.

The creeping snowberry is growing on woody debris within the hemlock palustrine forest that is dominated by eastern hemlock (*Tsuga canadensis*), yellow birch (*Betula alleghaniensis*), and eastern white pine (*Pinus strobus*). Common understory species are striped maple (*Acer pensylvanicum*), yellow birch, eastern hemlock

(*Tsuga canadensis*), and eastern white pine (*Pinus strobus*). Herbs present are jewelweed (*Impatiens capensis*), Canada mayflower (*Maianthemum canadense*), golden saxifrage (*Chrysosplenium americanum*), Jack-in-the-pulpit (*Arisaema triphyllum*), partridge-berry (*Mitchella repens*), wood-sorrel (*Oxalis* sp.), arrowleaf tearthumb (*Polygonum sagittatum*), bedstraw (*Galium* sp.), goldthread (*Coptis trifolia*), heartleaf foamflow (*Tiarella cordifolia*), a violet (*Viola* sp.), forget-me-knot (*Myosotis* sp.), dwarf dogwood (*Cornus canadensis*), wild sarsaparilla (*Aralia nudicaulis*), cinnamon fern (*Osmunda cinnamomea*), marginal wood fern (*Dryopteris marginalis*), sensitive fern (*Onoclea sensibilis*), bracken fern (*Pteridium aquilinum*), three-seed sedge (*Carex trisperma*), soft rush (*Juncus effuses*), mannagrass (*Glyceria* sp.), and Bailey's sedge (*Carex baileyi*). *Sphagnum* mosses form a carpet throughout the wetland.

The supporting landscape extends to the boundary of the immediate watershed supporting the wetland. This watershed is almost entirely forested and lies within private lands. The upland forest is predominantly deciduous, with hemlocks largely confined to the stream valleys. Birds observed were broad-winged hawk, red-breasted nuthatch, and black-capped chickadee. See Appendix VII, pg. 152 for a list of scientific names.

Threats and Stresses

The westward invasion of the hemlock woolly adelgid (*Adelges tsugae*), currently documented in 42 counties in Pennsylvania (PA Bureau of Forestry 2006), poses a potential threat to the hemlock trees in the region. The hemlock woolly adelgid, native to Asia, is a sap-feeding insect that attacks both the eastern hemlock and the Carolina hemlock (*Tsuga caroliniana*). This insect pest can result in high levels of hemlock mortality, opening up the forest canopy and illuminating the forest floor to full sunlight. Loss of the adjacent hemlock forest would impact the hydrologic regime of the wetland.

Canopy removal in the vicinity of the wetland, either due to forest pests or human activities, may increase temperatures in the wetland, potentially altering its habitat quality and species composition. Such temperature changes could negatively impact the creeping snowberry population, as this species is best adapted to cooler, more northern climates. Additionally, creeping snowberry appears to have narrow hydrologic requirements typical of conditions found around the edges of bogs and wetlands and on hummocky ground within these habitats. Any changes in the environment that raise or lower the water table may impact the species negatively (Hays 2001).

Conservation Recommendations

Within the wetland, activities of greater intensity than occasional foot traffic should be avoided due to the sensitivity of the habitat. Forest canopy removal operations should be avoided within a 400 meter (~1350 foot) buffer zone surrounding the wetland in order to avoid detrimentally impacting snowberry and to help maintain water quality and the natural microclimate conditions in the wetland. Timber harvesting and road construction should be limited on the slopes overlooking the wetland complex. Management of the forests in this area should include periodic monitoring for the hemlock woolly adelgid and other non-native forest pests. Any proposed treatments for insect outbreaks should take into consideration impacts to aquatic and other forest organisms.

Oswayo Creek BDA

This Natural Heritage Area is discussed under Sharon Township (pg. 95). The upper watershed of this BDA crosses over into Hebron Township and any negative affects on hydrology should be minimized.

Creeping Snowberry (*Gaultheria hispidula*)

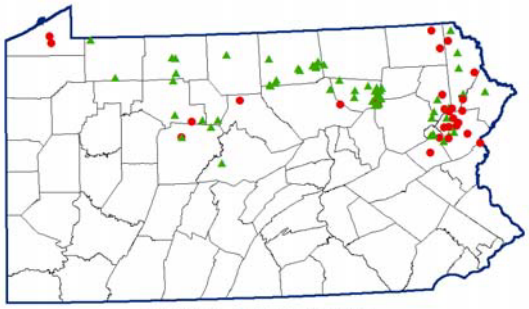
What it is:

The creeping snowberry is a matlike, creeping, evergreen shrub. All parts of the plant have a wintergreen odor when bruised. The leaves are alternately arranged, mostly less than one centimeter in length, and have scattered brownish hairs on the undersurface. The flowers are greenish/white, occur singly along the stem, and appear in spring. The fruit is white and berry-like. The species is easily recognized at any time of the year.

Where it is found:

The species grows in cool, damp or wet woods and boggy places. It is often found on rotting logs, sphagnum hummocks, and other moss-covered substrates. The creeping snowberry is widely distributed in the more northern and cooler portions of North America. It appears to be restricted to the northern counties in Pennsylvania.

Pennsylvania Distribution by County



▲ current data ● records > 30 years old

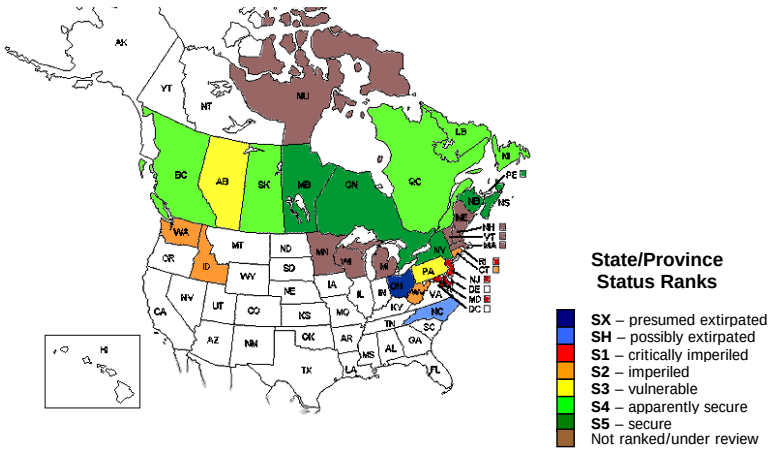
Pennsylvania Natural Heritage Program data 2006

Why it is rare:

Pennsylvania forms part of the southern extent of the distribution of creeping snowberry. The low-lying land that creeping snowberry prefers has often been cleared as the easiest place through which to build a road or railway. This land is often drained for agriculture as well. Large-scale timber harvests that occurred previously may also have contributed to habitat disturbance.

North American State/Province Conservation Status

Map by NatureServe



Conservation considerations:

Threats include wetland drainage and invasive species that inhabit wetlands such as purple loosestrife (*Lythrum salicaria*) and reed canary grass (*Phalaris arundinacea*). Preserving wetland habitats and surrounding forests is important to the conservation of this species.

Pennsylvania Natural Heritage Program

NatureServe conservation status ranks: G5 – considered globally secure; **S3** – vulnerable in Pennsylvania

References:

- Hays, M. 2001. Conservation assessment for creeping snowberry (*Gaultheria hispidula*). USDA Forest Service, Eastern Region. http://www.fs.fed.us/r9/wildlife/tes/ca-overview/docs/plant_Gaultheria-hispidula-Creeping_Snowberry.pdf
- NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: January 3, 2007).
- Pennsylvania Department of Conservation and Natural Resources web site (www.dcnr.state.pa.us)
- Rhoads, A.F. and T.A. Block. 2000. The plants of Pennsylvania: an illustrated manual. University of Pennsylvania Press, Philadelphia, PA.
- Rhoads, A.F. and W.M. Klein, Jr.. 1993. The vascular flora of Pennsylvania: annotated checklist and atlas. American Philosophical Society, Philadelphia, PA.

Hector Township

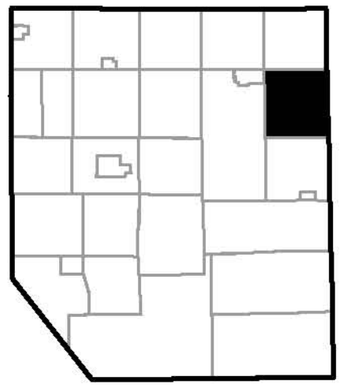
	PNHP Rank		Legal Status			
	Global	State	Federal	State	Last Seen	Quality
NATURAL HERITAGE AREAS:						
Cushing Hollow BDA		*Notable Significance*				
northern pygmy clubtail (*Lanthus parvulus*)	G4	S3S4			8/3/2005	E
State Game Land #64 LCA		*Exceptional Significance*				
OTHER CONSERVATION AREAS:	none					

Potter County
Natural Heritage Inventory
Hector Township

Biological Diversity Area:
Cushing Hollow

Landscape Conservation Area:
State Game Land #64 LCA

Managed Land:
Susquehannock State Forest



Susquehannock State Forest

Cushing Hollow BDA

State Game Land #64 LCA

Legend

Biological Diversity Area
- Core Area
- Supporting Landscape

Landscape Conservation Area
Streams
NWI Wetlands
Managed Land

0 0.5 1 Miles

HECTOR TOWNSHIP

Hector Township is located in eastern Potter County, bordered by Tioga County. This mostly forested township (80%) contains some large tracts of contiguous forest, but roads have resulted in much fragmentation, especially in the eastern part of the municipality (Table 6, Figure 5). Agriculture is 16 percent of the total land use in the township. Genesee Forks and Phoenix Run are the major drainages in Hector Township. The streams in the western part of the township are flowing through larger forest blocks, which may help to act as a buffer to filter out sediments and chemicals. Most of Hector Township is privately owned, but small sections of the Susquehannock State Forest are located in the northwestern corner of the township. No Important Mammal Areas (IMAs) are found within this municipality.

Cushing Hollow BDA

This Natural Heritage Area is discussed under Ulysses Township (pg. 113). Part of the stream in this BDA crosses over into Hector Township and any negative affects on hydrology should be minimized.

Homer Township

	PNHP Rank		Legal Status			
	Global	State	Federal	State	Last Seen	Quality
NATURAL HERITAGE AREAS:						
Big Moore's Run BDA		*High Significance*				
northern pygmy clubtail (*Lanthus parvulus*)	G4	S3S4			9/1/2005	E
Big Younglove Hollow BDA		*High Significance*				
great-spurred violet (*Viola selkirkii*)	G5?	S1			5/12/2006	E
Hemlock Trail BDA		*High Significance*				
Swainson's thrush (*Catharus ustulatus*)	G5	S2S3B			6/15/2006	E
South Woods Branch BDA		*Notable Significance*				
special animal (*Special Animal*)	G5	S3			1987-06---	E

OTHER CONSERVATION AREAS: Northern Allegheny Plateau IMA

GEOLOGIC FEATURES: none

Potter County
Natural Heritage Inventory
Homer Township

Biological Diversity Area:

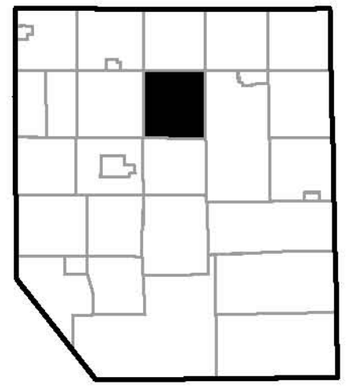
Big Moore's Run
Big Younglove Hollow
Hemlock Trail
South Woods Branch

Landscape Conservation Area:

None

Managed Land:

Susquehannock State Forest



South Woods Branch BDA

Hemlock Trail BDA

Big Moore's Run BDA

Big Younglove Hollow BDA

Susquehannock State Forest

HOMER

Legend

Biological Diversity Area

- Core Area
- Supporting Landscape
- Landscape Conservation Area
- Streams
- NWI Wetlands
- Managed Land

0 0.5 1 Miles

HOMER TOWNSHIP

Homer Township is located in central Potter County. Nearly 90 percent of the township is forested with a small amount of agricultural development (10%) in the northeastern corner of the township (Table 6). There are some larger forest tracts, but many have been fragmented by roads. The South Woods Branch of Sinnemahoning Creek, Big Moore's Run, and Little Moore's Run are the major drainages in Homer Township. The headwaters of many of the streams originate in the large forest blocks, which may provide a buffer against pollutants such as sediments and chemicals. The Susquehannock State Forest occupies much of the southern portion of the township. The Northern Allegheny Plateau Important Mammal Area (IMA) occupies most of the township except for the fragmented agricultural areas in the northeastern corner of the township.

Big Moore's Run BDA

This section of Big Moore's Run and adjacent forest provide habitat for the **northern pygmy clubtail** (*Lanthus parvulus*), a dragonfly species of special concern. Over three-quarters of the BDA, which extends from Big Moore's Run to the boundary of the immediate watershed, is contained within the Susquehannock State Forest. Dragonflies, as with other members of the Order Odonata, have three stages in their life cycle: egg, nymph, and adult. Dragonflies lay their eggs in water and this species utilizes clear, small wooded streams with riffles and sandy substrate for egg laying. After the eggs hatch, the nymphs remain in the water through several instars, feeding on small aquatic organisms until they eventually grow wings and emerge from the water as terrestrial adults (Dunkle 2000). The northern pygmy clubtail has a range that extends from Nova Scotia and Quebec to Tennessee and South Carolina (NatureServe 2006). In Pennsylvania, this dragonfly is found in the upper Allegheny River watershed of the north central region and in the Juniata River watershed of Huntingdon County and is considered a vulnerable species.

Threats and Stresses

The largely contiguous forest found within the immediate watershed of this site is important in maintaining water quality of Big Moore's Run and the health of adjacent habitats. A forested watershed functions to maintain water quality and natural nutrient cycles in its associated streams. Removal of forest cover on steep slopes is especially problematic because of the potential for increased runoff and erosion following storm events. Runoff from dirt and gravel roads in close proximity to the wetlands can contribute to physical degradation of the site.

Conservation Recommendations

The Pennsylvania Bureau of Forestry continues to develop and implement best management practices (BMPs) to minimize and prevent water pollution, as well as support and engage in research to restore degraded surface and groundwater resources. The Bureau's State Forest Resources Management Plan (available online at **http://www.dcnr.state.pa.us/forestry/sfrmp/water.htm**) outlines management guidelines for aquatic and riparian ecosystems. Preserving the riparian corridors along waterways is key to maintaining high water quality. Timbering and road development or other construction activities should be kept well away from the riparian corridors in order to avoid degrading important aquatic and streamside habitat.

Big Younglove Hollow BDA

The core of this BDA is a rich, mesic, east to northeast-facing forested slope occupied by **great-spurred violet** (*Viola selkirkii*), a plant species of special concern. Great-spurred violet is found in rich, cool woods and shady ravines throughout Canada and the northern United States extending as far south as Pennsylvania. The species has been observed mostly in the northeast portion of the state, with a disjunct population in Erie County; observations in Potter County are new county records. The great-spurred violet is considered critically imperiled in the state, but globally secure.

The forest community at this site is northern hardwood, and major canopy species include sugar maple (*Acer saccharum*) and American basswood (*Tilia americana*), with American beech (*Fagus grandifolia*) occasional in the overstory, but common in the understory. Herb species occurring at the site include yellow trout-lily (*Erythronium americanum*), eastern hay-scented fern (*Dennstaedtia punctilobula*), Canada violet (*Viola canadensis*), Canada mayflower (*Maianthemum canadensis*), bleeding hearts (*Dicentra* sp.), ill-scented trillium (*Trillium erectum*), smooth white violet (*Viola blanda*), round-leafed violet (*Viola rotundifolia*), intermediate wood fern (*Dryopteris intermedia*), common Solomon's-seal (*Polygonatum biflorum*), Jack-in-the-pulpit (*Arisaema triphyllum*), Canada wood-nettle (*Laportea canadensis*), Virginia spring beauty (*Claytonia virginica*), and Christmas fern (*Polystichum acrostichoides*).

Threats and Stresses

Given that this BDA is located within public lands of the Susquehannock State Forest, the population of great-spurred violet is under no immediate threat. However, trampling by wildlife, such as white-tailed deer, or recreationists, may be a risk. Great-spurred violet's dependence on cool, moist boreal habitats may also make it potentially vulnerable to large-scale climate changes and it is not known if the species can be sustained through catastrophic drought or prolonged climatic change (Hornbeck et al. 2003).

Conservation Recommendations

The Pennsylvania Bureau of Forestry recognizes the critical nature of the deer overbrowsing problem, and is actively engaged in addressing it. One of its stated management goals is to sustain a healthy and functioning forest ecosystem, including the ability of forests to regenerate with desirable species, by balancing the deer herd with its habitat across state forest lands. To this end, the Bureau has adopted measures that include fencing some areas to ensure regeneration, increasing hunter access, supporting research, monitoring habitat, and public education. In addition, the Bureau is currently using the Pennsylvania Game Commission's Deer Management Assistance Program to focus additional hunter pressure on specific areas to reduce deer browsing pressure.

Hemlock Trail BDA

Mixed hemlock riparian forest forms the core for this BDA that supports the **Swainson's thrush** (*Catharus ustulatus*), an animal species of special concern in the state. The Swainson's thrush is strongly associated with coniferous forests and breeds in eastern and central United States from Canada south to the Allegheny High Plateau of northern Pennsylvania. It overwinters in mature tropical forests of Central and South America. In Pennsylvania, it is considered to be an imperiled species and is a rare nester in several northern counties at the edge of the thrush' breeding range (Brauning 1992).

Breeding Bird Survey data from 1966 to 2004 indicate a significant survey-wide population decline for this species (Sauer et al. 2004). The causes of the decline are unclear. This thrush is prone to collisions with tall buildings and towers during migration and is sensitive to human activity near nesting sites. The Swainson's thrush is also categorized as area sensitive; nest numbers and nest success are lower in fragmented habitats (Evans Mack and Yong 2000). It was listed as one of 45 long-distance migrants most likely to be negatively affected by tropical deforestation (Petit et al. 1995), However, Holmes and Sherry (1988) concluded that events on wintering grounds were not having a large-scale impact on breeding populations, and that local trends were better explained by local influences, such as food abundance, climatic events, and habitat changes.

The mixed coniferous forest at the core of this site is dominated by eastern hemlock (*Tsuga canadensis*), with an understory of eastern hemlock and American beech (*Fagus grandifolia*). Other canopy species include yellow birch (*Betula alleghaniensis),* American basswood (*Tilia americana*), tuliptree (*Liriodendron tulipifera*), and black cherry (*Prunus serotina*). Striped maple (*Acer pensylvanicum*) and red maple (*Acer rubrum*) were found in the shub layer. Herbs present are jewelweed (*Impatiens* sp.), buttercup (*Ranunculus* sp.), partridge-berry (*Mitchella repens*), wood-sorrel (*Oxalis* sp.), long-spur violet (*Viola rostrata*), trillium

(*Trillium* sp.), northern starflower (*Trientalis borealis*), Canada mayflower (*Maianthemum canadense*), bedstraw (*Galium* sp.), Jack-in-the-pulpit (*Arisaema triphyllum*), foam flower (*Tiarella cordifolia*), skunk-cabbage (*Symplocarpus foetidus*), Virginia spring beauty (*Claytonia virginica*), hay-scented fern (*Dennstaedtia punctilobula*), intermediate wood fern (*Dryopteris intermedia*), with sphagnum mosses (*Sphagnum* spp.) and clubmosses (*Lycopodium*) forming a mat over the pit and mound topography of the forest floor. The supporting landscape of this BDA is a 500 meter (~1650 foot) buffer of contiguous forest surrounding the core habitat. Little Moore's Run flows though the site. Birds observed at the site were dark-eyed junco, blue-headed vireo, ovenbird, hairy woodpecker, winter wren, scarlet tanager, and blackburnian warbler. See Appendix VII, pg. 152 for a list of scientific names.

Threats and Stresses

The greatest threat to the Swainson's thrush in Pennsylvania may be the loss of habitat resulting from the infestation of introduced insect species, such as the hemlock woolly adelgid (*Adelges tsugae*). The woolly adelgid has been documented in 42 counties in Pennsylvania, but has not yet reached the High Allegheny Plateau (PA Bureau of Forestry 2006). This insect pest can result in high levels of mortality of hemlock trees, which are an important component of the Swainson's thrush's habitat. The species frequently nests in the understory, particularly in thickets of deciduous shrubs or conifer saplings; therefore, silvicultural treatments in the core area of this BDA may influence survival or nest success of population. Loss of canopy cover and shrub understory from timbering may negatively affect the thrush's habitat until dense regrowth appears after twenty years or more postlogging (Evans Mack and Yong 2000).

Conservation Recommendations

This site is located in the Susquehannock State Forest and the Pennsylvania Bureau of Forest State Forest Management Plan calls for protection of riparian zones. Periodic monitoring for the hemlock woolly adelgid and other non-native forest pests is recommended. Any proposed treatments for insect outbreaks should take into consideration impacts to aquatic and forest animals. No timbering should be conducted within core habitat of this site during the Swainson's thrush's breeding season—May through the end of July. Only silvicultural treatments that maintain at least a partial canopy and enhance structure in the understory, such as single tree or selective cuts, should be practiced at the site.

Hemlock Trail BDA, 2006

Swainson's Thrush (*Catharus ustulatus*)

What it is:

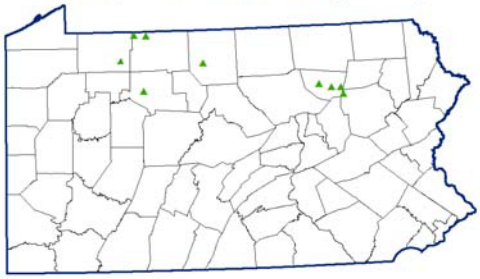
The Swainson's thrush, a member of the thrush family (Turdidae), is a discrete and secretive woodland songbird. It can be identified by its gray-brown back, buffy cheeks, and buffy eye ring. The breast is white with buffy spotting, almost appearing blurred. The song is a series of ethereal flute-like phrases that slides up in pitch; the only thrush song ending with a higher note. The Swainson's thrush nests in coniferous trees and shrubs. It lays one brood of 3-4 eggs per breeding season, which lasts from mid-April – late June.

Photo by Greg Gillson, The Bird Guide, Inc., http://thebirdguide.com

Where it is found:

The breeding range of this species extends from Alaska, east across Canada, and south through the northern portion of the Appalachians; it is contiguous throughout the west but absent in the Midwest and southeast United States. The Swainson's thrush is circumboreal species that prefers dense coniferous forests for breeding. In the Northeast, the preferred habitat is northern mixed hardwood or conifer forests, such as the Allegheny National Forest and other forested regions throughout the northern tier counties of Pennsylvania. Swainson's thrushes winter in the central Amazon.

Pennsylvania Distribution by County



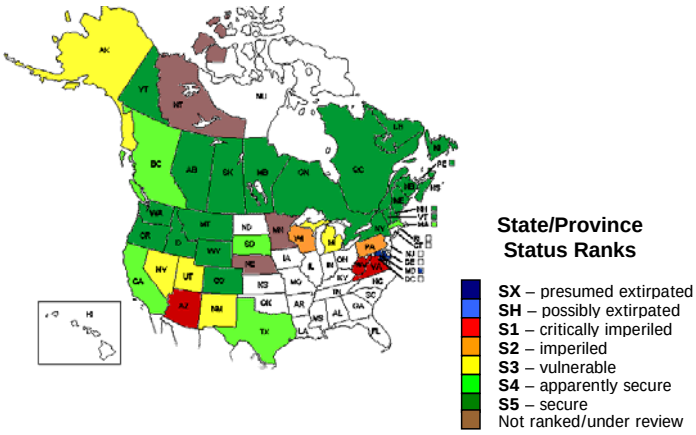
▲ current data
Pennsylvania Natural Heritage Program data 2003

Why it its rare:

This species is globally secure but declining throughout much of its range. In Pennsylvania, occurrences of breeding are uncommon to rare, and this species is considered imperiled to vulnerable throughout the state. The decline of breeding Swainson's thrushes is most likely due to the deterioration and loss of boreal forest types. In Pennsylvania, the loss of old-growth forest and logging of mature forest stands has reduced potential breeding habitat for these birds.

North American State/Province Conservation Status

Map by NatureServe



Conservation considerations:

Continued logging and fragmentation of northern forests and old-growth forests in the east will negatively affect the population status of this species. The Swainson's thrush's dependence on conifers makes it extremely susceptible to deforestation on breeding grounds. The hemlock woolly adelgid is a particular threat. A sustainable forestry practice to reduce fragmentation, such as unevenaged management or selective cutting, is recommended.

PNHP
Pennsylvania Natural Heritage Program

NatureServe conservation status ranks: G5 – considered globally secure; imperiled to vulnerable in Pennsylvania

References:

- Brauning, D.W. 1992. The Atlas of Breeding Birds in Pennsylvania. University of Pittsburgh Press. Pittsburgh, PA: 268-269.
- Ehrlich, P.R., Dobkin, D.S., and D. Wheye. 1988. The Birder's Handbook: A Field Guide to the Natural History of North American Birds. Simon and Shuster Inc. New York, NY: 452-464.
- McWilliams, G.M. and D.W. Brauning. 2000. The Birds of Pennsylvania. Cornell University Press. Ithaca, NY: 332-333.
- NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life [web application]. Version 5.0. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. Accessed: October 13, 2006.
- Outlaw, D. C., Voelker, G., Boria, M. and D.J. Girman. 2003. Evolution of long-distance migration in and historical biogeography of Catharus thrushes: a molecular phylogenetic approach. The Auk 120(2):299-310.
- Ridgely, R.S., T.F. Allnutt, T. Brooks, D.K. McNicol, D.W. Mehlman, B.E. Young, and J.R. Zook. 2003. Digital Distribution Maps of the Birds of the Western Hemisphere, version 1.0. NatureServe, Arlington, Virginia, USA.
- The Boreal Songbird Initiative. 2005. Swainson's Thrush (*Catharus ustalatus*) [web application]. The Boreal Songbird Initiative. Seattle WA. Available at http://www.borealbirds.org. Accessed on 13 Oct 2006.

South Woods Branch BDA

This BDA is delineated around an open roadside and adjacent forested streambank along the South Woods Branch of the First Fork Sinnemahoning Creek occupied by an **animal of special concern**. The forest community along the creek is primarily deciduous. Across the road is mixed coniferous forest. The surrounding landscape includes extensive forest, both publicly and privately owned, with agricultural and residential development within the site.

The animal species of special concern observed at this BDA is considered common within its range, vulnerable in Pennsylvania, and imperiled in the surrounding states of Ohio, West Virginia, and New York. Populations of this species in Pennsylvania are widely scattered, localized, and composed of relatively few individuals. This diurnally active terrestrial species favors open habitats such as rocky bluffs, dry shale barrens and sandstone slabs and ledges, in addition to humid, wooded areas. In general, females lay clutches of several eggs in moist soil or rotten logs during the summer and attend the eggs until they hatch. Its relatively small home range is typically not more than 30 meters (~100 feet) in diameter (Fitch 1954) and it is generally found within 50 meters (~170 feet) of water (NatureServe 2006).

Threats and Stresses

Given the roadside location of this site, direct threats to the animal of concern include disturbance to the animal and its habitat by roadside maintenance activities such as chemical spraying and mowing. Since populations are widely scattered in Pennsylvania and are composed of relatively few individuals, this species may be prone to localized extirpation due to habitat modification or destruction.

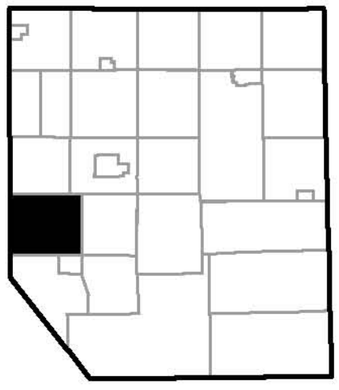
Conservation Recommendations

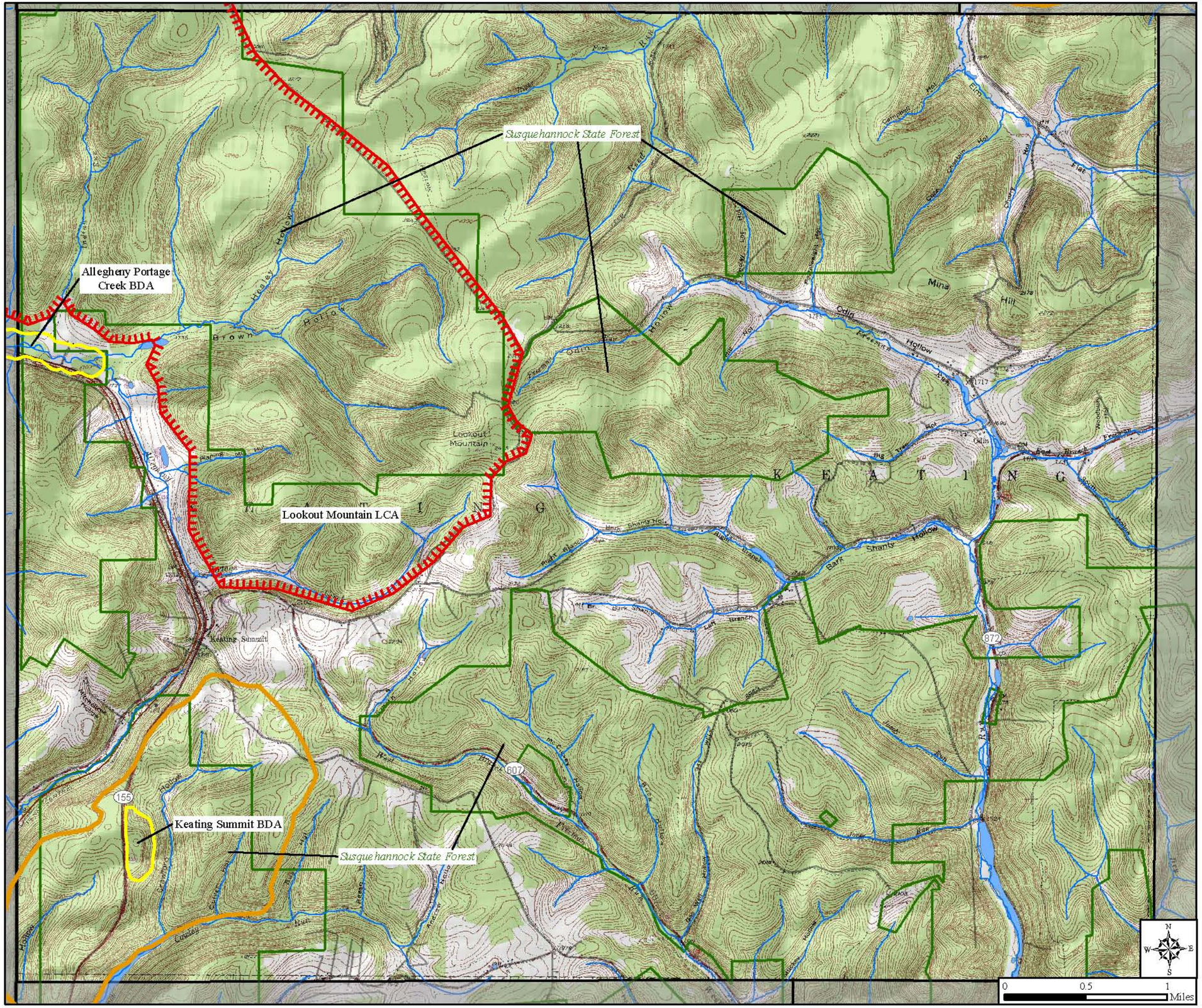
Workers involved in roadside maintenance activities within the site should be informed of the presence of the rare animal species. The application of chemicals, such as herbicides and salts, and mowing should be avoided, especially during the nesting season from late June through late August.

Keating Township

	PNHP Rank		Legal Status			
	Global	State	Federal	State	Last Seen	Quality
NATURAL HERITAGE AREAS:						
Allegheny Portage Creek BDA		*Notable Significance*				
American brook lamprey (*Lampetra appendix*)	G4	S3		PC	5/4/2005	E
Keating Summit BDA		*Notable Significance*				
animal of special concern	G5T3T4	S3			9/18/2006	E
Lookout Mountain LCA		*Notable Significance*				

OTHER CONSERVATION AREAS: Northern Allegheny Plateau IMA





Potter County
Natural Heritage Inventory
Keating Township

Biological Diversity Area:

Allegheny Portage Creek
Keating Summit

Landscape Conservation Area:

Lookout Mountain

Managed Land:

Susquehannock State Forest

Legend

Biological Diversity Area

○ Core Area
○ Supporting Landscape
○ Landscape Conservation Area
~ Streams
▨ NWI Wetlands
☐ Managed Land

KEATING TOWNSHIP

Keating Township is located in southwestern Potter County, bordered by McKean County. As with other municipalities in this region, it is largely forested (89%), with some large tracts of contiguous forest (Table 6, Figure 5). Agriculture is nine percent of the total land use in Keating Township and is scattered throughout the township, mostly along streams. Freeman Run and Allegheny Portage Creek are the major drainages that flow through the township. The West Branch of Cowley Run has been identified as an Exceptional Value (EV) stream. Sections of the Susquehannock State Forest are scattered throughout the township. The Northern Allegheny Plateau Important Mammal Area (IMA) occupies almost all of Keating Township, except for a small portion along the northern border of the township.

Allegheny Portage Creek BDA

The section of Allegheny Portage Creek that lies within this site provides habitat for the **American brook lamprey** (*Lampetra appendix*), an aquatic animal species of concern. This species requires cool, clear water and inhabits large creeks and small to medium rivers (NatureServe 2006). Eggs of the American brook lamprey are laid in nests in riffles and runs with a gravel/sand substrate and a strong current. Once the larvae hatch, they burrow into the loose substrate of pools or slow-moving water near stream banks, where they feed on plankton. The larval stage may last several years. The animal becomes sexually mature during the period of transformation from larva into adult (NatureServe 2006). Its distribution extends from Arkansas to Ontario in the West and from Alabama and North Carolina to Quebec in the east. In Pennsylvania, this lamprey species has previously only been recorded in Monroe, Venango and Warren counties and is considered imperiled in the state.

Threats and Stresses

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

Conservation Recommendations

Preserving forested river and stream corridors is key to maintaining high water quality. Timbering and road development or other construction activities should be kept well away from riparian corridors in order to avoid degrading important aquatic and river and streamside habitat. Although sections of the watersheds beyond the riparian zones have less direct influence on the stream ecosystems, a high degree of forest cover should be maintained for additional protection of the water quality and ecological integrity of the aquatic ecosystems. Landowners engaged in timber harvesting within the watershed can refer to *Best Management Practices for Pennsylvania Forests*, a brochure available through the College of Agricultural Sciences, Penn State University or online at http://pubs.cas.psu.edu/FreePubs/pdfs/uh102.pdf, for guidelines aimed at minimizing impacts from timber harvesting.

Keating Summit BDA

The core of this BDA is delineated along a stretch of rocky habitat created by a roadside cut through a forested landscape that is occupied by an **animal of special concern**. The forest community along the road is deciduous with sugar maple (*Acer saccharum*) and American basswood (*Tilia americana*) as dominant components. Striped maple (*Acer pensylvanicum*) is dominant in the understory and herbs are sparse. The surrounding landscape is extensive forest, both publicly and privately owned, with a few agricultural fields in the northeast section of the site. Three-quarters of the site is within the Susquehannock State Forest.

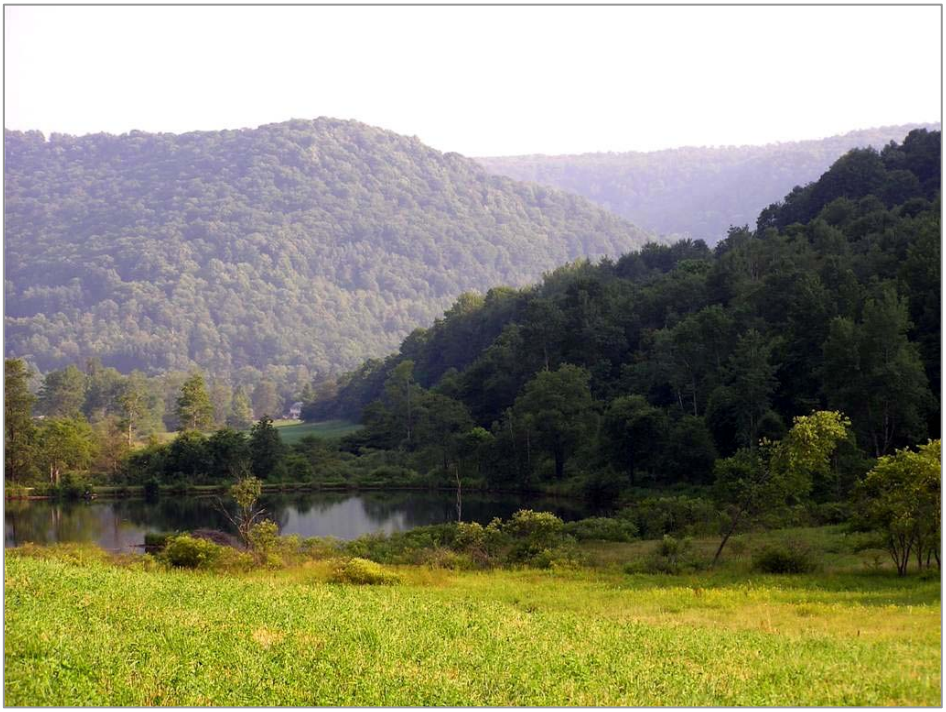
The animal species of special concern observed at this BDA inhabits steep, rocky, forested slopes of deciduous and mixed forests with a well-developed understory. This species' limited range extends from the Allegheny Plateau in western Pennsylvania through the Laurel Highlands to western Maryland and West Virginia. Eighty percent of its range is in Pennsylvania (Pennsylvania Game Commission 2005). It is considered a vulnerable species in the state.

Threats and Stresses

Given the roadside location of this site, direct threats to the animal of concern include disturbance to the animal and its habitat by roadside maintenance activities such as chemical spraying and mowing. Since populations are sporadically distributed within a limited range, this species may be prone to localized extirpation due to habitat modification or destruction.

Conservation Recommendations

Workers involved in roadside maintenance activities within the site should be informed of the presence of the rare animal species. The application of chemicals, such as herbicides and salts, and mowing should be avoided, especially during the birthing season from late August through September.



Viewshed of northern Potter County, 2005

Oswayo Township

NATURAL HERITAGE AREAS: None identified

OTHER CONSERVATION AREAS: None identified

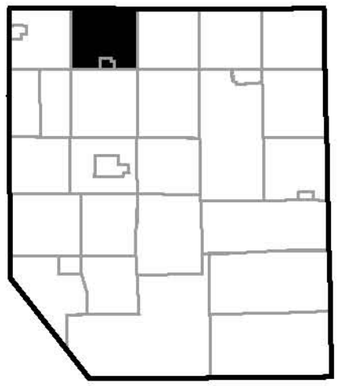
Potter County
Natural Heritage Inventory

Oswayo Township

Biological Diversity Area:
None

Landscape Conservation Area:
None

Managed Land:
None



Legend

Biological Diversity Area
- Core Area
- Supporting Landscape

Landscape Conservation Area
Streams
NWI Wetlands
Managed Land

0 0.5 1 Miles

OSWAYO TOWNSHIP

Oswayo Township, which includes Oswayo Borough, is located in northern Potter County, bordered by New York. As with other municipalities in the northeastern portion of Potter County, this township has much agricultural development (17%) relative to others in the county. A great deal of the remaining forest (80%) is fragmented by agriculture (Table 6, Figure 5). Oswayo Borough is a mixture of forestland (58%), agriculture (24%) and residential development (5%). Elevenmile Creek and Oswayo Creek are the major streams flowing through the township. The headwaters of some streams originate in the larger forested blocks, but later flow through agricultural areas that do not provide buffers against pollutants such as sediments and chemicals. All of the land within Oswayo Township is privately owned. No public lands or Important Mammal Areas (IMAs) are found within this municipality.

No Natural Heritage Areas were identified within Oswayo Township.

Pike Township

	PNHP Rank		Legal Status			
	Global	State	Federal	State	Last Seen	Quality
NATURAL HERITAGE AREAS:						
Ansley Hollow BDA		*Notable Significance*				
Fernald's hay sedge (*Carex foenea*)	G5	S2		PE	6/24/1996	E
Bristol Pond BDA		*Notable Significance*				
pied-billed grebe (*Podilymbus podiceps*)	G5	S3BS4N				
Clark Farm Road Complex BDA		*Notable Significance*				
ephemeral/fluctuating natural pool	--	S3			4/9/2006	E
Martin Hollow BDA		*High Significance*				
great-spurred violet (*Viola selkirkii*)	G5?	S1		N	5/9/2006	E
Phoenix Run Slopes BDA		*High Significance*				
mountain starwort (*Stellaria borealis*)	G5	S1S2		N	7/13/2005	A
State Game Land #64 BDA		*High Significance*				
downy willow-herb (*Epilobium strictum*)	G5?	S3		PE	8/12/2004	C
Slaughterhouse Swamp BDA		*Notable Significance*				
backward sedge (*Carex retrorsa*)	G5	S1		PE	7/17/1993	CD
State Game Land #64 LCA		*Exceptional Significance*				

OTHER CONSERVATION AREAS: Northern Allegheny Plateau IMA

Potter County
Natural Heritage Inventory
Pike Township
& Galeton Borough

Biological Diversity Area:

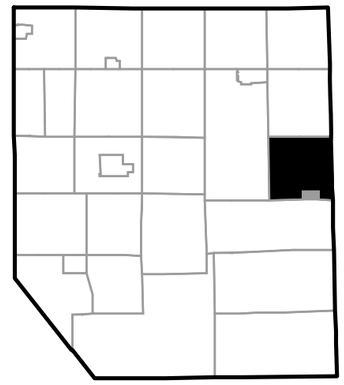
Ansley Hollow
Bristol Pond
Clark Farm Road Complex
Martin Hollow
Phoenix Run Slopes
State Game Land #64
Slaughterhouse Swamp

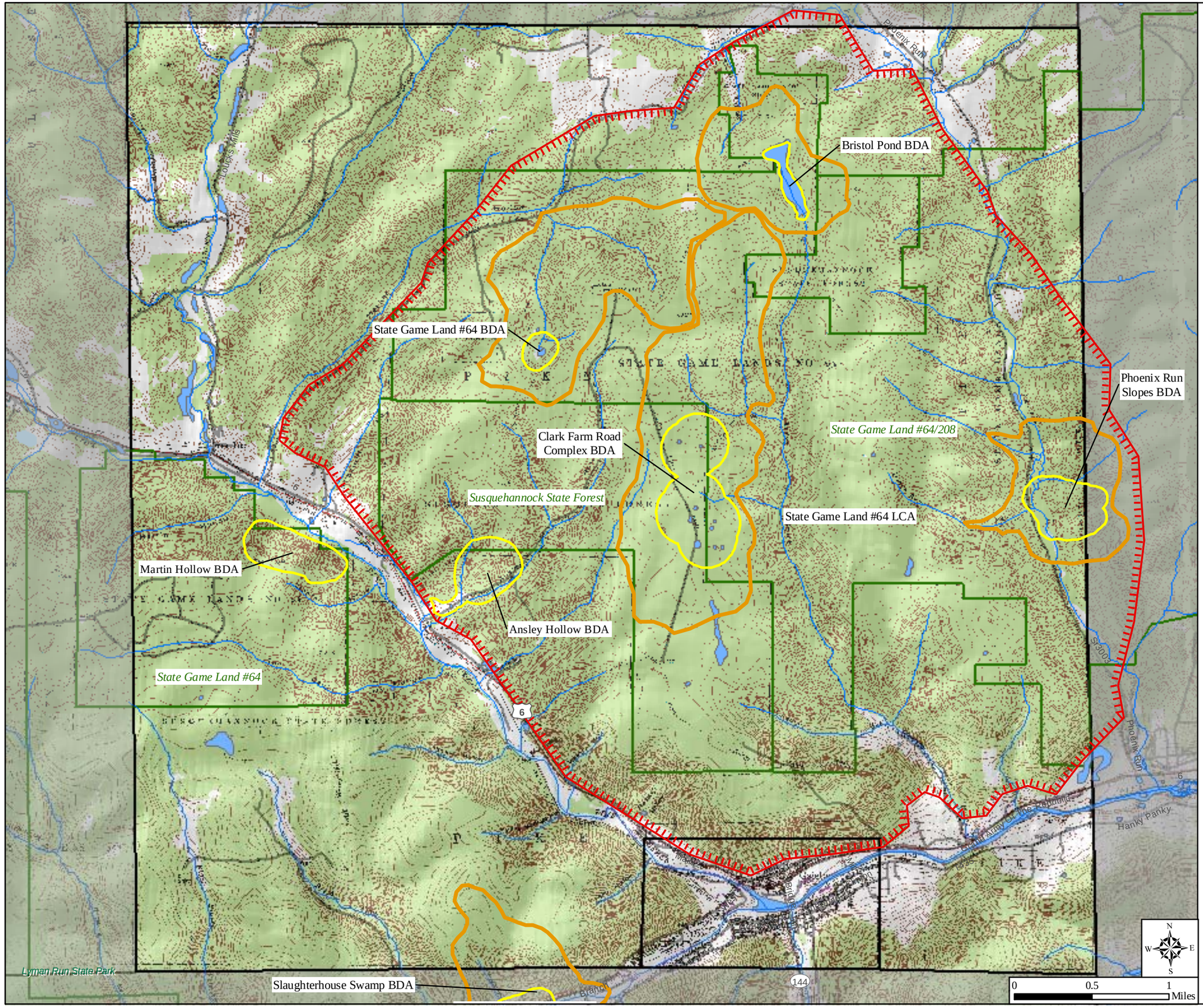
Landscape Conservation Area:

State Game Land #64 LCA

Managed Land:

State Game Land #64
State Game Land #208
Susquehannock State Forest





Legend

Biological Diversity Area

Core Area
Supporting Landscape
Landscape Conservation Area
Streams
NWI Wetlands
Managed Land

PIKE TOWNSHIP

Pike Township, which includes Galeton Borough, is located in eastern Potter County, bordered by Tioga County. Galeton is the most developed borough (27% residential) in Potter County (Table 6). The township is largely forested (91%), with tracts that have remained relatively intact. Agriculture is seven percent of the total land use in Pike Township, mostly occurring along the streams. Pine Creek, Johnson Brook, and Phoenix Run are the major drainages in the township. Portions of Pine Creek and Johnson Brook have been selected as Exceptional Value (EV) streams. State Game Land #64 and Susquehannock State Forest cover most of the township. The Northern Allegheny Plateau Important Mammal Area (IMA) is located in the large forest blocks of Pike Township.

Ansley Hollow BDA

The core of this BDA includes open field habitat bordered by upland deciduous forest that supports a Pennsylvania state endangered plant species, **Fernald's hay sedge** (*Carex foenea*). This sedge is unusual because it is found in dry upland habitats, including gravel and sandy banks (Rhoads and Block 2000). This species' distribution extends across northern North American south to Montana and Pennsylvania (Ball et al. 2002). It was previously thought that Fernald's hay sedge might have been extirpated from Pennsylvania. Today, it is considered critically imperiled in the state and occurs in several counties. This occurrence is the first in Potter County.

Plant species present in the open field are small pussy toes (*Antennaria howellii*), Japanese barberry (*Berberis thunbergii*), shaved sedge (*Carex tonsa*), spotted starthistle (*Centaurea biebersteinii*), Virginia strawberry (*Fragaria virginiana*), quaker-ladies (*Houstonia caerulea*), common cinquefoil (*Potentilla simplex*), white goldenrod (*Solidago bicolor*), and early lowbush blueberry (*Vaccinium pallidum*). Dry northern red oak (*Quercus rubra*) forest surrounds the open habitat where the rare sedge occurs. Species present include downy serviceberry (*Amelanchier arborea*), small pussy toes (*Antennaria howellii* ssp. *neodioica*), wild columbine (*Aquilegia canadensis*), loose flower sedge (*Carex laxiflora*), longstalk sedge (*C. pedunculata*), northern bush honeysuckle (*Diervilla lonicera*), hairy bedstraw (*Galium pilosum*), mountain honeysuckle (*Lonicera dioica*), four-flower loosestrife (*Lysimachia quadriflora*), eastern hop-hornbeam (*Ostrya virginiana*), gay-wing milkwort (*Polygala paucifolia*), Christmas fern (*Polystichum acrostichoides*), bluestem goldenrod (*Solidago caesia*), fall aster (*Symphyotrichum lowrieanum*), wavy-leaf aster (*S. undulatum*), coltsfoot (*Tussilago farfara*), perfoliate bellwort (*Uvularia perfoliata*), Le conte's violet (*Viola* cf. *affinis*), downy yellow violet (*V. pubescens*), and long-spur violet (*V. rostrata*).

Threats and Stresses

Threats to Fernald's hay sedge may be minimal at this site since this plant appears to do well in disturbed habitats. However, direct alteration or destruction of the plant, such as through the direct application of herbicides, is a concern. Since this population is near a new housing development, displacement by invasive exotic plant species that typically colonize disturbed habitats and permanent habitat conversion that would result from continued development in the area may be threats.

Conservation Recommendations

Non-native, invasive plants should be removed at the site. Application of chemicals by landowner should be carefully managed to avoid direct application to the rare plants. Mowing of fields within the site should not occur until after the plants have flowered and seeds have matured to ensure a viable seed bank for the next generation.

Bristol Pond BDA

A reservoir and adjacent wetland and forest communities form the core for this BDA that supports **pied-billed grebe** (*Podilymbus podiceps*), an animal species of concern in the state. The pied-billed grebe is the most widely distributed grebe in the Americas. It breeds from southern Alaska through much of North America to southern South America. It winters from British Columbia to Mexico in the west and the southern Great Lakes regions to the southern part of North America in the east. Populations in the northeastern U.S. are less abundant and more localized. The pied-billed grebe inhabits freshwater marshes, lakes, and sluggish rivers with dense emergent vegetation that the species utilizes for nest construction. The species has been known to nest in moderately to heavily populated areas as long as nesting habitat requirements are met (Muller and Storer 1999). This species is currently under consideration for listing as rare by the Pennsylvania Biological Survey. See the pied-billed grebe fact sheet, pg. 82, for more information about this species.

The shallow reservoir where the grebes are nesting was formed by the impoundment of the headwaters of Johnson Brook, a DEP-designated Exceptional Value stream. The supporting landscape of this BDA is the immediate watershed of contiguous forest surrounding the core habitat. Birds observed at the site included red-tailed hawk, double-crested cormorant, tree swallow, red-winged blackbird, eastern kingbird, veery, indigo bunting, yellow warbler, eastern towhee, black-throated blue warbler, rose-breasted grosbeak, wood duck with eight ducklings, yellow-billed cuckoo, cedar waxwing, mourning warbler, mallard, scarlet tanager, northern flicker, yellow-bellied flycatcher, Baltimore oriole, song sparrow, red-eyed vireo, least flycatcher, and eastern bluebird. See Appendix VII, pg. 152 for a list of scientific names.

Threats and Stresses

The reservoir and adjacent wetland and forest communities at this site lie entirely within State Game Land #64 and are currently under no imminent threat. In the northeastern United States, the greatest threat to the pied-billed grebe is the loss of wetland habitat. Additionally, pollution has been known to impact populations and historically, large numbers of grebes have been shot for sport (Muller and Storer 1999, NatureServe 2006).

Conservation Recommendations

No specific management needs are anticipated, given that the current management program is aimed at sustaining the reservoir within this tract of public land.

Clark Farm Road Complex BDA

The core of this site is delineated around an **ephemeral/fluctuating natural pool**—also known as a seasonal pool complex—located on a flat-topped forested ridge, and a 300 meter (~1000 feet) area intended to capture additional critical habitat for amphibian species that the wetland supports. Seasonal pools, also known as vernal pools, are wetlands that fill annually from precipitation, surface water runoff, and rising groundwater (Kenney and Burne 2000). The pools typically become completely dry through evaporation by late spring or summer. Since these ponds dry up during a portion of the year, they cannot support fish populations. During the brief time the pools contain water, and in the absence of fish, they become important breeding areas for a multitude of amphibian species such as spotted salamanders (*Abystoma maculatum*) and fairy shrimp (Order Anostraca), many of which breed solely in seasonal pools.

Supporting landscape for this site extends from core habitat to the boundary of the immediate watershed. The forest community is mixed oak (*Quercus alba, Q. rubra*), with some eastern hemlock (*Tsuga canadensis*), eastern white pine (*Pinus strobus*), and red maple (*Acer rubrum*). Other species present in the forest around seasonal pools include paper birch (*Betula papyrifera*), pitch pine (*Pinus rigida*) and European larch (*Larix cf. deciduas*). Herb species are brownish sedge (*Carex brunnescens*), hoary sedge (*C. canescens*), three-seed sedge (*C. trisperma*), blue ridge sedge (*C. lucorum*), goldthread (*Coptis trifolia*), bugleweed (*Lycopus* sp.),

sessile-leaf bellwort (*Uvularia sessilifolia*), teaberry (*Gaultheria procumbens*), Canada mayflower (*Maianthemum canadense*), white-grained mountain-ricegrass (*Oryzopsis asperifolia*), bracken fern (*Pteridium aquilinum*), cinnamon fern (*Osmunda cinnamomea*), black chokeberry (*Photinia melanocarpa*), bristly dewberry (*Rubus hispidus*), mountain holly (*Ilex montana*), and late lowbush blueberry (*Vaccinium angustifolium*).

The largely contiguous forest of the sections of the Susquehannock State Forest and State Game Land #64 found within this site is important in maintaining water quality of these wetlands and the health of adjacent habitats. Several tributaries to Johnson Brook, a DEP-designated Exceptional Value stream, have their headwaters within the site. Birds observed at the site during early spring were winter wren, common raven, white-breasted nuthatch, and golden-crowned kinglet. See Appendix VII, pg. 152 for a list of scientific names.

Threats and Stresses

Changes in hydrological pattern, light levels, or the contiguity of surrounding forest habitat may negatively impact the species and natural communities within this BDA. The seasonal pools are fed by surface runoff from the entire watershed area above them. Any activity resulting in earth disturbance could affect the current hydrological pattern at this site and potentially alter conditions within the seasonal pools. Additionally, disruptions to the forest adjacent to ponds may impact amphibian populations associated with the seasonal pools (Semlitsch and Bodie 2003). Conditions on the forest floor, including the presence of woody debris and leaf litter, moisture levels, and temperature, are important to the ability of amphibians to use this habitat.

Conservation Recommendations

Activities that remove forest canopy or result in earth disturbance should be avoided within 500 meters (~1650 feet) of the ponds, in order to avoid disrupting natural hydrological patterns in the ponds and to avoid impacts to potential amphibian populations. Where roads, clearings, or staging areas have already been constructed within this BDA, ditching and other drainage solutions should be directed toward preserving the natural drainage of the site and should provide effective erosion control. Inventories for invertebrates and amphibians should be conducted at the site.

Martin Hollow BDA

The core of this BDA is a rich, mesic northeast-facing forested slope occupied by **great-spurred violet** (*Viola selkirkii*), a plant species of special concern. Great-spurred violet is found in rich, cool woods and shady ravines throughout Canada and the northern United States extending as far south as Pennsylvania. The species has been observed mostly in the northeast portion of the state, with a disjunct population in Erie County; observations in Potter County are new county records. The great-spurred violet is considered critically imperiled in the state, but globally secure.

The forest community at this site is northern hardwood; dominant canopy species include yellow birch (*Betula alleghaniensis)*, white ash (*Fraxinus americana*), and red maple (*Acer rubrum*), with striped maple (*Acer pensylvanicum*) common in the understory. Herb species include squirrel corn (*Dicentra canadensis*), Carolina spring beauty (*Claytonia caroliniana*), marginal wood fern (*Dryopteris marginalis*), intermediate wood fern (*Dryopteris intermedia*), Canada violet (*Viola canadensis*), stinging nettle (*Urtica dioica*), two-leaf toothwort (*Cardamine diphylla*), ill-scented trillium (*Trillium erectum*), heartleaf foamflow (*Tiarella cordifolia*), wood-sorrel (*Oxalis* sp.), lowland brittle fern (*Cystopteris protrusa*), and Indian cucumber root (*Medeola virginiana*). The lower slope of the site is along Pine Creek and has riparian forest that is dominated by eastern hemlock (*Tsuga canadensis*). Other plants include eastern hop-hornbeam (*Ostrya virginiana*), yellow birch, serviceberry (*Amelanchier* sp.), skunk-cabbage (*Symplocarpus foetidus*), yellow trout-lily (*Erythronium americanum*), and intermediate and marginal wood ferns.

Threats and stresses

Given that this BDA is located within public lands of State Game Land #64, the population of great-spurred violet is under no immediate threat. However, trampling by wildlife, such as white-tailed deer, or recreationists, may be a risk. Great-spurred violet's dependence on cool, moist boreal habitats may also make it potentially vulnerable to large-scale climate changes and it is not known if the species can be sustained through catastrophic drought or prolonged climatic change (Hornbeck et al. 2003).

Conservation Recommendations

The Pennsylvania Game Commission (PGC) recognizes the critical nature of deer overbrowsing and is actively engaged in addressing this issue through measures such as increasing hunter access, supporting research, monitoring habitat, and public education. In addition, the PGC has implemented a Deer Management Assistance Program to focus additional hunter pressure on specific areas to reduce deer browsing pressure.

Phoenix Run Slopes BDA

At the core of this BDA is a forested seep upslope from Phoenix Run along a west-facing slope that supports **mountain starwort** (*Stellaria borealis*), a plant species of special concern. Mountain starwort's range extends from western United States and Canada south through West Virginia in the Northeast. It is considered to be critically imperiled in Pennsylvania and is rare on moist slopes, swamps and streambank habitats throughout the state (Rhoades and Block 2000). This observation is a new county record for Potter County.

The supporting landscape of this BDA extends to the boundary of the immediate watershed of the seepage wetland and includes a mosaic of hemlock – mixed hardwood palustrine forest with associated channels and upland forest. The upland forest is dominated by yellow birch (*Betula alleghaniensis*), quaking aspen (*Populus tremuloides*), and northern red oak (*Quercus rubra*). Other canopy species include black birch (*Betula lenta*), paper birch (*B. papyrifera*), American beech (*Fagus grandifolia*), and white ash (*Fraxinus americana*). The surrounding forest shades the seep where the mountain starwort is found. Dominant herbs include slender mannagrass (*Glyceria melicaria*) and drooping sedge (*Carex prasina*). Other herbs present are perennial bentgrass (*Agrostis perennans*), ladyfern (*Athyrium filix-femina* var. *angustum*), Pennsylvania watercress (*Cardamine pensylvanica*), Bailey's sedge (*Carex baileyi*), bristly-stalk sedge (*C. leptalea*), drooping sedge (*C. prasina*), necklace sedge (*C. projecta*), rough sedge (*C. scabrata*), common mouse-ear chickweed (*Cerastium fontanum*), small enchanter's-nightshade (*Circaea alpina*), purpleleaf willowherb (*Epilobium coloratum*), field horsetail (Equisetum arvense), nodding fescue (*Festuca subverticillata*), stiff marsh bedstraw (*Galium tinctorium*), slender mannagrass (*Glyceria melicaria*), fowl mannagrass (*Glyceria striata*), American water-pennywort (*Hydrocotyle americana*), common St. John's-wort (*Hypericum punctatum*), jewelweed (*Impatiens capensis*), sensitive fern (*Onoclea sensibilis*), common yellow wood-sorrel (*Oxalis stricta*), tall buttercup (*Ranunculus acris*), bristly buttercup (*R. caricetorum*), hooked crowfoot (*R. recurvatus*), bitter dock (*Rumex obtusifolius*), mad-dog skullcap (*Scutellaria lateriflora*), northern stitchwort (*Stellaria borealis*), and American speedwell (*Veronica americana*). The entire site is contained within State Game Land #64.

Threats and Stresses

The intact condition of the landscape within the watershed serves to enhance the ecological value of the seepage wetland and forest communities by maintaining water quality and wetland health, as well as providing a large contiguous forest throughout which native species can move and disperse. Runoff from activities such as logging and road building upslope from the population of mountain starwort may contribute to physical degradation of the site.

Conservation Recommendations

Timbering and road development or other construction activities should be kept well away from the core habitat in order to avoid degrading important seepage wetland and forest habitat.

Slaughterhouse Swamp BDA

This Natural Heritage Area is discussed under West Branch Township (pg. 120). A portion of the watershed of this BDA crosses over into Pike Township and any negative affects on hydrology should be minimized.

State Game Land #64 BDA

The core of this site is delineated around a headwater graminoid wetland located on a high-elevation saddle that supports a population of **downy willow-herb** (*Epilobium strictum*), a plant species of special concern. Downy willow-herb, a Pennsylvania endangered plant species, is found in several counties throughout Pennsylvania, but is specific to wetland habitats. It is found in wet meadows and thickets, as well as in calcareous marshes (Rhoads and Block 2000), a critically imperiled wetland community in the state. The range of downy willow-herb extends from Ontario to Nova Scotia south to Iowa and Delaware (NatureServe 2006). As an obligate wetland species, it is highly threatened by wetland destruction and pollution.

The wetland at this site serves as the headwaters of an unnamed stream that flows northward before entering Pine Creek. Woody plant species present at the site include eastern hemlock (*Tsuga canadensis*), musclewood (*Carpinus caroliniana*), yellow birch (*Betula alleghaniensis)*, black cherry (*Prunus serotina*), red maple (*Acer rubrum*), American beech (*Fagus grandifolia*), multiflora rose (*Rosa multiflora*), American basswood (*Tilia americana*), white ash (*Fraxinus americana*), gooseberry (*Ribes* sp.), and striped maple (*Acer pensylvanicum*). Herbs include zig-zag aster (*Aster prenanthoides*), a violet (*Viola* sp.), Canada mayflower (*Maianthemum canadense*), Canada wood nettle (*Laportea canadensis*), bedstraw (*Galium* sp.), self-heal (*Prunella vulgaris*), jewelweed (*Impatiens* sp.), northern bugleweed (*Lycopus uniflorus*), white avens (*Geum canadense*), tearthumb (*Polygonum sagittatum*), golden ragwort (*Packera aurea*), mad-dog skullcap (*Scutellaria lateriflora*), starflower (*Trientalis borealis*), agrimony (*Agrimonia* sp.), Jack-in-the-pulpit (*Arisaema triphyllum*), wood-sorrel (*Oxalis* sp.), white rattlesnake-root (*Prenanthes alba*), heartleaf foamflow (*Tiarella cordifolia*), false hellebore (*Veratrum viride*), American golden saxifrage (*Chrysosplenium americanum*), and pennywort (*Hydrocotyle* sp.).

The supporting landscape extends to the boundary of the immediate watershed hydrologically linked to the wetland. This watershed is entirely forested and lies within State Game Land #64. The forest is predominantly deciduous, with hemlocks largely confined to the wetland edge. The intact condition of the landscape within the watershed serves to enhance the ecological value of the wetland and stream communities by maintaining water quality and wetland health, as well as providing a large contiguous forest throughout which native species can move and disperse.

Threats and Stresses

This BDA is under no imminent threat since the wetland at the core of this site lies entirely within State Game Land #64 and thus is protected (PA Bureau of Forestry 2003b). However, the westward migration of the hemlock woolly adelgid (*Adelges tsugae*) poses a serious potential threat to this site. Infestations of this insect pest can result in high levels of hemlock mortality, further opening up the forest canopy and thus altering the light and hydrologic regimes of this wetland.

Conservation Recommendations

Any land management decisions regarding the watershed surrounding this site should take into consideration potential impacts to the wetland, including alterations to the light, temperature, and hydrologic regimes. Periodic monitoring for hemlock woolly adelgid is recommended, as well as further surveys to document amphibian and insect species utilizing the wetland.

Pied-billed Grebe (*Podilymbus podiceps*)

What it is:

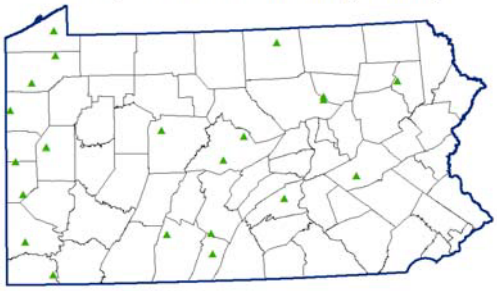
The pied-billed grebe is a small water bird, about 31-38 centimeters in length, with a blunt beak that bears a single distinctive stripe in the mating season. Male and female adults are both drab brown with white rumps and diagnostic black patches on the throat and forehead; the chicks are striped in a black and white pattern. Because of their secretive nature, especially during the breeding season, population size and distribution are not well known. Breeding season occurs from early May to mid August. Pied-billed grebes usually lay one, but sometimes two broods. Clutch size is 4-7 eggs.

Victor Loewen, Animal Diversity Web.

Where it is found:

Pied-billed grebes inhabit wetlands near open water, including farm ponds, marshes, artificial lakes, and flooded quarries. They require thick vegetation of some sort – rushes, reeds, or cattails – to provide cover and anchorage for their floating nests. They are year-round residents of the North American southeast and west, as well as southern South America; and breeding residents from the midwestern and eastern United States north into Canada.

Pennsylvania Distribution by County



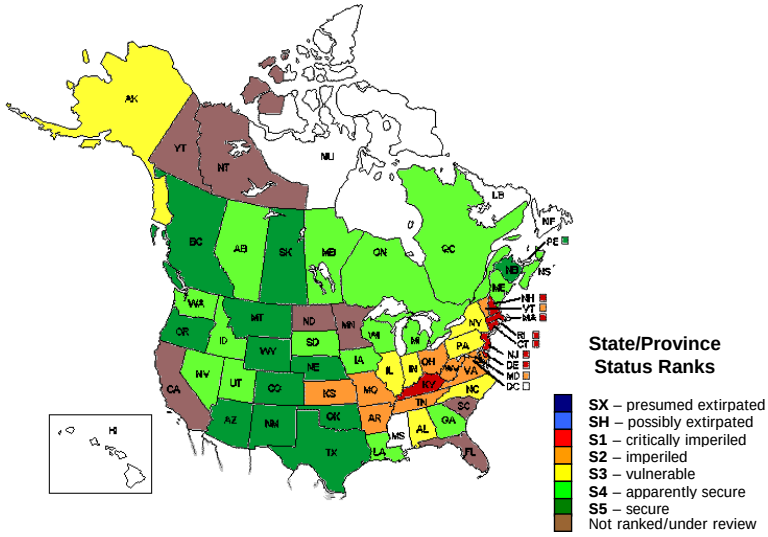
current data
Pennsylvania Natural Heritage Program data 2003

Why it is rare:

The pied-billed grebe is most vulnerable to human alteration of its wetland habitats: draining, filling, or other interference with natural hydrology. This danger may be offset by the grebe's willingness to nest in artificial ponds. Recreational activities such as boating and fishing may also disturb the birds.

North American State/Province Conservation Status

Map by NatureServe



Conservation considerations:

The pied-billed grebe can benefit most from preservation and restoration of wetland habitats and from control of disruptive human activities near its breeding grounds. NatureServe's management recommendations call for preserved wetlands to be larger than 10 hectares, with healthy populations of emergent and submerged vegetation; and for breeding grounds to be protected from chemical pollution, siltation, and eutrophication. Maintenance of stable water levels in managed wetlands can greatly improve the grebes' reproductive success.

Pennsylvania Natural Heritage Program

NatureServe conservation status ranks:

G5 – apparently secure worldwide

S3B, S4N – breeding populations are considered vulnerable, but non-breeding populations are apparently secure in Pennsylvania

References:

- Brauning, Daniel W., ed. 1992. Atlas of Breeding Birds in Pennsylvania. Pittsburgh: University of Pittsburgh Press. 44-5.
- NatureServe. 2004. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.1. NatureServe, Arlington, Virginia. Available at http://www.natureserve.org/explorer. Accessed 11 January 2005.
- Smith, A. 2003. "Podilymbus podiceps." Animal Diversity Web [web application]. University of Michigan Museum of Zoology, Ann Arbor, Michigan. Available at http://animaldiversity.ummz.umich.edu/site/accounts/ information/Podilymbus_podiceps.html. Accessed 24 February 2005.
- U.S. Fish and Wildlife Service. 2005. Digital Library System: Gateway to Digital Media [web application]. USFWS, Washington, DC. Available at http://www.images.fws.gov. Accessed 14 February 2005.

Streambank habitat, southern Potter County, 2005

Pleasant Valley Township

NATURAL HERITAGE AREAS: None identified

OTHER CONSERVATION AREAS: None identified

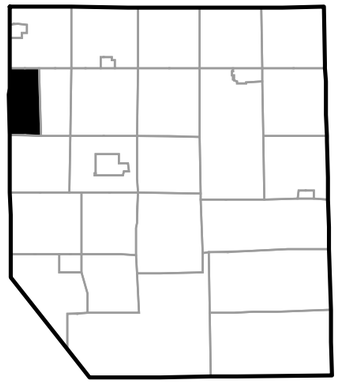
Potter County
Natural Heritage Inventory

Pleasant Valley Township

Biological Diversity Area:
None

Landscape Conservation Area:
None

Managed Land:
State Game Land #59



State Game Land #59

Legend

Biological Diversity Area
- Core Area
- Supporting Landscape

Landscape Conservation Area
Streams
NWI Wetlands
Managed Land

0 0.5 1 Miles

PLEASANT VALLEY TOWNSHIP

Pleasant Valley Township, the second smallest township in the county, is located in western Potter County, bordered by McKean County. Nearly all the township is forested (84%) and much of the forest is in large, contiguous tracts larger than 1000 acres (Table 6, Figure 5). Agriculture occurs along many of the streams, covering 13 percent of the township. Sartwell Creek and the Shaytown Branch of Bell Run primarily drain the township. Most of the streams in the township flow through agricultural areas and along roads, which provide little buffering capacity to remove sediments and chemicals before they enter into the streams. State Game Land #59 occupies much of the forested area in southern Pleasant Valley Township. No Important Mammal Areas (IMAs) are found within this municipality.

No Natural Heritage Areas were identified within Pleasant Valley Township.

Portage Township

	PNHP Rank		Legal Status			
	Global	State	Federal	State	Last Seen	Quality
NATURAL HERITAGE AREAS:						
East Branch Cowley Run BDA		*High Significance*				
northern pygmy clubtail (*Lanthus parvulus*)	G4	S3S4			8/2/2005	E
Keating Summit BDA		*Notable Significance*				
animal of special concern	G5T3T4	S3			9/18/2006	E
Bailey Run LCA		*High Significance*				

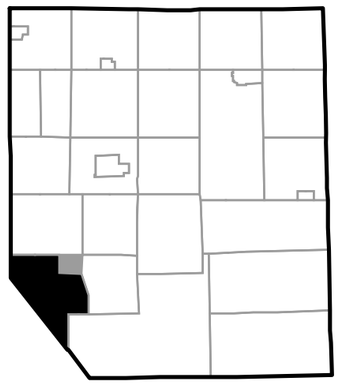
OTHER CONSERVATION AREAS: Northern Allegheny Plateau IMA

Potter County
Natural Heritage Inventory
Portage Township & Austin Borough

Biological Diversity Area:
East Branch Cowley Run
Keating Summit

Landscape Conservation Area:
Bailey Run

Managed Land:
Sizerville State Park
Susquehannock State Forest



Keating Summit BDA
East Branch Cowley Run BDA
Sizerville State Park
Susquehannock State Forest
Bailey Run LCA
155
872
607

Legend

Biological Diversity Area
- Core Area
- Supporting Landscape

Landscape Conservation Area
Streams
NWI Wetlands
Managed Land

N W E S

0 0.5 1 Miles

PORTAGE TOWNSHIP

Portage Township, which includes Austin Borough, is located in southwestern Potter County, bordered by McKean County to the west and Cameron County to the south. Forests comprise 88 percent of Austin, with the remainder of the land in agricultural (6%) and residential development (4%)(Table 6). As with other municipalities in this region, the township is largely forested (96%), with large tracts of contiguous forest (Table 6, Figure 5). The West Branch of Freeman Run and East and the West Branch of Cowley Run are the major drainages in Portage Township. The East and West Branch of Cowley Run and Bailey Run have been identified as Exceptional Value (EV) streams. Almost the entire township is publically owned: the Elk and Susquehannock State Forests occupy all but small portions of northeastern Portage Township and Sizerville State Park occupies the southwest corner of the township. The Northern Allegheny Plateau Important Mammal Area (IMA) covers the entire township.

East Branch Cowley Run BDA

This section of East Branch Cowley Run, a DEP-designated Exceptional Value stream, and adjacent forest provide habitat for the **northern pygmy clubtail** (*Lanthus parvulus*), a dragonfly species of special concern. Dragonflies, as with other members of the Order Odonata, have three stages in their life cycle: egg, nymph, and adult. Dragonflies lay their eggs in water and this species utilizes clear, small wooded streams with riffles and sandy substrate for egg laying. After the eggs hatch, the nymphs remain in the water through several instars, feeding on small aquatic organisms until they eventually grow wings and emerge from the water as terrestrial adults (Dunkle 2000). The northern pygmy clubtail has a range that extends from Nova Scotia and Quebec to Tennessee and South Carolina (NatureServe 2006). In Pennsylvania, this dragonfly is found in the upper Allegheny River watershed of the north central region and in the Juniata River watershed of Huntingdon County and is considered a vulnerable species.

The entire BDA, which extends from East Branch Cowley Run to the boundary of the immediate watershed, is contained within Sizerville State Park and Elk State Forest. The cobbly stream is braided with small graminoid islands and back channels. There is some woody debris within the stream, especially in open areas. Small fish, many water skimmers (*Aquarius* spp.), and adult dragonflies were observed using the stream. The surrounding landscape is primarily forested and dominated by eastern hemlock (*Tsuga canadensis*), sugar maple (*Acer saccharum*), and yellow birch (*Betula alleghaniensis*). Other canopy and shrub species present are eastern white pine (*Pinus strobus*), red maple (*Acer rubrum*), black cherry (*Prunus serotina*), witch-hazel (*Hamamelis virginiana*), willow (*Salix* sp.), musclewood (*Carpinus caroliniana*), and white ash (*Fraxinus americana*). Herbs include vervain (*Glandularia* sp.), hay-scented fern (*Dennstaedtia punctilobula*), wild hydrangea (*Hydrangea arborescens*), goldenrod (*Solidago* sp.), bedstraw (*Galium* sp.), jewelweed (*Impatiens capensis*), milkweed (*Asclepias* sp.), brittle-stem hempnettle (*Galeopsis tetrahit*), sensitive fern (*Onoclea sensibilis*), interrupted fern (*Osmunda claytonia*), cottongrass bulrush (*Scirpus cyperinus*), foxtail (*Alopecurus* sp.), and deer-tongue witchgrass (*Panicum clandestinum*).

Threats and Stresses

The largely contiguous forest found within the immediate watershed of this site is important in maintaining water quality of East Branch Cowley Run and the health of adjacent habitats. A forested watershed functions to maintain water quality and natural nutrient cycles in its associated streams. Removal of forest cover on steep slopes is especially problematic because of the potential for increased runoff and erosion following storm events. Runoff from dirt and gravel roads in close proximity to the wetlands can contribute to physical degradation of the site.

Conservation Recommendations

The Pennsylvania Bureau of Forestry continues to develop and implement best management practices (BMPs) to minimize and prevent water pollution, as well as support and engage in research to restore degraded surface and groundwater resources. Landowners should refer to the Bureau's State Forest

Resources Management Plan (available online at http://www.dcnr.state.pa.us/forestry/sfrmp/water.htm) for management guidelines pertaining to aquatic and riparian ecosystems. Preserving the riparian corridors along waterways is key to maintaining high water quality. Timbering and road development or other construction activities should be kept well away from the riparian corridors in order to avoid degrading important aquatic and streamside habitat.

Keating Summit BDA

This Natural Heritage Area is discussed under Keating Township (pg. 70). This roadside BDA extends into Portage Township. Roadside maintenance activities such as mowing and herbicide application should be avoided.

Roulette Township

	PNHP Rank		Legal Status			
	Global	State	Federal	State	Last Seen	Quality
NATURAL HERITAGE AREAS:						
Allegheny River at Reed Run BDA		*Exceptional Significance*				
American brook lamprey (*Lampetra appendix*)	G4	S3		PC	6/7/2005	E
animal of special concern	G5	S1S2		PT	7/15/2002	E
hemlock palustrine forest	--	S3			8/18/2005	E
Fishing Creek BDA		*High Significance*				
American brook lamprey (*Lampetra appendix*)	G4	S3		PC	6/7/2005	E
animal of special concern 1	G5	S1S2		PT	5/4/2005	E
animal of special concern 2	G3	S2S3		PT	5/4/2005	E
Lookout Mountain LCA		*Notable Significance*				

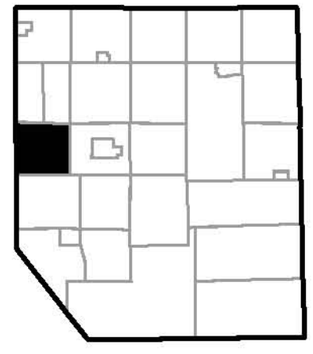
OTHER CONSERVATION AREAS: Northern Allegheny Plateau IMA

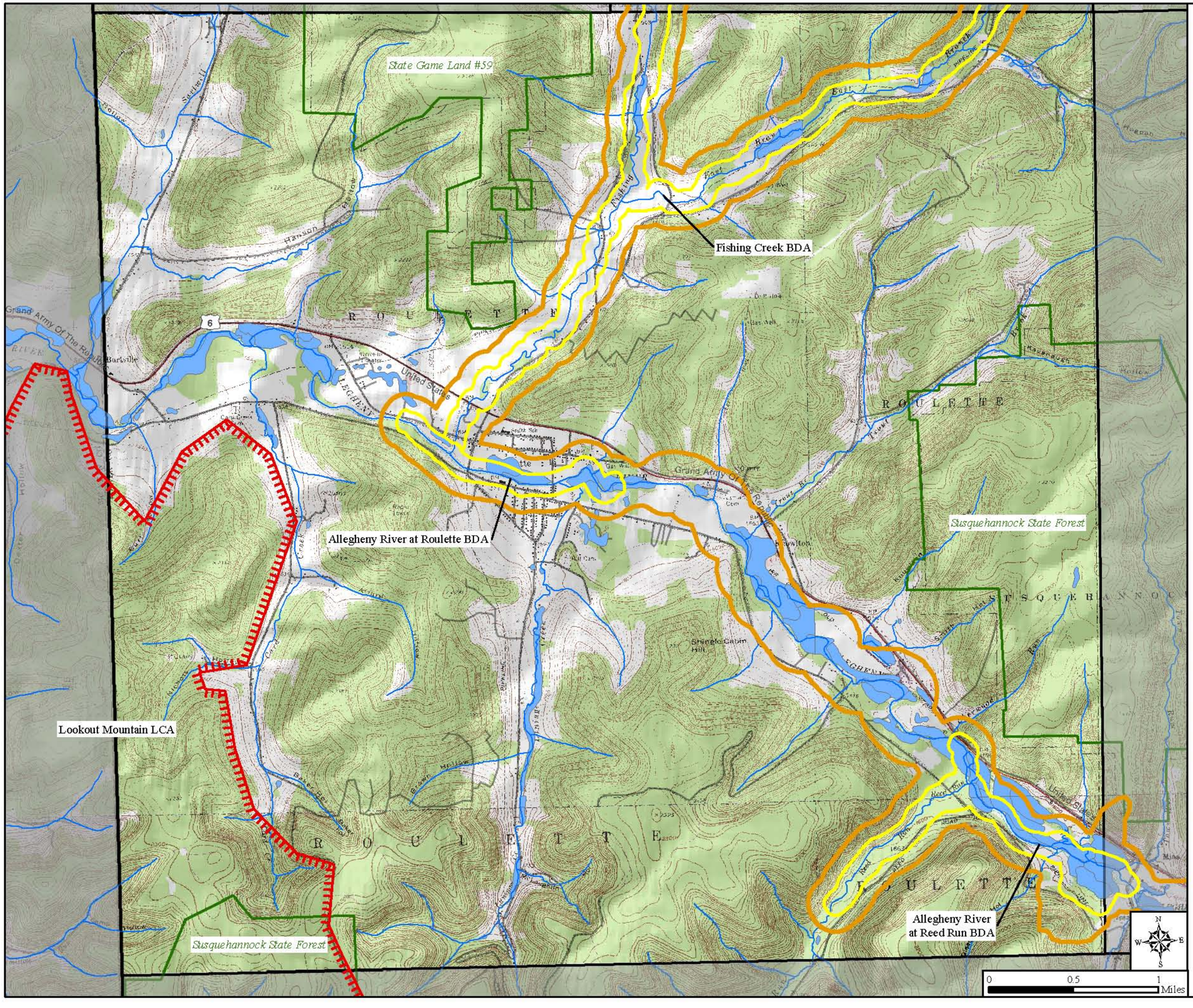
Potter County
Natural Heritage Inventory
Roulette Township

Biological Diversity Area:
Allegheny River at Reed Run
Allegheny River at Roulette
Fishing Creek

Landscape Conservation Area:
Lookout Mountain

Managed Land:
State Game Land #59
Susquehannock State Forest





Legend

Biological Diversity Area
- Core Area
- Supporting Landscape

Landscape Conservation Area
Streams
NWI Wetlands
Managed Land

ROULETTE TOWNSHIP

Roulette Township is located in western Potter County, bordered by McKean County. Over three-quarters of this township is forested with most tracts larger than 1000 acres (Table 6, Figure 5). Agriculture tends to occur along streams and is 17 percent of the total land use in Roulette Township. The Allegheny River and Fishing Creek are the major drainages in the township. Most of the streams flow along roads and through agricultural areas, which do not provide a buffer against pollutants such as sediments and chemicals. State Game Land #59 and Susquehannock State Forest occupy the northwest and southeast sections of Roulette Township, respectively. The Northern Allegheny Plateau Important Mammal Area (IMA) is located in the large forest tracts in the southern half of the township.

Allegheny River at Reed Run BDA

The cores of this BDA are delineated around sections of the Allegheny River that provide habitat for the **American brook lamprey** (*Lampetra appendix*), two **animal species of concern**, and a **hemlock palustrine forest** community adjacent to the river. Eggs of the American brook lamprey are laid in nests in riffles and runs with a gravel/sand substrate and a strong current. Once the larvae hatch, they burrow into the loose substrate of pools or slow-moving water near stream banks, where they feed on plankton. The larval stage may last several years. The animal becomes sexually mature during the period of transformation from larva into adult (NatureServe 2006). In Pennsylvania, this species has only been previously recorded in Monroe, Venango, and Warren counties. Its distribution extends from Arkansas to Ontario in the West and from Alabama and North Carolina to Quebec in the East. The two rare animal species require cool, clear water and inhabit large creeks, deep lakes, and small to medium rivers (NatureServe 2006).

The hemlock palustrine forest community found at this site is dominated by eastern hemlock (*Tsuga canadensis)*. Speckled alder (*Alnus incana* ssp. *rugosa*) and black holly (*Ilex verticillata*) are dominant shrub species in areas where the canopy opens up. Other woody plants present include downy serviceberry (*Amelanchier arborea*), yellow birch (*Betula alleghaniensis*), black ash (*Fraxinus nigra*), and eastern white pine (*Pinus strobus*). The forest floor has the pit and mound microtopography characteristic of hemlock palustrine forests in northern Pennsylvania, with many of the pits holding standing water and dominated by sphagnum mosses (*Sphagnum* spp.). The herb layer is sparse under the dense canopy and includes interrupted and cinnamon ferns (*Osmunda claytoniana, O. cinnamomea*), jewelweed (*Impatiens capensis*), and skunk-cabbage (*Symplocarpus foetidus*).

Other herbs present include perennial bentgrass (*Agrostis perennans*), wild sarsaparilla (*Aralia nudicaulis*), Jack-in-the-pulpit (*Arisaema triphyllum*), lady-fern (*Athyrium filix-femina*), marsh marigold (*Caltha palustris*), Pennsylvania watercress (*Cardamine pensylvanica*), three-seed sedge (*Carex trisperma* var. *trisperma*), American golden-saxifrage (*Chrysosplenium americanum*), slender wood reedgrass (*Cinna latifolia*), Clinton lily (*Clintonia borealis*), Canada horse-balm (*Collinsonia canadensis*), goldthread (*Coptis trifolia*), early coralroot (*Corallorhiza trifida*), spinulose shieldfern (*Dryopteris carthusiana*), purpleleaf willowherb (*Epilobium coloratum*), rough bedstraw (*Galium asprellum*), stiff marsh bedstraw (*G. tinctorium*), slender mannagrass (*Glyceria melicaria*), jewelweed (*Impatiens capensis*), creeping jenny (*Lysimachia nummularia*), Canada mayflower (*Maianthemum canadense*), sensitive fern (*Onoclea sensibilis*), northern naugehyde liverwort (*Ptilidium ciliare*), bristly buttercup (*Ranunculus caricetorum*), cut-leaved coneflower (*Rudbeckia laciniata*), swamp saxifrage (*Saxifraga pensylvanica*), mad-dog skullcap (*Scutellaria lateriflora*), halberd-leaf greenbrier (*Smilax hispida*), climbing nightshade (*Solanum dulcamara*), heartleaf foamflower (*Tiarella cordifolia*), American speedwell (*Veronica americana*), smooth white violet (*Viola blanda*), marsh blue violet (*V. cucullata*), and a variety of sedges (*Carex* spp.)

The brownwater streams flowing from this wetland are high in tannins and naturally low in pH, with the potential of supporting unique aquatic fauna, particularly insects. Tannins are complex organic acids released during the decay of plant materials (Colburn 2004). Organic acids can serve as food for bacteria and some animals, they can buffer water from inputs of mineral acids (such as those present in acid precipitation), and

in some cases they can bind metals and prevent them from having adverse effects on aquatic organisms (Colburn 2004).

The supporting landscape for the hemlock palustrine forest extends to the boundary of the immediate watershed hydrologically linked to the wetland and is entirely forested. The intact condition of the landscape within the watershed serves to enhance the ecological value of the wetland community by maintaining water quality and wetland health, as well as providing a large contiguous forest throughout which native species can move and disperse.

Threats and Stresses

The westward migration of the hemlock woolly adelgid (*Adelges tsugae*) poses a serious potential threat to the hemlock palustrine forest community at this site. Infestations of this insect pest can result in high levels of hemlock mortality, opening up the forest canopy and thus altering the amount of light, evaporation, and transpiration within this wetland. Maintaining suitable river habitat is key to the continued success of the aquatic animal species. Runoff from dirt and gravel roads in close proximity to rivers can contribute to physical degradation of the river channels and erosion and sediment pollution in the rivers. Loss of forest cover within the core areas may also result in increased water temperatures and disruption of natural nutrient cycling linked to the rivers. If forest cover is substantially reduced within the watersheds, water quality is likely to decline from increased sediment loads. Removal of forest cover on steep slopes is especially problematic because of the potential for increased runoff and erosion following storm events.

Conservation Recommendations

Any land management decisions regarding the watershed supporting the hemlock palustrine forest should take into consideration potential impacts to the wetland, including alterations to the light, temperature, and hydrologic regimes. Periodic monitoring for hemlock woolly adelgid is recommended, as well as further surveys to document amphibian and insect species utilizing the wetland. Preserving forested river corridors is key to maintaining high water quality. Timbering and road development or other construction activities should be kept well away from riparian corridors in order to avoid degrading important aquatic and riverside habitat.

Fishing Creek BDA

These tributaries to the Allegheny River—Fishing Creek and East Branch Fishing Creek—provide habitat for the **American brook lamprey** (*Lampetra appendix*) and another aquatic **animal of special concern**. These species require cool, clear water and inhabit large creeks, deep lakes, and small to medium rivers (NatureServe 2006). Eggs of the American brook lamprey are laid in nests in riffles and runs with a gravel/sand substrate and a strong current. Once the larvae hatch, they burrow into the loose substrate of pools or slow-moving water near stream banks, where they feed on plankton. The larval stage may last several years. The animal becomes sexually mature during the period of transformation from larva into adult (NatureServe 2006). In Pennsylvania, this species has only been previously recorded in Monroe, Venango, and Warren counties. Its distribution extends from Arkansas to Ontario in the West and from Alabama and North Carolina to Quebec in the East. The animal of special concern, a Pennsylvania endangered species, has only been recorded in the four northwestern counties along the New York border of the state. It is considered critically imperiled in Pennsylvania, but globally secure. Its distribution extends from northern Canada across North America south to Kansas and Kentucky.

Threats and Stresses

Maintaining suitable stream habitat is key to the continued success of these species. Runoff from dirt and gravel roads in close proximity to streams can contribute to physical degradation of the stream channels and erosion and sediment pollution in the streams. Loss of forest cover within the core areas may also result in increased water temperatures and disruption of natural nutrient cycling linked to the streams. If forest cover

is substantially reduced within the watersheds, water quality is likely to decline from increased sediment loads. Removal of forest cover on steep slopes is especially problematic because of the potential for increased runoff and erosion following storm events.

Conservation Recommendations

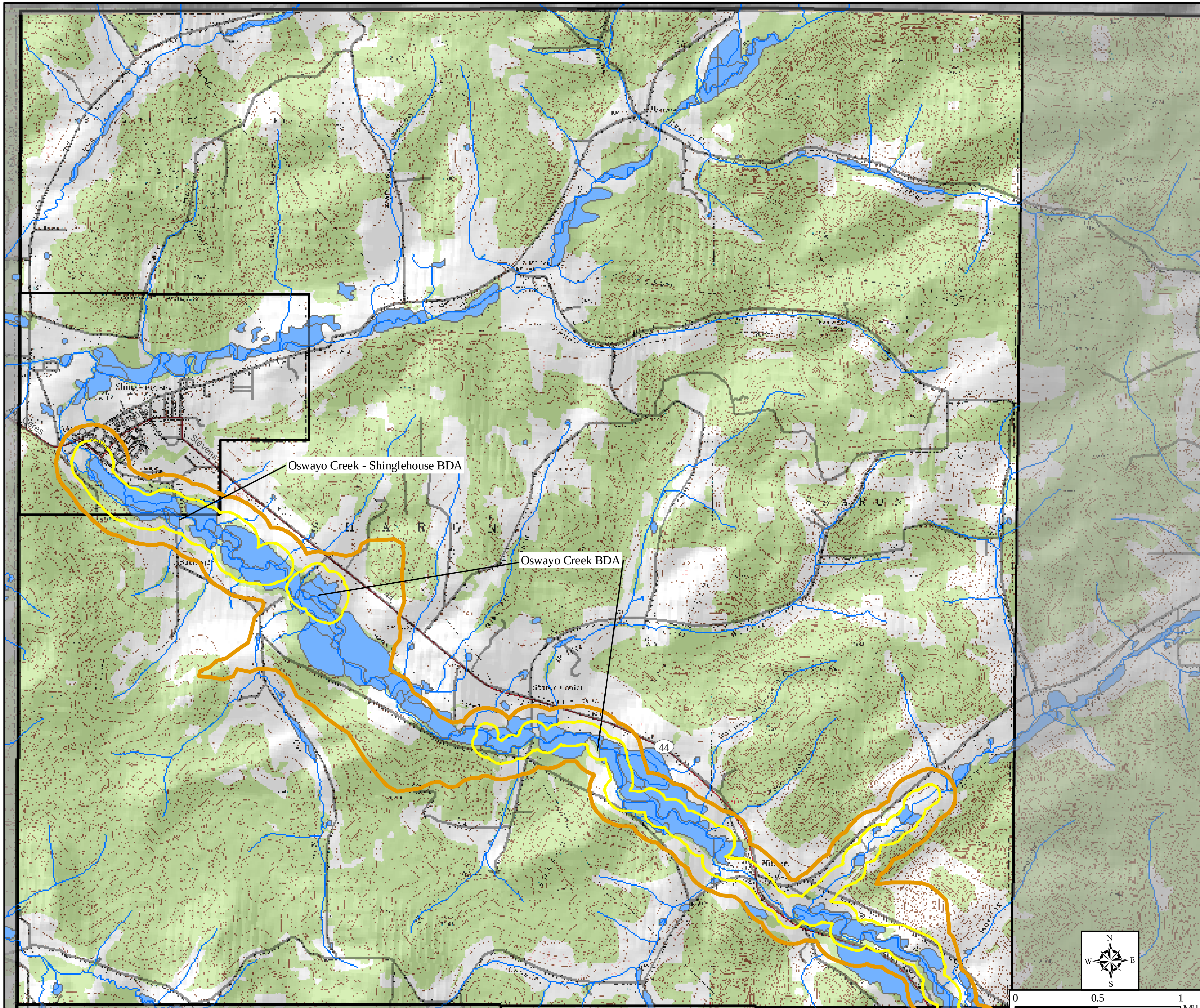
Preserving forested stream corridors is key to maintaining high water quality. Timbering and road development or other construction activities should be kept well away from riparian corridors in order to avoid degrading important aquatic and streamside habitat. Although the surrounding watersheds are not as closely linked to the stream ecosystems as are the riparian zones, a high degree of forest cover should be maintained for additional protection of the water quality and ecological integrity of the aquatic ecosystems. Landowners engaged in timber harvesting within the watershed can refer to *Best Management Practices for Pennsylvania Forests*, a brochure available online at http://pubs.cas.psu.edu/FreePubs/pdfs/uh102.pdf or through the College of Agricultural Sciences, Penn State University, for guidelines aimed at minimizing impacts from timber harvesting.

Sampling fish in the Allegheny River and tributaries, 2005

Sharon Township

	PNHP Rank		Legal Status			
	Global	State	Federal	State	Last Seen	Quality
NATURAL HERITAGE AREAS:						
Oswayo Creek BDA	*Exceptional Significance*					
American brook lamprey (*Lampetra appendix*)	G4	S3		PC	6/7/2005	E
animal of special concern	G5	S1S2		PE	8/6/1996	E
harpoon clubtail (*Gomphus descriptus*)	G4	S1S2			6/14/2006	E
northern bluet (*Enallagma annexum*)	G5	S3			6/14/2006	E
Ohio lamprey (*Ichthyomyzon bdellium*)	G3G4	S2S3		PC	6/7/2005	E
sable clubtail (*Gomphus rogersi*)	G4	S1			6/14/2006	E
stalked bulrush (*Scirpus pedicellatus*)	G4	S1		PT	7/15/2005	AB
Oswayo Creek at Shinglehouse BDA	*Exceptional Significance*					
long-solid (*Fusconaia subrotunda*)	G3	S1			6/14/2006	E
round pigtoe (*Pleurobema sintoxia*)	G4	S2			6/14/2006	E

OTHER CONSERVATION AREAS: none



Potter County
Natural Heritage Inventory

Sharon Township
& Shinglehouse Borough

Biological Diversity Area:

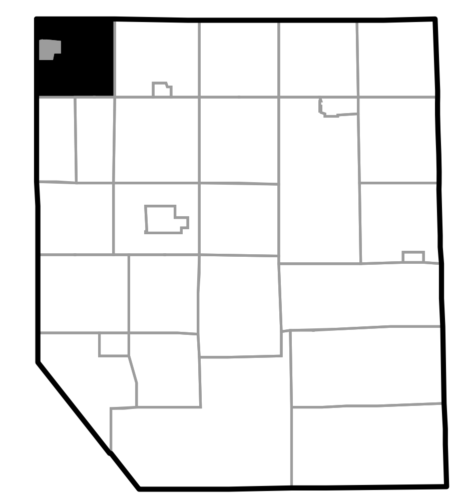
Oswayo Creek
Oswayo Creek at Shinglehouse

Landscape Conservation Area:

None

Managed Land:

None



Legend

Biological Diversity Area

- Core Area
- Supporting Landscape
- Landscape Conservation Area
- Streams
- NWI Wetlands
- Managed Land

SHARON TOWNSHIP

Sharon Township, which includes Shinglehouse Borough, is located in northwestern Potter County, bordered by McKean County to the west and New York to the north. Most of Shinglehouse is forested (48%) or in agriculture (33%), with some residential development (Table 6). Nearly three-quarters of Sharon Township is forested (73%); however, most of the tracts have been fragmented by agriculture and roads (Table 6, Figure 5). Agriculture is 22 percent of the total land use in the township. Honeoye Creek and Oswayo Creek are the major drainages in the township. Many of the streams flow through agricultural areas, which do not provide a buffer against pollutants such as sediments and chemicals. All of the land within Sharon Township is privately owned. No public lands or Important Mammal Areas (IMAs) are found within this municipality.

Oswayo Creek BDA

Over seven miles of Oswayo Creek and adjacent habitat form the core for this BDA that supports **stalked bulrush** (*Scirpus pedicellatus*), a plant species of concern, and six animal species of concern. Stalked bulrush, an obligate wetland species, was found in one of the marshes that are scattered throughout the more forested floodplains along Oswayo Creek. The species inhabits floodplains and stream valleys from Newfoundland to New Jersey and west to Missouri and Ontario. In Pennsylvania, stalked bulrush is found primarily in northwestern counties, which are at the southern edge of its range (Rhoads and Block 2000). It is considered critically imperiled in Pennsylvania, but globally common.

Three rare dragonfly and damselfly species occur at this site: **harpoon** and **sable clubtails** (*Gomphus descriptus* and *G. rogersi*, respectively), and **northern bluet** (*Enallagma annexum*). Dragonflies and damselflies (odonates) have three stages in their life cycle: egg, nymph, and adult. Odonates lay their eggs in water and the three species at this site use a variety of substates and habitats for egg laying. After the eggs hatch, the nymphs remain in the water through several instars, feeding on small aquatic organisms until they eventually grow wings and emerge from the water as terrestrial adults (Dunkle 2000). The harpoon clubtail has a range that extends from Nova Scotia to North Carolina and west to Ontario and Kentucky (NatureServe 2006). In Pennsylvania, this dragonfly is found in the Allegheny and Delaware River watersheds and is considered a critically imperiled species. The sable clubtail is found in several counties in central and eastern Pennsylvania. This observation is a new county record for Potter County. Its range extends from Vermont south to Alabama. The northern bluet (*Enallagma annexum*) is widely distributed in the United States and Canada, but it is not found in the southeastern states. This species has recently been separated taxonomically from *Enallagma cyathigerum*, which occurs on other continents (NatureServe 2006).

The two rare lamprey species found at this site, **American brook lamprey** (*Lampetra appendix*) and **Ohio lamprey** (*Ichthyomyzon bdellium*), inhabit large streams to medium rivers with cool, clear water (NatureServe 2006). Eggs are laid in gravel and sand and larvae of these species burrow in areas of sand, silt, and mud (NatureServe 2006). In Pennsylvania, the American brook lamprey has only been previously recorded in Monroe, Venango, and Warren counties. Its distribution extends from Arkansas to Ontario in the West and from Alabama and North Carolina to Quebec in the East. The Ohio lamprey is found in the Ohio River basin from southwestern New York to Indiana and Alabama. The sixth **animal of special concern** found at the site is a Pennsylvania endangered species; in Pennsylvania, it has only been recorded in the four northwestern counties along the New York border. Its distribution extends from northern Canada across North America from Pennsylvania to Oregon, south to Kentucky and Kansas. It inhabits deep lakes, reservoirs and large rivers and prefers cold temperatures (NatureServe 2006).

Canopy and shrub plant species present at this site include red maple (*Acer rubrum*), American beech (*Fagus grandifolia*), green ash (*Fraxinus pennsylvanica*), red pine (*Pinus resinosa*)(planted), eastern white pine (*Pinus strobus*), American sycamore (*Platanus occidentalis*), black cherry (*Prunus serotina*), European alder (*Alnus glutinosa*), yellow birch (*Betula alleghaniensis*), eastern hemlock (*Tsuga canadensis*), musclewood (*Carpinus caroliniana*), silky dogwood (*Cornus amomum*), white hawthorn (*Crataegus punctata*), common winterberry (*Ilex verticillata*), butternut (*Juglans cinerea*), apple (*Malus pumila*), hop hornbeam (*Ostrya*

virginiana), chokeberry (*Prunus virginiana*), red oak (*Quercus rubra*), staghorn sumac (*Rhus typhina*), multiflora rose (*Rosa multiflora*), silky willow (*Salix sericea*), common elderberry (*Sambucus nigra* ssp. *canadensis*), white meadowsweet (*Spiraea alba*), and American elm (*Ulmus americana*).

Herbs present include roadside agrimony (*Agrimonia striata*), swamp milkweed (*Asclepias incarnata*), beggar-ticks (*Bidens* sp.), broad-glumed brome (*Bromus latiglumis*), dodder (*Cuscuta* sp.), flattened oatgrass (*Danthonia compressa*), flat-top white aster (*Doellingeria umbellata*), four wild rye species (*Elymus* spp.), purpleleaf willowherb (*Epilobium coloratum*), eastern helleborine (*Epipactis helleborine*), spotted joe-pyeweed (*Eutrochium maculatum*), three bedstraw species (*Galium* spp.), two avens species (*Geum* spp.), three mannagrass species (*Glyceria* spp.), cow-parsnip (*Heracleum maximum*), dame's rocket (*Hesperis matronalis*), common St. John's-wort (*Hypericum perforatum*), jewelweed (*Impatiens capensis*), blueflag (*Iris versicolor*), Canada wood-nettle (*Laportea canadensis*), rice cutgrass (*Leersia oryzoides*), Turk's cap lily (*Lilium superbum*), northern bugleweed (*Lycopus uniflorus*), partridge-berry (*Mitchella repens*), true forget-me-not (*Myosotis scorpioides*), halberd-leaf tearthumb (*Polygonum arifolium*), dotted smartweed (*P. punctata*), Virginia knotweed (*P. virginianum*), reed canarygrass (*Phalaris arundinacea*), mayapple (*Podophyllum peltatum*), self-heal (*Prunella vulgaris*), creeping buttercup (*Ranunculus repens*), bristly dewberry (*Rubus hispidus*), arrowhead (*Sagittaria* sp.), cottongrass bulrush (*Scirpus cyperinus*), leafy bulrush (*S. polyphyllus*), mad-dog skullcap (*Scutellaria lateriflora*), hemlock water-parsnip (*Sium suave*), tall goldenrod (*Solidago altissima*), smooth goldenrod (*S. gigantea*), American bur-reed (*Sparganium americanum*), crooked-stem aster (*S. prenanthoides*), skunk-cabbage (*Symplocarpus foetidus*), tall meadowrue (*Thalictrum pubescens*), poison-ivy (*Toxicodendron radicans*), stinging nettle (*Urtica dioica*), blue vervain (*Verbena hastata*), marsh-speedwell (*Veronica scutellata*), riverbank grape (*Vitis riparia*), barren strawberry (*Waldsteinia fragarioides*), 11 sedge species (*Carex* spp.) and five fern species.

Threats and Stresses

The patches of forest found within the immediate watershed of this site are important in maintaining water quality of Oswayo Creek and the health of adjacent wetland habitats. Maintaining suitable stream habitat is key to the continued success of the aquatic animal species. Dams and channelization pose threats to these species (NatureServe 2006). Runoff from dirt and gravel roads in close proximity to streams can contribute to physical degradation of the stream channels and erosion and sediment pollution in the streams. Loss of forest cover within the core areas may also result in increased water temperatures and disruption of natural nutrient cycling linked to the streams. If forest cover is substantially reduced within the watersheds, water quality is likely to decline from increased sediment loads.

Conservation Recommendations

Preserving forested river corridors is key to maintaining high water quality. Timbering and road development or other construction activities should be kept well away from riparian corridors in order to avoid degrading important aquatic and streamside habitat. Although sections of the watersheds beyond the riparian zones have less direct influence on the river ecosystems, a high degree of forest cover should be maintained for additional protection of the water quality and ecological integrity of the aquatic ecosystems. The U.S. Environmental Protection Agency's (EPA) *Agricultural Management Practices for Water Quality Protection* module (available online at http://www.epa.gov/watertrain/agmodule/) outlines eight basic types of agricultural practices that are suitable for reducing or minimizing water quality impacts, as part of a watershed approach to management. These practices are often called Best Management Practices, or BMPs.

Oswayo Creek at Shinglehouse BDA

This BDA is delineated around aquatic habitat in Oswayo Creek that supports two mussel species of concern, **round pigtoe** (*Pleurobema sintoxia*) and **long-solid** (*Fusconaia subrotunda*). Round pigtoe is a Pennsylvania endangered species that is found in the Upper Mississippi River drainage, from Ontario and New York south to Oklahoma and Alabama. In Pennsylvania, it is found in the Ohio River drainage; this

observation is a new county record for Potter County (NatureServe 2006). The long-solid is found in the Ohio, Cumberland, and Tennessee River basins from Pennsylvania to North Carolina and west to Arkansas. The long solid is considered vulnerable globally and critically imperiled in Pennsylvania. Both species inhabit medium to large rivers with sand and gravel substrate (Parmalee and Bogan 1998). See the freshwater mussel fact sheet, pg. 98, for more information about these species.

The main channel of Oswayo Creek is about 15-20 meters (~50-65 feet) wide and at least two meters (~7 feet) or more deep. In places along the stream, the edge has some exposed soil or gravel with little herbaceous cover because of the stream's steep banks. Other areas adjacent to the creek are herb dominated marshes, shrub thickets, and floodplain forests. Characteristic species at the edge of the stream include beggar-ticks (*Bidens* sp.), vernal water starwort (*Callitriche palustris*), clammy hedgehyssop (*Gratiola neglecta*), yellowseed false pimpernel (*Lindernia dubia*), marsh seed box (*Ludwigia palustris)*, northern bugleweed *(Lycopus uniflorus)*, Allegheny monkeyflower (*Mimulus ringens*), true forget-me-not *(Myosotis scorpioides)*, dotted smartweed (*Polygonum punctata*), and bog yellowcress (*Rorippa palustris*).

The marshes adjacent to the creek are very dense with herbaceous vegetation. Dominant herbs include ostrich fern *(Matteuccia struthiopteris)*, wrinkle-leaf goldenrod (*Solidago rugosa*), and stinging nettle (*Urtica dioica ssp. gracilis*). The shrub thickets at the edge of the creek are in places very dense and dominated by silky dogwood (*Cornus amomum*). Other shrubs are silky willow (*Salix sericea*), common elderberry (*Sambucus nigra* ssp. *canadensis*), and white meadowsweet (*Spiraea alba*). The floodplain forests are mostly dominated by eastern white pine (*Pinus strobus*). New York fern *(Thelypteris noveboracensis)* is a species dominant in the herb layer.

Threats and Stresses

There are many threats to native freshwater mussels, including siltation, pollution (particularly pollution lowering dissolved oxygen and increasing ammonia levels), and dredging. The patches of forest found within the immediate watershed of this site are important in maintaining water quality of Oswayo Creek and the health of adjacent habitats. Removal of forest cover on steep slopes may be problematic because of the potential for increased runoff and erosion following storm events. Runoff from dirt and gravel roads in close proximity to the stream can contribute to physical degradation of the site (NatureServe 2006).

Conservation Recommendations

The Pennsylvania Bureau of Forestry continues to develop and implement best management practices (BMPs) to minimize and prevent water pollution and support and engage in research to restore degraded surface and groundwater resources. Landowners should refer to the Bureau's State Forest Resources Management Plan (available online at http://www.dcnr.state.pa.us/forestry/sfrmp/water.htm) for management guidelines pertaining to aquatic and riparian ecosystems. Preserving the riparian corridors along waterways is key to maintaining high water quality. Timbering and road development or other construction activities should be kept well away from the riparian corridors in order to avoid degrading important aquatic and streamside habitat.

Freshwater Mussels (Order Unionida)

What they are:

Freshwater mussels are bivalves, or two-shelled mollusks the evolutionary relatives of clams, oysters, and scallops. They are largely immobile creatures, burrowing into streambeds and feeding by filtering microscopic plants called phytoplankton out of the surrounding water.

North America is home to 297 species of native freshwater mussels – more species than anywhere else in the world, which are distinguished by their unique dispersal strategy. These mussels hatch in a special larval form called glochidia, which attach themselves to the gills of passing fish. After a sufficient period of attachment, the glochidia metamorphose into immature mussels and drop off the host fish in a new location.

The northern riffleshell, *Epioblasma torulosa rangiana*.
USFWS, Digital Library System.

Where they are found:

Freshwater mussels are found throughout the streams, rivers, and lakes of North America. Endangered mussel species native to Pennsylvania include:

- **The northern riffleshell (*Epioblasma torulosa rangiana*)** – a mussel growing up to 7.6 centimeters long, with a brown or yellowish shell marked by fine greenish rays. The shell interior is white or occasionally pink. Males are distinguished from females by a broad, shallow sulcus, or groove, in their shell (see topmost image).
- **The clubshell (*Pleurobema clava*) –** a mussel growing up to 7.6 centimeters long, with a bright yellow to brown exterior marked by blotchy, bright green rays and a white interior. The shell is wedge-shaped with a high umbo, or hinge area.

Threats to Pennsylvania's freshwater mussels:

Since 1900, freshwater mussel species have been going extinct faster than any other group of animals in North America. Nineteen North American mussel species are extinct, 62 are listed as endangered by the federal government, and 130 are at risk. Many species were harvested for their shells; now filter-feeding mussels come into direct contact with water pollutants such as pesticides washed off of agricultural fields. Mussels' long lifespan means they reproduce late in life, which together with their poor dispersal ability and juvenile survival rates, makes them unable to quickly re-colonize areas from which they have been extirpated. Dams and other flow-altering structures can dramatically impact mussel populations. Mussels below dams may stop reproducing; and if they are still able to reproduce, movements of host fish may be restricted preventing the upstream transport of glochidia.

A freshwater mussel covered with zebra mussels.
USFWS, Digital Library System.

North America's freshwater mussels are most recently threatened by the invasion of the zebra mussel, *Dreissena polymorpha*, from Europe and Asia. Though individually small, zebra mussels are so prolific that their colonies can significantly increase the clarity of surrounding water, depriving native mussels of food. Further, because they are able to attach directly to solid surfaces, zebra mussels are able to exploit habitats that native mussels cannot colonize, and even grow on native mussels' shells. Native mussels have evolved no mechanism for removing infestations of zebra mussels, which can be significant sources of stress.

Conservation considerations:

Mussel habitat quality can be improved by elimination of water pollution and, where possible, the removal of man-made structures that impede host fish movement. Mussel populations may benefit from translocation to better-quality habitat. Conservation of host fish species is essential for recovering mussel populations to spread. Effective ways to eliminate zebra mussel infestations without harming native mussels have not yet been developed, but manual removal of zebra mussels from native mussel shells can be beneficial. Preventive measures can be taken to reduce the spread of zebra mussels.

References:

- Baker, S.M. and D.J. Hornbach. 2000. Physiological status and biochemical composition of a natural population of Unionid mussels (*Amblema plicata*) infested by zebra mussels (*Dreissena polymorpha*). Am. Midl. Nat., 143(2): 443-52.
- Heinricher, J.R. and J.B. Layzer. 1999. Reproduction by individuals of a nonreproducing population of *Megalonaias nervosa* (Mollusca: Unionidae) following translocation. Am. Midl. Nat., 141(1): 140-8.
- NatureServe. 2004. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.1. NatureServe, Arlington, Virginia. Available at http://www.natureserve.org/explorer. Accessed 9 March 2005.
- Ricciardi, A., R.J. Neves, and J.B. Rasmussen. 1998. Impending extinctions of North American freshwater mussels (Unionoida) following the zebra mussel (*Dreissena polymorpha*) invasion. J. Animal Ecol., 67(4): 613-9.
- Ricciardi A, and J.B. Rasmussen. 1999. Extinction rates of North American freshwater fauna. Cons. Bio., 13(5): 1220-2.
- U.S. Fish and Wildlife Service. 2005a. Digital Library System: Gateway to Digital Media [web application]. USFWS, Washington, DC. Available at http://www.images.fws.gov. Accessed 15 February 2005.
- U.S. Fish and Wildlife Service. 2005b. Endangered Species Program [website]. USFWS, Washington, DC. Available at http://endangered.fws.gov/. Accessed 15 February and 9 March 2005.

PNHP
Pennsylvania Natural Heritage Program

Stewardson Township

	PNHP Rank		Legal Status			
	Global	State	Federal	State	Last Seen	Quality
NATURAL HERITAGE AREAS:						
Kettle Creek at Pipeline Hollow BDA		*High Significance*				
stalked bulrush (*Scirpus pedicellatus*)	G4	S1		PT	8/25/2005	E
Kettle Creek at Rixford Hollow BDA		*High Significance*				
harpoon clubtail (*Gomphus descriptus*)	G4	S1S2			6/13/2006	E
northern pygmy clubtail (*Lanthus parvulus*)	G4	S3S4			6/13/2006	E
Ole Bull State Park BDA		*High Significance*				
northern pygmy clubtail (*Lanthus parvulus*)	G4	S3S4			6/13/2006	E
Big Ridge LCA		*High Significance*				
Hammersley Wild Area LCA		*Exceptional Significance*				
Keeney Mountain LCA		*Exceptional Significance*				

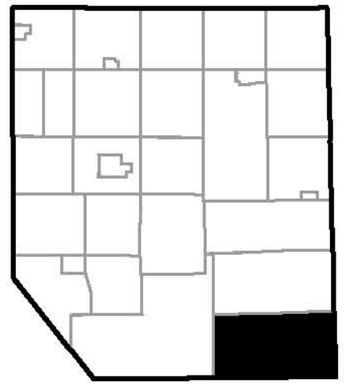
OTHER CONSERVATION AREAS: Northern Allegheny Plateau IMA, Hammersley Wild Area

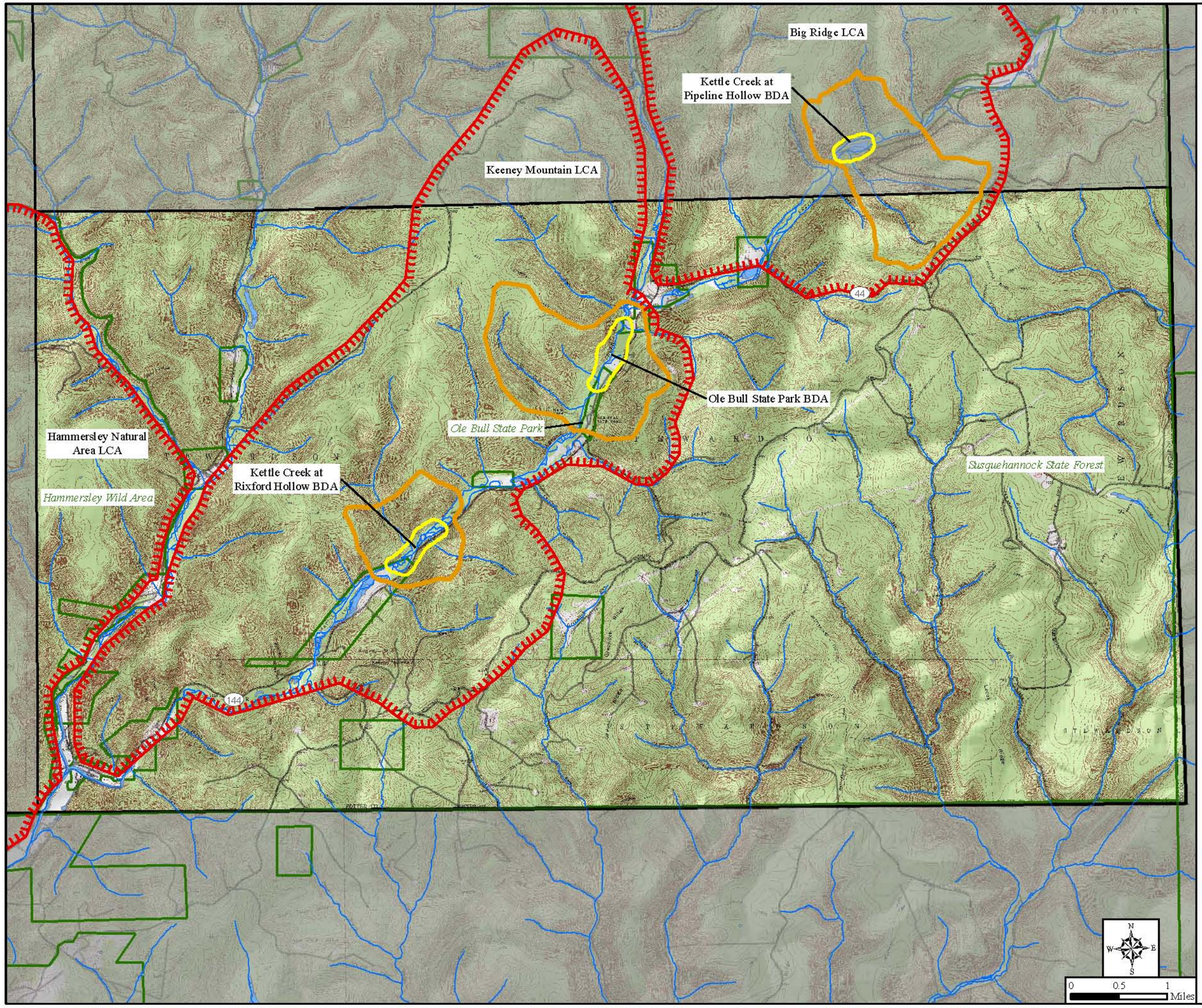
Potter County
Natural Heritage Inventory
Stewardson Township

Biological Diversity Area:
- Kettle Creek at Pipeline Hollow
- Kettle Creek at Rixford Hollow
- Ole Bull State Park

Landscape Conservation Area:
- Big Ridge
- Hammersley Natural Area
- Keeney Mountain

Managed Land:
- Hammersley Wild Area
- Ole Bull State Park
- Susquehannock State Forest





Legend

Biological Diversity Area
- Core Area
- Supporting Landscape

Landscape Conservation Area

Streams

NWI Wetlands

Managed Land

STEWARDSON TOWNSHIP

Stewardson Township is located in southeastern Potter County, bordered by Tioga and Lycoming County to the east and Clinton County to the south. As with other municipalities in this region, it is largely forested (97%), with tracts that are large and contiguous (Table 6, Figure 5). Hammersley Creek and Kettle Creek are the major drainages in Stewardson Township. These streams and their tributaries, along with the Francis Branch of Slate Run, have been designated as Exceptional Value (EV) streams. The headwaters of most of the streams originate in large forest blocks, which may provide a buffer against pollutants such as sediments and chemicals. The Susquehannock State Forest, Hammersley Wild Area, and the Northern Allegheny Plateau Important Mammal Area (IMA) are found within this township.

Kettle Creek at Pipeline Hollow BDA

This Natural Heritage Area is discussed under Abbott Township (pg. 34). Part of the watershed of this BDA crosses into Stewardson Township and any negative affects on hydrology should be minimized.

Kettle Creek at Rixford Hollow BDA & Ole Bull State Park BDA

These BDAs are delineated around sections of Kettle Creek—a DEP-designated Exceptional Value stream—that are occupied by dragonfly species of special concern. The core of Kettle Creek at Rixford Hollow BDA is aquatic habitat that supports the larvae of two dragonfly species of concern, the **harpoon clubtail** (*Gomphus descriptus*) and **northern pygmy clubtail** (*Lanthus parvulus*). Aquatic habitat of Kettle Creek within Ole Bull State Park forms the core habitat that supports a second population of **northern pygmy clubtail.** Dragonflies, along with other members of the Order Odonata, have three stages in their life cycle: egg, nymph, and adult. Dragonflies lay their eggs in water and these species utilize riverine habitats and clear, small wooded streams with riffles and sandy substrate for egg laying. After the eggs hatch, the nymphs remain in the water through several instars, feeding on small aquatic organisms until they eventually grow wings and emerge from the water as terrestrial adults (Dunkle 2000).

The harpoon clubtail has a range that extends from Nova Scotia to North Carolina and west to Ontario and Kentucky (NatureServe 2006). In Pennsylvania, this dragonfly is found in the Allegheny and Delaware River watersheds and is considered a critically imperiled species. The northern pygmy clubtail has a range that extends from Nova Scotia and Quebec to Tennessee and South Carolina (NatureServe 2006). In Pennsylvania, this dragonfly is found in the upper Allegheny River watershed of the north central region and in the Juniata River watershed of Huntingdon County and is considered a vulnerable species.

The supporting landscapes of these BDAs extend to the boundaries of their immediate watersheds hydrologically linked to Kettle Creek. The watersheds are entirely forested and lie within the Susquehannock State Forest and Ole Bull State Park. The intact condition of the landscape within these watersheds serves to enhance the ecological value of the wetland and stream communities by maintaining water quality and wetland health, as well as providing a large contiguous forest throughout which native species can move and disperse. Birds observed at these sites included black-capped chickadee, yellow-bellied sapsucker, red-eyed vireo, chestnut-sided warbler, indigo bunting, yellow-rumped warbler, ovenbird, blue jay, American crow, swamp sparrow, blackburnian warbler, eastern phoebe, great blue heron, tufted titmouse, red-breasted nuthatch, black-and-white warbler, hermit thrush, magnolia warbler, red-winged blackbird, mourning dove, cedar waxwing, eastern kingbird, song sparrow, northern flicker, tree swallow, and Canada goose. See Appendix VII, pg. 152 for a list of scientific names.

Threats and Stresses

The largely contiguous forest found within the immediate watersheds of these sites is important in maintaining water quality of Kettle Creek and the health of adjacent habitats. A forested watershed functions to maintain water quality and natural nutrient cycles in its associated streams and rivers. Removal of forest cover on steep slopes is especially problematic because of the potential for increased runoff and erosion following storm events. Runoff from dirt and gravel roads in close proximity to the wetlands can contribute to physical degradation of the site by siltation and a decrease in dissolved oxygen. Dams and channelization also pose a threat to these species (NatureServe 2006).

Conservation Recommendations

The Pennsylvania Bureau of Forestry continues to develop and implement best management practices (BMPs) to minimize and prevent water pollution and support and engage in research to restore degraded surface and groundwater resources. The Bureau's State Forest Resources Management Plan (available online at http://www.dcnr.state.pa.us/forestry/sfrmp/water.htm) outlines management guidelines for aquatic and riparian ecosystems. Preserving the riparian corridors along waterways is key to maintaining high water quality. Timbering and road development or other construction activities should be kept well away from the riparian corridors in order to avoid degrading important aquatic and streamside habitat.

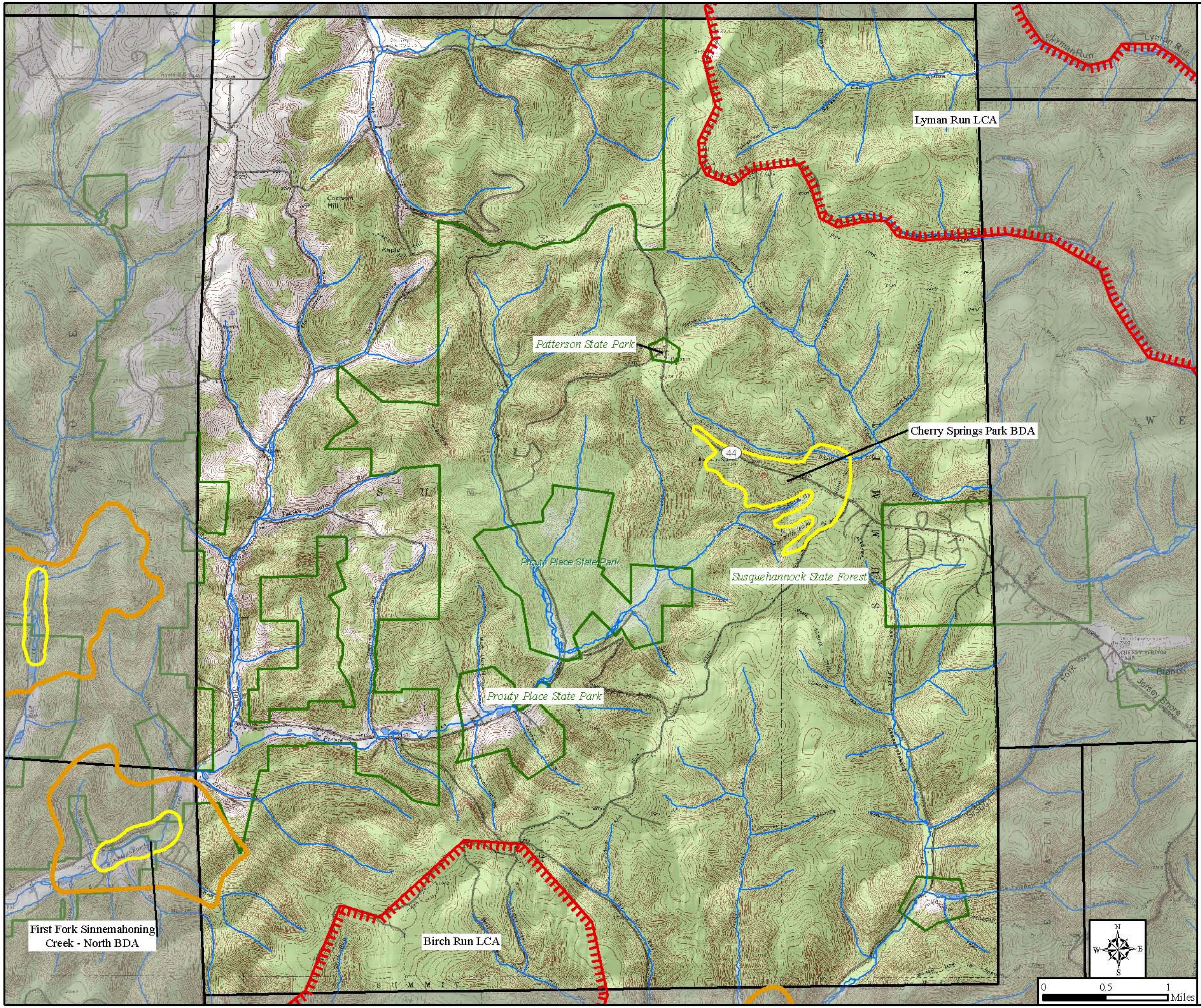
Ole Bull State Park BDA, 2006

Summit Township

	PNHP Rank		Legal Status			
	Global	State	Federal	State	Last Seen	Quality
NATURAL HERITAGE AREAS:						
Cherry Springs Park BDA		*Notable Significance*				
common claybank tiger beetle (*Cicindela limbalis*)	G5	S3			9/19/2006	E
First Fork Sinnemahoning Creek - North BDA		*Exceptional Significance*				
Maine snaketail (*Ophiogomphus mainensis*)	G4	S3			6/3/2006	E
northern pygmy clubtail (*Lanthus parvulus*)	G4	S3S4			6/13/2006	E
ocellated darner (*Boyeria grafiana*)	G5	S3			6/13/2006	E
superb jewelwing (*Calopteryx amata*)	G4	S2S3			6/3/2006	E
Birch Run LCA		*High Significance*				
Lyman Run LCA		*Notable Significance*				

OTHER CONSERVATION AREAS: Northern Allegheny Plateau IMA

Potter County
Natural Heritage Inventory
Summit Township



Biological Diversity Area:

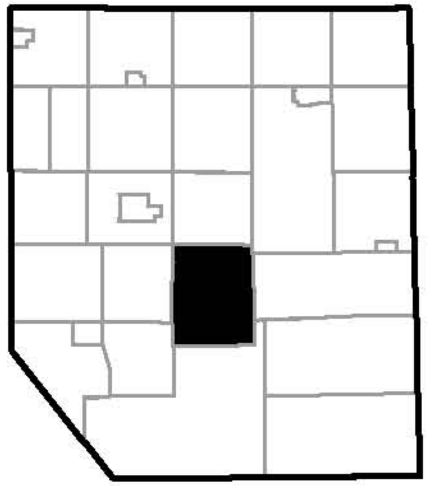
Cherry Springs Park
First Fork Sinnemahoning Creek-North

Landscape Conservation Area:

Birch Run
Lyman Run

Managed Land:

Patterson State Park
Prouty Place State Park
Susquehannock State Forest



Legend

Biological Diversity Area

- Core Area
- Supporting Landscape
- Landscape Conservation Area
- Streams
- NWI Wetlands
- Managed Land

SUMMIT TOWNSHIP

Summit Township is located in central Potter County and is 92 percent forested with some agricultural development (6%) in the northwestern corner of the township (Table 6). Prouty Creek and the West Branch of Pine Creek are the major drainages in the township. Stony Lick Run and portions of East Fork Sinnemahoning Creek have been designated as Exceptional Value (EV) streams. The headwaters of most of the streams originate in large forest blocks, which may provide a buffer against pollutants such as sediments and chemicals. Most of the land is publicly owned; the Susquehannock State Forest occupies much of the eastern and southern portions of the Summit Township, and Patterson and Prouty State Parks are also located in the township. The Northern Allegheny Plateau Important Mammal Area (IMA) covers all but the fragmented area in the northwestern corner of Summit Township.

Cherry Springs Park BDA

The core habitat for this BDA encompasses suitable habitat within 1 km of a ridgetop site occupied by the **common claybank tiger beetle** (*Cicindela limbalis*), an invertebrate species of concern. The common claybank tiger beetle inhabits clay and bare soil habitats with sparse vegetation and may be found along dirt roads, river or stream banks, and on bare slopes and forest openings (Pearson et al. 2006). This species has a three-year life cycle and adults can be found from April through June, and again from late August through September. Its distribution extends across Canada south to Utah and Virginia with records in New Mexico, Georgia, and North Carolina (NatureServe 2006). This tiger beetle species is considered vulnerable in Pennsylvania and is found only in western counties.

Threats and Stresses

Given the roadside location of this site, direct threats to the common claybank tiger beetle include disturbance to the animal and its habitat by roadside maintenance activities such as chemical spraying and widening of the road. Collection does not appear to be an issue because of the species' secretive habit. Erosion of slope habitats may also be a threat to this species.

Conservation Recommendations

Workers involved in roadside maintenance activities within the site should be informed of the presence of the rare animal species. The application of chemicals should be minimized and widening of roads in areas where the common claybank tiger beetle has been observed should be avoided.

First Fork Sinnemahoning Creek - North BDA

This Natural Heritage Area is discussed under Sylvania Township (pg. 108). The watershed of this BDA extends into Summit Township and any negative affects on hydrology should be minimized.

Sweden Township

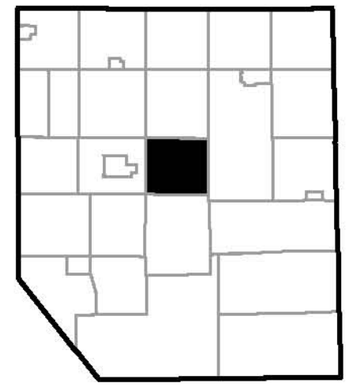
	PNHP Rank		Legal Status			
	Global	State	Federal	State	Last Seen	Quality
NATURAL HERITAGE AREAS:						
Frinks BDA		*Significance*				
creeping snowberry (*Gaultheria hispidula*)	G5	S3		PR	8/24/2005	C
hemlock palustrine forest	--	S3			8/24/2005	E
Lyman Run LCA		*Notable Significance*				
OTHER CONSERVATION AREAS:	Northern Allegheny Plateau IMA					

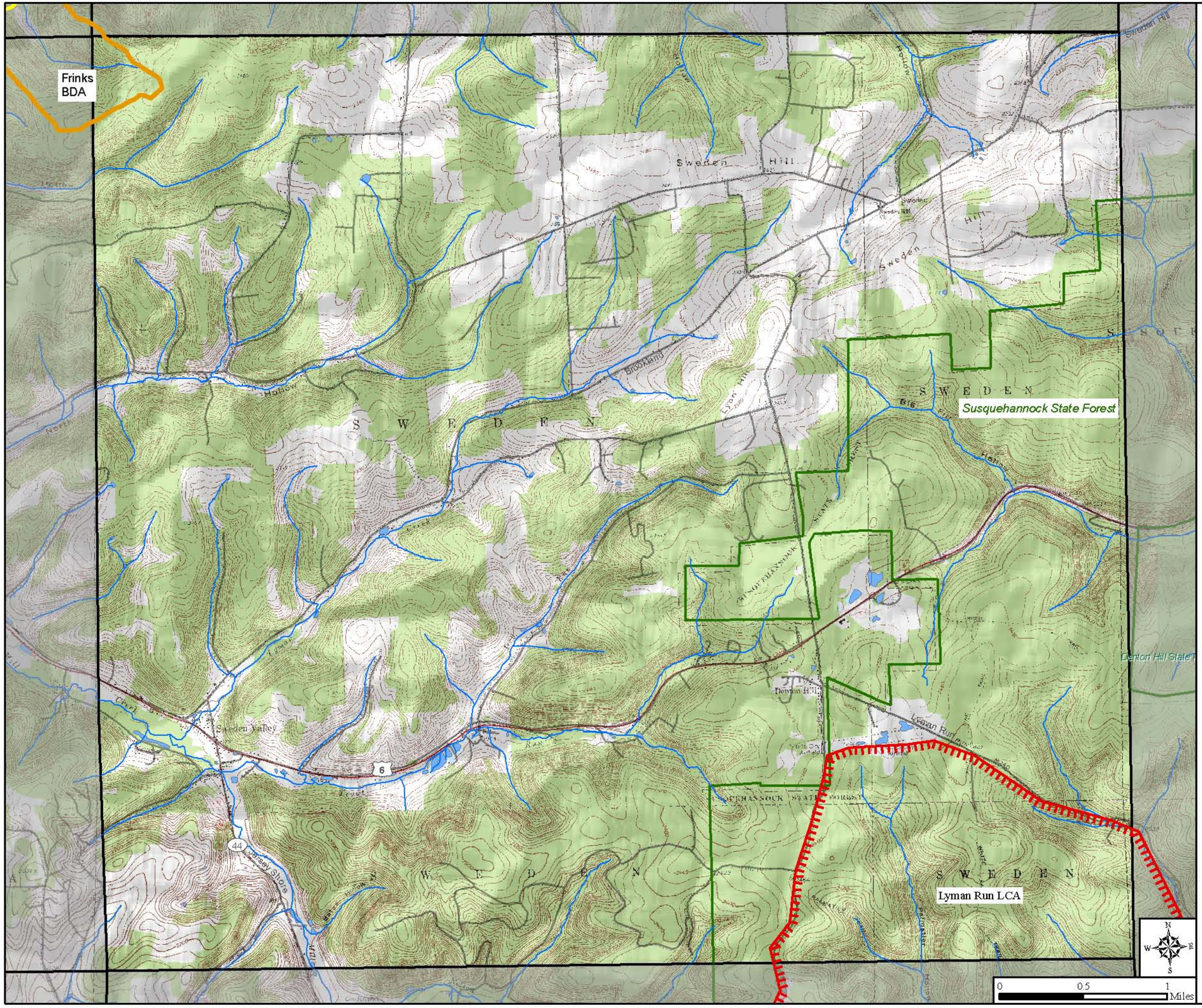
Potter County
Natural Heritage Inventory
Sweden Township

Biological Diversity Area:
Frinks

Landscape Conservation Area:
Lyman Run

Managed Land:
Susquehannock State Forest





Legend

Biological Diversity Area
- Core Area
- Supporting Landscape

Landscape Conservation Area
Streams
NWI Wetlands
Managed Land

SWEDEN TOWNSHIP

Sweden Township is located in central Potter County. Forest covers over three-quarters (77%) of the township; however, much of it has been fragmented by agriculture and roads, especially in the northeastern and southwestern corners (Table 6, Figure 5). Agriculture is 20 percent of the total land use in the township. Trout Run and Lyman Creek are the major drainages in Sweden Township. The headwaters of some streams originate in the larger forest tracts, which may provide a buffer against pollutants such as sediments and chemicals. Sections of the Susquehannock State Forest and the Northern Allegheny Plateau Important Mammal Area (IMA) are located in the larger forested tracts of southeastern Sweden Township.

Frinks BDA

This Natural Heritage Area is discussed under Hebron Township (pg. 58). The supporting landscape for this forest wetland BDA extends into Sweden Township. Forest canopy removal should be avoided in this area, and it should be monitored periodically for hemlock woolly adelgid and other invasive species.

Sylvania Township

	PNHP Rank		Legal Status			
	Global	State	Federal	State	Last Seen	Quality
NATURAL HERITAGE AREAS:						
First Fork Sinnemahoning Creek - North BDA		*Exceptional Significance*				
Maine snaketail (*Ophiogomphus mainensis*)	G4	S3			6/3/2006	E
northern pygmy clubtail (*Lanthus parvulus*)	G4	S3S4			6/13/2006	E
ocellated darner (*Boyeria grafiana*)	G5	S3			6/13/2006	E
superb jewelwing (*Calopteryx amata*)	G4	S2S3			6/3/2006	E
Bailey Run LCA		*High Significance*				
Birch Run LCA		*High Significance*				

OTHER CONSERVATION AREAS: Northern Allegheny Plateau IMA

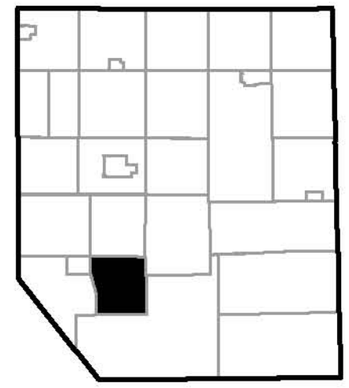
Potter County
Natural Heritage Inventory

Sylvania Township

Biological Diversity Area:
First Fork Sinnemahoning Creek- North

Landscape Conservation Area:
Bailey Run
Birch Run

Managed Land:
Susquehannock State Forest



First Fork Sinnemahoning Creek - North BDA

Susquehannock State Forest

Birch Run LCA

Bailey Run LCA

Legend

Biological Diversity Area
- Core Area
- Supporting Landscape

Landscape Conservation Area
Streams
NWI Wetlands
Managed Land

SYLVANIA TOWNSHIP

Sylvania Township is located in central Potter County. Over 90 percent of the township is in forest, most of which has remained intact as large forest blocks (Table 6, Figure 5). Agriculture is 6 percent of the total land use in the township and occurs mostly along the streams (Table 6). Sinnemahoning Creek and Freeman Run are the major drainages in the township. The Right Branch of Big Nelson Run has been designated as an Exceptional Value (EV) stream. The headwaters of some streams originate in the larger forest tracts, which may provide a buffer against pollutants such as sediments and chemicals. The Susquehannock State Forest occupies most of Sylvania Township, except for some areas along Sinnemahoning Creek and Freeman Run. The Northern Allegheny Plateau Important Mammal Area (IMA) covers the entire township.

First Fork Sinnemahoning Creek - North BDA

This section of First Fork Sinnemahoning Creek and adjacent forest provide habitat for four dragonfly species of special concern. The entire BDA, which extends from First Fork Sinnemahoning Creek to the boundary of the immediate watershed, is contained within the Susquehannock State Forest. Dragonflies, as with other members of the Order Odonata, have three stages in their life cycle: egg, nymph, and adult. Eggs are laid in a variety of aquatic habitats and substrates depending on the species. After the eggs hatch, the nymphs remain in the water through several instars, feeding on small aquatic organisms until they eventually grow wings and emerge from the water as terrestrial adults (Dunkle 2000).

The **Maine snaketail** (*Ophiogomphus mainensis*) has a range that extends from Quebec east to Nova Scotia and south to Alabama. In Pennsylvania, it is found in northeastern and northwestern counties. The Maine snaketail prefers riffle habitat with boulders and cobble in streams to medium rivers. It is considered a vulnerable species in the state. The **northern pygmy clubtail** (*Lanthus parvulus*), a vulnerable species in Pennsylvania, inhabits clear, small, wooded streams with riffles and sandy substrate. Its range extends from Nova Scotia and Quebec to Tennessee and South Carolina (NatureServe 2006). In Pennsylvania, this dragonfly is found in the upper Allegheny River watershed of the north central region and in the Juniata River watershed of Huntingdon County.

The **ocellated darner** (*Boyeria grafiana*), a vulnerable species in Pennsylvania, inhabits clear, fast-flowing, rocky streams and large clear lakes without much vegetation. Adults prefer forested uplands. In contrast to most dragonflies, the adults are active late in the day and prefer shaded areas (Massachusetts Division of Fisheries and Wildlife 2003). Its distribution extends from Quebec to Georgia west to Minnesota and Mississippi. The **superb jewelwing** (*Calopteryx amata*) is found from Quebec to North Carolina west to Tennessee. The nymph of this dragonfly is found in clear, medium-to high-gradient streams and rivers. As an adult it prefers open sunlit areas including streamside plants and emergent stream vegetation (NatureServe 2006). The superb jewelwing is considered a state imperiled species.

Threats and Stresses

The largely contiguous forest found within the immediate watershed of this site is important in maintaining water quality of First Fork Sinnemahoning Creek and the health of adjacent habitats. A forested watershed functions to maintain water quality and natural nutrient cycles in its associated streams and rivers. Removal of forest cover on steep slopes is especially problematic because of the potential for increased runoff and erosion following storm events. Runoff from dirt and gravel roads in close proximity to the wetlands can contribute to physical degradation of the site by siltation and a decrease in dissolved oxygen. Dams and channelization also pose a threat to these species (NatureServe 2006).

Conservation Recommendations

The Pennsylvania Bureau of Forestry continues to develop and implement best management practices (BMPs) to minimize and prevent water pollution and support and engage in research to restore degraded surface and groundwater resources. The Bureau's State Forest Resources Management Plan (available online

at http://www.dcnr.state.pa.us/forestry/sfrmp/water.htm) outlines management guidelines for aquatic and riparian ecosystems. Preserving the riparian corridors along waterways is key to maintaining high water quality. Timbering and road development or other construction activities should be kept well away from the riparian corridors in order to avoid degrading important aquatic and streamside habitat.

Ulysses Township

	PNHP Rank		Legal Status			
	Global	State	Federal	State	Last Seen	Quality
NATURAL HERITAGE AREAS:						
Buckseller Run BDA		*High Significance*				
great-spurred violet (*Viola selkirkii*)	G5?	S1		N	5/10/2006	E
northern water shrew (*Sorex palustris albibarbis*)	G5T5	S3			8/17/2005	E
Cushing Hollow BDA		*Notable Significance*				
northern pygmy clubtail (*Lanthus parvulus*)	G4	S3S4			8/3/2005	E
Ridge Road BDA		*High Significance*				
great-spurred violet (*Viola selkirkii*)	G5?	S1		N	5/6/2005	C
Rock Run Road BDA		*High Significance*				
great-spurred violet (*Viola selkirkii*)	G5?	S1		N	5/9/2006	A
Walton Slopes BDA		*High Significance*				
great-spurred violet (*Viola selkirkii*)	G5?	S1		N	5/10/2005	E
West Virginia white (*Pieris virginiensis*)	G3G4	S2S3			5/10/2006	E
Lyman Run LCA		*Notable Significance*				

OTHER CONSERVATION AREAS: Northern Allegheny Plateau IMA

Potter County
Natural Heritage Inventory
Ulysses Township
& Ulysses Borough

Biological Diversity Area:

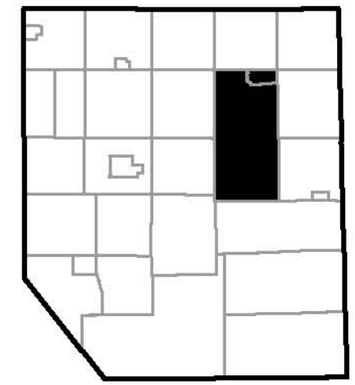
Buckseller Run
Cushing Hollow
Ridge Road
Rock Run Road
Walton Slopes

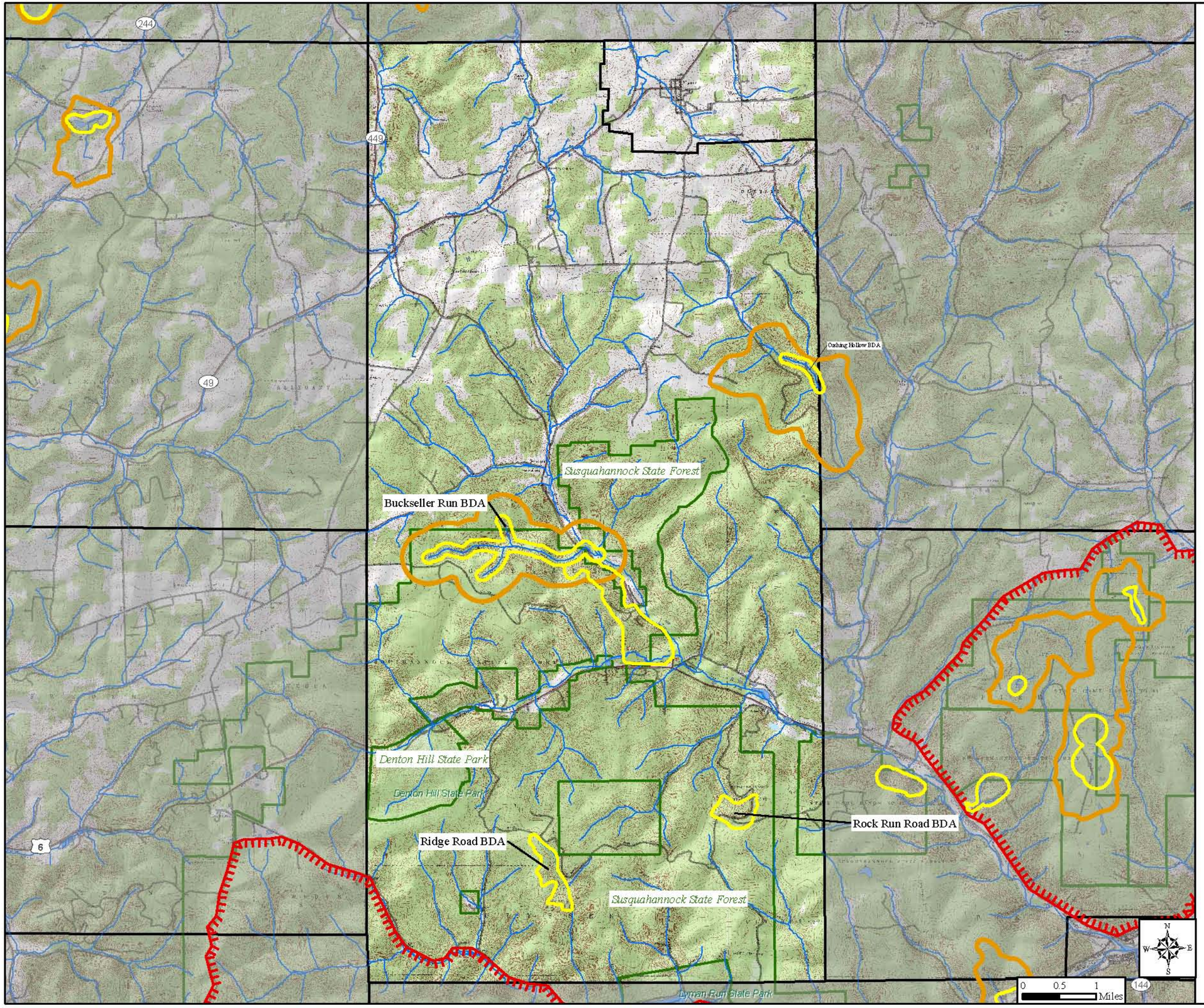
Landscape Conservation Area:

Lyman Run

Managed Land:

Denton Hill State Park
Lyman Run State Park
State Game Land #64
Susquehannock State Forest





Legend

Biological Diversity Area
- Core Area
- Supporting Landscape

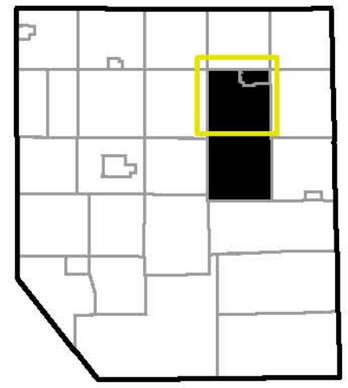
Landscape Conservation Area
Streams
NWI Wetlands
Managed Land

Potter County
Natural Heritage Inventory
Ulysses Township (North) & Ulysses Borough

Biological Diversity Area:
Cushing Hollow

Landscape Conservation Area:
None

Managed Land:
Susquehannock State Forest



Cushing Hollow BDA

Susquehannock State Forest

Legend

Biological Diversity Area
- Core Area
- Supporting Landscape

Landscape Conservation Area
Streams
NWI Wetlands
Managed Land

N
W E
S

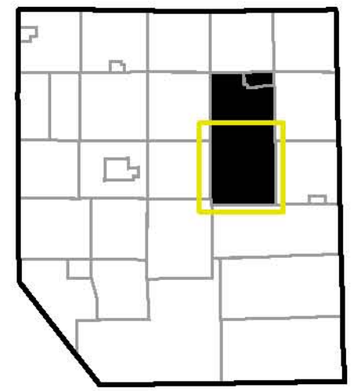
0 0.5 1 Miles

Potter County
Natural Heritage Inventory
Ulysses Township (South)

Biological Diversity Area:
- Buckseller Run
- Ridge Road
- Rock Run Road
- Walton Slopes

Landscape Conservation Area:
- Lyman Run

Managed Land:
- Denton Hill State Park
- Lyman Run State Park
- State Game Land #64
- Susquehannock State Forest



Buckseller Run BDA

Walton Slopes BDA

Rock Run Road BDA

Ridge Road BDA

Lyman Run LCA

Susquehannock State Forest

Denton Hill State Park

State Game Land #64

Lyman Run State Park

U L Y S S E S

SUSQUEHANNOCK STATE FOREST

EDEN

Legend

Biological Diversity Area
- Core Area
- Supporting Landscape

Landscape Conservation Area

Streams

NWI Wetlands

Managed Land

N W E S

0 0.5 1 Miles

ULYSSES TOWNSHIP

Ulysses Township, which includes Ulysses Borough, is Potter County's largest township and is located in the central part of the county. Agriculture is the major land use in the borough (53%) and forests constitute 40 percent of the land cover. Forests cover 81 percent of Ulysses Township, mostly in the southern part where they have remained largely intact (Table 6, Figure 5). Fifteen percent of the total land use is agriculture, most of which occurs in the northern part of the township. Pine Creek and Nine Mile Run are the major drainages in the township. The headwaters of streams in the south originate in the larger forest tracts, which may provide a buffer against pollutants such as sediments and chemicals; streams in northern Ulysses Township are flowing through the more fragmented forest tracts. Much of the land within the township is publicly owned; the Susquehannock State Forest, Denton Hill State Park, Lyman Run State Park, and State Game Land #64 are located in the southern part of the township. The Northern Allegheny Plateau Important Mammal Area (IMA) is also located in the larger forest blocks found in the southern half of the township.

Buckseller Run BDA

This section of Buckseller Run, with its slow current, deeply undercut banks, and forested riparian zone, provides habitat for the **northern water shrew** (*Sorex palustris albibarbis*), an animal of concern. This species is currently under consideration for listing as rare by the Pennsylvania Biological Survey. The northern water shrew is a boreal species, also inhabiting relict habitat in the southern Appalachian Mountains. Optimal habitat for this species is along mountain streams with rocky bottoms that typically flow through forests commonly dominated by eastern hemlock (*Tsuga canadensis*), spruce (*Picea* sp.), and rhododendron (*Rhododendron maximum*) (Merritt 1987). This species requires high quality water and abundant cover such as rocks, logs, or overhanging stream banks. Water shrews are voracious predators primarily of aquatic macroinvertebrates. They have an extremely high metabolic rate and must feed frequently.

This BDA is entirely contained within the Susquehannock State Forest. The core of the site includes the portion of stream where the presence of the northern water shrew was documented, plus a 150 meter (~500 foot) buffer designed to capture the critical streamside habitats of the shrew. The supporting landscape provides an additional 350 meter (~1150 foot) buffer of contiguous forest needed to protect the water quality of the stream. Plant species found in the riparian forest along Buckseller Run are eastern hemlock (*Tsuga canadensis*), musclewood (*Carpinus caroliniana*), American beech (*Fagus grandifolia*), red maple (*Acer rubrum*), black cherry (*Prunus serotina*), witch hazel (*Hamamelis virginiana*), hawthorn (*Crataegus* sp.), meadow rue (*Thalictrum* sp.), bedstraws (*Galium* spp.), Jack-in-the-pulpit (*Arisaema triphyllum*), bindweed (*Calystegia* sp.), crooked-stem aster (*Aster prenanthoides*), goldenrods (*Solidago* spp.), docks (*Rumex* spp.), intermediate wood fern (*Dryopteris intermedia*), and Christmas fern (*Polystichum acrostichoides*).

Threats and Stresses

Northern water shrews are exceptionally vulnerable to the degradation or destruction of their aquatic habitats brought about by pollution and anthropogenic (human-caused) disturbance. Activities such as timbering, agriculture, road building, and surface mining contribute to the loss of habitat. However, timbering may not be a serious threat if water quality is protected and riparian buffer strips are maintained at the site (NatureServe 2006).

The effects of acid rain, particularly on the shrew's microhabitat and food supply, may pose a large threat to northern water shrew populations (NatureServe 2006). One of the results of acid rain is the acidification of streams and lakes, which in turn reduces the shrew's food supply, aquatic macroinvertebrates. The greatest threat to the northern water shrew in Pennsylvania may be the loss of additional habitat resulting from the infestation of introduced insect species, such as the hemlock woolly adelgid (*Adelges tsugae*). The woolly adelgid has been documented in 42 counties in Pennsylvania, but has not yet reached the High Allegheny Plateau (PA Bureau of Forestry 2006). This insect pest can result in high levels of mortality of hemlock trees, which are an important component of northern water shrew's habitat.

Conservation Recommendations

This site is located in the Susquehannock State Forest and land managers are aware of the presence of the northern water shrew along Buckseller Run. In addition, the Pennsylvania Bureau of Forestry State Forest Resources Management Plan calls for protection of riparian zones. Periodic monitoring for the hemlock woolly adelgid and other non-native forest pests is recommended. Any proposed treatments for insect outbreaks should take into consideration impacts to aquatic and forest organisms.

Cushing Hollow BDA

This section of stream along an unnamed tributary to Pine Creek provides habitat for the **northern pygmy clubtail** (*Lanthus parvulus*), a dragonfly species of special concern. Dragonflies, as with other members of the Order Odonata, have three stages in their life cycle: egg, nymph, and adult. Dragonflies lay their eggs in water and this species utilizes clear, small wooded streams with riffles and sandy substrate for egg laying. After the eggs hatch, the nymphs remain in the water through several instars, feeding on small aquatic organisms until they eventually grow wings and emerge from the water as terrestrial adults (Dunkle 2000). The northern pygmy clubtail has a range that extends from Nova Scotia and Quebec to Tennessee and South Carolina (NatureServe 2006). In Pennsylvania, this dragonfly is found in the upper Allegheny River watershed of the north central region and in the Juniata River watershed of Huntingdon County and is considered a vulnerable species.

Habitats sampled were small, isolated pools formed by back channels of the stream. The forest community type within core habitat is mixed hemlock palustrine forest dominated by eastern hemlock (*Tsuga canadensis*), sugar maple (*Acer saccharum*), and yellow birch (*Betula alleghaniensis*), with some hawthorn (*Crataegus* sp.). Shrubs present are black birch (*Betula lenta*), musclewood (*Carpinus caroliniana*), American beech (*Fagus grandifolia*), blackberry and raspberry (*Rubus* spp.), willows (*Salix* spp.), and striped maple (*Acer pensylvanicum*). Herbs along the stream are jewelweed (*Impatiens capensis*), forget-me-nots (*Myosotis* spp.), white turtlehead (*Chelone glabra*), bedstraws (*Galium* spp.), goldenrods (*Solidago* spp.), crooked-stem aster (*Aster prenanthoides*), buttercups (*Ranunculus* spp.), meadowrues (*Thalictrum* spp.), self-heal (*Prunella vulgaris*), and sensitive fern (*Onoclea sensibilis*). The supporting landscape of this site extends from the stream to the boundary of the immediate watershed. Forest to the west of the site has been logged within the last ten years; however, a riparian buffer was left along the creek. Dense regeneration with scattered trees characterizes this area.

Threats and Stresses

The largely contiguous forest found within the immediate watershed of this site is important in maintaining water quality of the creek and the health of adjacent habitats. A forested watershed functions to maintain water quality and natural nutrient cycles in its associated streams. Removal of forest cover on steep slopes is especially problematic because of the potential for increased runoff and erosion following storm events. Runoff from dirt and gravel roads in close proximity to the wetlands can contribute to physical degradation of the site.

Conservation Recommendations

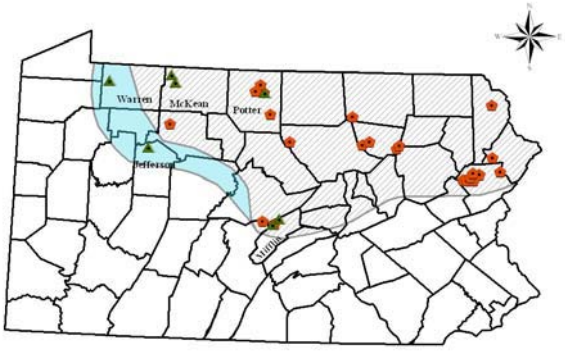
The Pennsylvania Bureau of Forestry continues to develop and implement best management practices (BMPs) to minimize and prevent water pollution and support and engage in research to restore degraded surface and groundwater resources. Landowners should refer to the Bureau's State Forest Resources Management Plan (available online at http://www.dcnr.state.pa.us/forestry/sfrmp/water.htm) for management guidelines pertaining to aquatic and riparian ecosystems. Preserving the riparian corridors along waterways is key to maintaining high water quality. Timbering and road development or other construction activities should be kept well away from the riparian corridors in order to avoid degrading important aquatic and streamside habitat.

Northern Water Shrew (*Sorex palustris albibarbis*)

What it is:

The northern water shrew (*Sorex palustris albibarbis*) is a relatively large member of the *Sorex* genus, reaching lengths of 13-17 centimeters and weighting 10-16 grams. Water shrews are black to gray in color with a silvery-gray belly, white throat and chin, and a bicolored tail. The large, partially webbed hind feet have hairs on the toes and sides and there are some hairs present on the fore feet. Water shrews are solitary, short-lived species with an average life span of 18 months. They breed from December to September and have 2-3 litters per year.

Water shrews are active both day and night and spend their lives in and around water. They dive and swim into water when foraging for food and to avoid predators. Air trapped in the fur allows them to immediately come to the surface when they stop swimming. The fringe of hairs on the hind foot trap air and actually allow the shrews to walk on water. Easy access to food is essential to the survival of this species. Water shrews can only survive without food for up to three hours. The northern water shrew (*Sorex palustris albibarbis*) can be distinguished from other water shrews by very specific physical characteristics such as dental and skull features.



Map by James A. Hart, PNHP

Where it is found:

Water shrews can be found along streams and lake edges, in boulders and sphagnum moss. *Sorex palustris* is found throughout most of Canada, the western U.S., the upper northeastern U.S. and the Appalachian mountains. The *albibarbis* subspecies is found in southeastern Canada and the upper northwestern U.S. including north central and northeastern Pennsylvania. It is only found in a few sites around the state.

Map from Genoways and Brenner (1985)

Conservation considerations:

Decreased water quality may have a significant effect on this species. A decrease in numbers of aquatic insects may be very detrimental to this species since food is such a limiting factor. Timber harvesting along streams and lake edges may also be detrimental to this species. Many times, water shrews will live in vegetation or crevices along the waters edge. The loss of the overstory could dramatically change the microhabitat conditions on the forest floor. Maintaining natural stream corridors and lake buffers is essential to the protection of this species.

PNHP
Pennsylvania Natural Heritage Program

NatureServe conservation status ranks: G4T5 – apparently secure globally, **S3** – vulnerable in Pennsylvania

References:

- ENature.com Field Guide. Water Shrew (*Sorex palustris*). http://www.enature.com/fieldguide/
- Genoways, H.H. and F.J. Brenner. 1985. Species of Special Concern in Pennsylvania. Carnegie Museum of Natural History. Pittsburgh, PA. 430pp.
- The University of Michigan Museum of Zoology Animal Diversity Web. Species Account: Sorex palustris (water shrew). http://animaldiversity.ummz.umich.edu/site/accounts/information/Sorex_palustris.html.

Ridge Road BDA &
Rock Run Road BDA

The cores of these BDAs are rich, mesic, north- to northeast-facing forested slopes occupied by **great-spurred violet** (*Viola selkirkii*), a plant species of special concern. Great-spurred violet is found in rich, cool woods and shady ravines throughout Canada and the northern United States extending as far south as Pennsylvania. The species has been observed mostly in the northeast portion of the state, with a disjunct population in Erie County; observations in Potter County are new county records. The great-spurred violet is considered critically imperiled in the state, but globally secure.

The forest community at Ridge Road BDA is black cherry - northern hardwood forest. Dominant plant species include black cherry (*Prunus serotina*), sugar maple (*Acer saccharum*), white ash (*Fraxinus americana*), striped maple (*Acer pensylvanicum*), intermediate wood fern (*Dryopteris intermedia*), white-edge sedge (*Carex debilis*), flattened oatgrass (*Danthonia compressa*), smooth white violet (*Viola macloskeyi*), roundleaf violet (*Viola rotundifolia*), squirrel corn (*Dicentra canadensis*), and yellow trout-lily (*Erythronium americanum*).

The site at Rock Run Road BDA is a steep slope with sandstone outcrops that is dominated by sugar maple (*Acer saccharum*). Other woody species present include white ash (*Fraxinus americana*), American basswood (*Tilia americana*), eastern hemlock (*Tsuga canadensis*), black birch (*Betula lenta*), downy serviceberry (*Amelanchier arborea*), northern bush honeysuckle (*Diervilla lonicera*), and prickly gooseberry (*Ribes cynosbati*). Striped maple (*Acer pensylvanicum*) is dominant in the understory layer. The herb layer is composed of species mostly with a northern affinity and includes Jack-in-the-pulpit (*Arisaema triphyllum*), two-leaf toothwort (*Cardamine diphylla*), Pennsylvania watercress (*Cardamine pensylvanica*), Carolina spring beauty (*Claytonia caroliniana*), squirrel corn (*Dicentra canadensis*), fan clubmoss (*Lycopodium digitatum*), intermediate wood fern (*Dryopteris intermedia*), marginal wood fern (*Dryopteris marginalis*), shining clubmoss (*Huperzia lucidula*), jewelweeds (*Impatiens* spp.), Canada wood-nettle (*Laportea canadensis*), interrupted fern (*Osmunda claytoniana*), white wood-sorrel (*Oxalis montana*), drooping bluegrass (*Poa saltuensis*), Christmas fern (*Polystichum acrostichoides*), Virginia saxifrage (*Saxifraga virginiensis*), heartleaf foamflower (*Tiarella cordifolia*), northern starflower (*Trientalis borealis*), stinging nettle (*Urtica dioica* ssp. *gracilis*), Canada violet (*Viola canadensis*), and large-leaf white violet (*Viola blanda* var. *palustriformis*).

Threats and stresses

Given that these BDAs are located within public lands of the Susquehannock State Forest, the population of great-spurred violet is under no immediate threat. However, trampling by recreationists or wildlife, such as white-tailed deer, may be a risk. The great-spurred violet's dependence on cool, moist boreal habitats may also make it potentially vulnerable to large-scale climate changes and it is not known if the species can be sustained through catastrophic drought or prolonged climatic change (Hornbeck et al. 2003).

Conservation Recommendations

The Pennsylvania Bureau of Forestry recognizes the critical nature of the deer overbrowsing problem, and is actively engaged in addressing it. One of its stated management goals is to sustain a healthy and functioning forest ecosystem, including the ability of forests to regenerate with desirable species, by balancing the deer herd with its habitat across state forest lands. To this end, the Bureau has adopted measures that include fencing some areas to ensure regeneration, increasing hunter access, supporting research, monitoring habitat, and public education. In addition, the Bureau is currently using the Pennsylvania Game Commission's Deer Management Assistance Program to focus additional hunter pressure on specific areas to reduce deer browsing pressure.

Walton Slopes BDA

The core of this BDA is a rich, mesic, north- to northeast-facing forested slope occupied by **great-spurred violet** (*Viola selkirkii*), a plant species of special concern, and **West Virginia white** (*Pieris virginiensis*), a butterfly species of concern. The great-spurred violet is found in rich, cool woods and shady ravines throughout Canada and the northern United States extending as far south as Pennsylvania. The species has been observed mostly in the northeast portion of the state, with a disjunct population in Erie County; observations in Potter County are new county records. The great-spurred violet is considered critically imperiled in the state, but globally secure.

The West Virginia white inhabits rich, moist, deciduous or mixed deciduous/coniferous woods where abundant stands of its host plants are present. The adults feed on the nectar of spring wildflowers, such as spring beauty (*Claytonia* sp.), toothworts (*Cardamine* spp.), violets (*Viola* spp.), and stonecrop (*Sedum* sp.). *Cardamine diphylla* (two-leaved toothwort) and *Cardamine laciniata* (cut-leaved toothwort) are the primary preferred food sources for larvae, but the species has also been reported to use other bittercresses (*Cardamine* spp.) and even smooth rockcress (*Arabis serotina*) in Ohio (Allen 1997). The West Virginia white's range extends from Quebec to Wisconsin, south to Alabama. In Pennsylvania, records exist for the species in all western counties except Armstrong and Cameron. The species is absent from the middle to lower central Appalachian portion of the state and is generally absent from southeastern Pennsylvania. The West Virginia white is considered imperiled in the state and vulnerable globally (NatureServe 2006).

Ninemile Run forms the southern boundary of this site and the northern part of the site overlaps with Buckseller Run BDA. Forest community is northern hardwood and canopy species include sugar maple (*Acer saccharum*), American basswood (*Tilia americana*), tuliptree (*Liriodendron tulipifera*), American beech (*Fagus grandifolia*), and red maple (*Acer rubrum*). Tree density is low, apparently due to a diameter cut, and very few woody plants are present in the shrub layer. Herbs present include squirrel corn (*Dicentra canadensis*), yellow trout-lily (*Erythronium americanum*), Canada wood-nettle (*Laportea canadensis*), brome (*Bromus* sp.), Carolina spring beauty (*Claytonia caroliniana*), Dutchman's breeches (*Dicentra cucullaria*), two-leaf toothwort (*Cardamine diphylla*), blue cohosh (*Caulophyllum thalictroides*), plantainleaf sedge (*Carex plantaginea*), finely-nerved sedge (*Carex leptonervia*), sharp-lobed violet (*Hepatica nobilis* var. *acuta*), intermediate wood fern (*Dryopteris intermedia*), eastern hay-scented fern (*Dennstaedtia punctilobula*), ill-scented trillium (*Trillium erectum*), Jack-in-the-pulpit (*Arisaema triphyllum*), smooth white violet (*Viola blanda*), two-leaf toothwort (*Cardamine diphylla*), and New York fern (*Thelypteris noveboracensis*)

Threats and Stresses

Given that this BDA is located within public lands of the Susquehannock State Forest, the population of great-spurred violet is under no immediate threat. However, trampling by recreationists or wildlife, such as white-tailed deer (there are significant signs of deer browse at site), may be a risk. Great-spurred violet's dependence on cool, moist boreal habitats may also make it potentially vulnerable to large-scale climate changes and it is not known if the species can be sustained through catastrophic drought or prolonged climatic change (Hornbeck et al. 2003).

The West Virginia white seems to be reluctant to traverse large forest openings or colonize new areas (Allen 1997, NatureServe 2006); barriers such as uncanopied streams and rivers, power lines, and unshaded paved roads can limit movements. Garlic mustard (*Alliaria officinalis*), an exotic plant in the mustard family, causes direct mortality to the West Virginia white. Female butterflies may oviposit on this mustard species but the plant is toxic to caterpillars when they feed upon it. Gypsy moth spraying and overbrowsing of host plants by large densities of white-tailed deer also pose a threat to this species (NatureServe 2006).

Conservation Recommendations

The Pennsylvania Bureau of Forestry recognizes the critical nature of the deer overbrowsing problem, and is actively engaged in addressing it. One of its stated management goals is to sustain a healthy and functioning forest ecosystem, including the ability of forests to regenerate with desirable species, by balancing the deer herd with its habitat across state forest lands. To this end, the Bureau has adopted measures that include fencing some areas to ensure regeneration, increasing hunter access, supporting research, monitoring habitat, and public education. In addition, the Bureau is currently using the Pennsylvania Game Commission's Deer Management Assistance Program to focus additional hunter pressure on specific areas to reduce deer browsing pressure.

Monitoring and removing garlic mustard within areas that contain known occurrences of West Virginia white and good stands of toothworts are highly beneficial. Avoiding or minimizing gypsy moth spraying is also recommended. In timbering operations, minimizing activities in early spring months where the host plants could be destroyed would help to maintain habitat for the species. Selective harvesting that maintains at least canopy cover conditions would be preferable to other harvesting practices. Overall, this species would be best conserved in well-managed forests with healthy stands of toothworts and spring ephemeral plants.

Rock Run Road BDA, 2006

Buckseller Run BDA, 2006

West Branch Township

	PNHP Rank		Legal Status			
	Global	State	Federal	State	Last Seen	Quality
NATURAL HERITAGE AREAS:						
Slaughterhouse Swamp BDA		*Notable Significance*				
backward sedge (*Carex retrorsa*)	G5	S1		PE	7/17/1993	CD

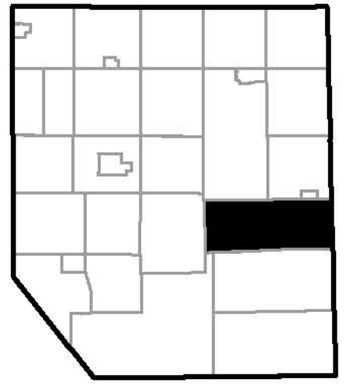
OTHER CONSERVATION AREAS: Northern Allegheny Plateau IMA

Potter County
Natural Heritage Inventory
West Branch Township

Biological Diversity Area:
Slaughterhouse Swamp

Landscape Conservation Area:
Lyman Run

Managed Land:
Cherry Springs State Park
Lyman Run State Park
Susquehannock State Forest



Denton Hill State Park
Slaughterhouse Swamp BDA
Lyman Run State Park
Lyman Run State Park
Lyman Run LCA
Susquehannock State Forest
Cherry Springs State Park
6
144
44
N
W
E
S
0 0.5 1 Miles

Legend

Biological Diversity Area
- Core Area
- Supporting Landscape

Landscape Conservation Area
Streams
NWI Wetlands
Managed Land

WEST BRANCH TOWNSHIP

West Branch Township is located in eastern Potter County, bordered by Tioga County. This largely forested township (89%) contains some large tracts of contiguous forest that have not been fragmented by agriculture or roads (Table 6). Agriculture covers nine percent of West Branch Township, most of it is located in the southeastern corner of the township. Lyman Run and the West and South Branches of Pine Creek are the major drainages flowing though the township. The headwaters of some streams originate in the larger forest tracts, which may provide a buffer against pollutants such as sediments and chemicals. Much of the land within this township is publicly owned: the Susquehannock State Forest covers most of the western half of the township; Lyman Run and Cherry Springs State Parks are other managed areas in the township. The Northern Allegheny Plateau Important Mammal Area (IMA) occupies the larger forest blocks of West Branch Township.

Slaughterhouse Swamp BDA

At the core of this BDA is a dry, graminoid wetland north of West Branch Pine Creek that supports a small population of **backward sedge** (*Carex retrorsa*), a plant species of special concern. Backward sedge, a Pennsylvania endangered plant species, is found in various counties throughout the state in swampy woods, wet meadows, and along streams banks. Its range spans across northern North America from the Northwest Territories to Quebec, south to Nevada in the West and New Jersey in the East. This plant reaches the southern extent of its range in Pennsylvania and is considered to be a critically imperiled species in the state.

The habitat where plants were found is a nearly dry wetland within a ninebark-aspen thicket between an old railroad grade and state road. The old railroad grade appears to have altered the local hydrology of the site. This site has also been grazed in the past as indicated by old barbed wire fencing. Other sedge species present at the site include *Carex lupulina, C. intumescens, C. vulpinoidea, C. scabrata, C. trisperma, C. debilis, and C. crinita.* The supporting landscape for this BDA, which includes Slaughterhouse Hollow and extends to the boundary of the immediate watershed, is forested, with some residential and agricultural development.

Threats and Stresses

Non-point source pollution from residential and agricultural development within the immediate watershed presents the greatest threat to this wetland. A gas pipeline right-of-way and an abandoned railroad grade pass through the southern portion of the site. The area to the south of the grade is considerably drier than the bulk of the wetland to the north, suggesting that the railroad grade has altered the local hydrology.

Conservation Recommendations

Any land management decisions regarding the watershed supporting the wetland pocket should take into consideration potential impacts to the wetland, including alterations to the light, temperature, and hydrologic regimes. The Pennsylvania Bureau of Forestry continues to develop and implement best management practices (BMPs) to minimize and prevent water pollution and support and engage in research to restore degraded surface and groundwater resources. Landowners should refer to the Bureau's State Forest Resources Management Plan (available online at http://www.dcnr.state.pa.us/forestry/sfrmp/water.htm) for management guidelines pertaining to aquatic and riparian ecosystems. Preserving the riparian corridors along waterways is key to maintaining high water quality. Timbering and road development or other construction activities should be kept well away from the riparian corridors in order to avoid degrading important aquatic and streamside habitat.

Wharton Township

	PNHP Rank		Legal Status			
	Global	State	Federal	State	Last Seen	Quality
NATURAL HERITAGE AREAS:						
East Fork Sinnemahoning Creek BDA		*High Significance*				
northern pygmy clubtail (*Lanthus parvulus*)	G4	S3S4			8/4/2005	E
First Fork Sinnemahoning Creek - South BDA		*Exceptional Significance*				
northern pygmy clubtail (*Lanthus parvulus*)	G4	S3S4			6/1/2005	A
ocellated darner (*Boyeria grafiana*)	G5	S3			6/1/2005	AB
spine-crowned clubtail (*Gomphus abbreviatus*)	G3G4	S2			6/1/2005	AB
superb jewelwing (*Calopteryx amata*)	G4	S2S3			6/1/2005	B
Hammersley Fork BDA		*High Significance*				
northern pygmy clubtail (*Lanthus parvulus*)	G4	S3S4			6/7/2006	E
Bailey Run LCA		*High Significance*				
Birch Run LCA		*High Significance*				
Hammersley Wild Area LCA		*Exceptional Significance*				
Wharton LCA		*Exceptional Significance*				

OTHER CONSERVATION AREAS: Northern Allegheny Plateau IMA, Hammersley Wild Area

Potter County
Natural Heritage Inventory
Wharton Township

Biological Diversity Area:

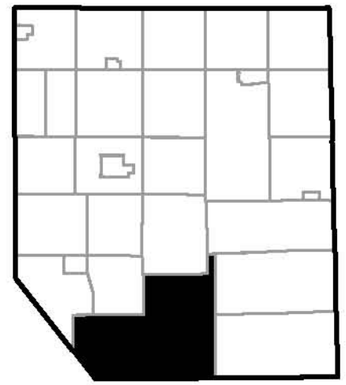
East Fork Sinnemahoning Creek
First Fork Sinnemahoning Creek-South
Hammersley Fork

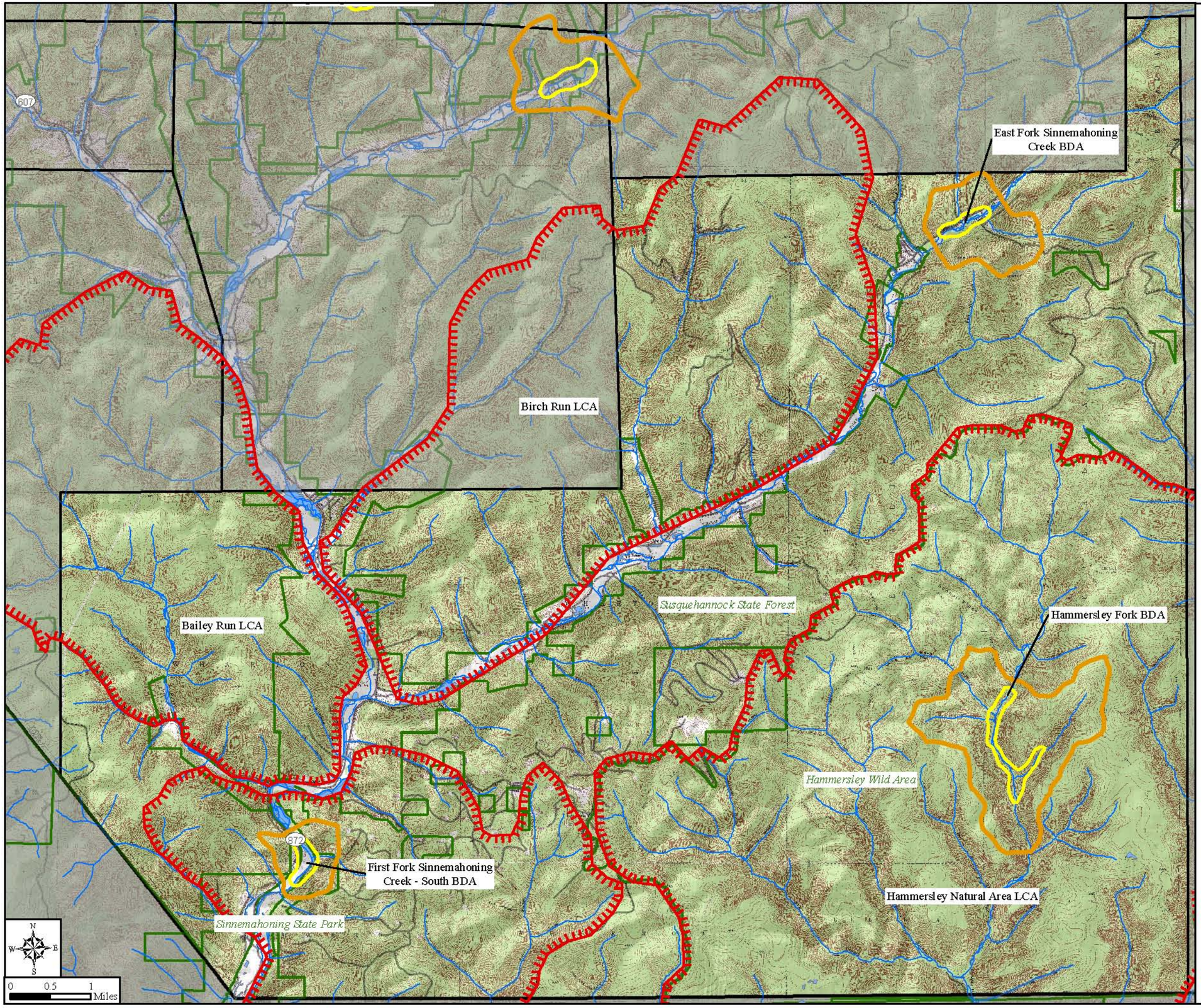
Landscape Conservation Area:

Bailey Run
Birch Run
Hammersley Natural Area
Wharton

Managed Land:

Hammersley Wild Area
Sinnemahoning State Park
Susquehannock State Forest





Legend

Biological Diversity Area

- Core Area
- Supporting Landscape
- Landscape Conservation Area
- Streams
- NWI Wetlands
- Managed Land

WHARTON TOWNSHIP

Wharton Township is located in southwestern Potter County, bordered by Cameron County to the west and Clinton County to the south. As with other municipalities in this region, it is largely forested (95%) with the largest tracts of contiguous forest in the county, such as Hammersley Wild Area LCA (Table 6, Figure 5). East Fork Sinnemahoning Creek and Hammersley Run are the major drainages in the township. Eight streams in the township have been designated as Exceptional Value (EV) streams by the DEP. The headwaters of some streams originate in the larger forest tracts, which may provide a buffer against pollutants such as sediments and chemicals. All of the land within this township is publicly owned; the Susquehannock State Forest occupies most of the township and the Hammersley Wild Area and Sinnemahoning State Park are also located in Wharton Township. The Northern Allegheny Plateau Important Mammal Area (IMA) covers the entire township.

East Fork Sinnemahoning Creek BDA

This BDA is contained within the Susquehannock State Forest and extends from the section of East Fork Sinnemahoning Creek that is occupied by the **northern pygmy clubtail** (*Lanthus parvulus*), a dragonfly species of special concern, to the boundary of the immediate watershed. Dragonflies, as with other members of the Order Odonata, have three stages in their life cycle: egg, nymph, and adult. Dragonflies lay their eggs in water and this species utilizes clear, small wooded streams with riffles and sandy substrate for egg laying. After the eggs hatch, the nymphs remain in the water through several instars, feeding on small aquatic organisms until they eventually grow wings and emerge from the water as terrestrial adults (Dunkle 2000). The northern pygmy clubtail has a range that extends from Nova Scotia and Quebec south to Tennessee and South Carolina (NatureServe 2006). In Pennsylvania, this dragonfly is found in the upper Allegheny River watershed of the north central region and in the Juniata River watershed of Huntingdon County and is considered a vulnerable species.

Habitats sampled were small, isolated pools formed by back channels of East Fork Sinnemahoning Creek. Stony Lick Run, a DEP-designated Exceptional Value stream, drains into the creek at the core of the site. The forest community type along the creek is hemlock—northern hardwood. Common canopy and subcanopy species include American beech (*Fagus grandifolia*), eastern hemlock (*Tsuga canadensis*), sugar maple (*Acer saccharum*), eastern white pine (*Pinus strobus*), yellow birch (*Betula alleghaniensis*), black cherry (*Prunus serotina*), and musclewood (*Carpinus caroliniana*). Jewelweed (*Impatiens capensis*), partridge-berry (*Mitchella repens*), lycododium (*Lycopodium* spp)., Canada mayflower (*Maianthemum canadense*), goldenrods (*Solidago* spp.), hay-scented fern (*Dennstaedtia punctilobula*), and intermediate wood fern (*Dryopteris intermedia*) are common herbs found at the site.

Threats and Stresses

The largely contiguous forest found within the immediate watershed of this site is important in maintaining water quality of East Fork Sinnemahoning Creek and the health of adjacent habitats. A forested watershed functions to maintain water quality and natural nutrient cycles in its associated streams. Removal of forest cover on steep slopes is especially problematic because of the potential for increased runoff and erosion following storm events. The most immediate threat may be if travel was resumed on the abandoned road that runs along the creek. Runoff from dirt and gravel roads in close proximity to the wetlands can contribute to physical degradation of the site.

Conservation Recommendations

The Pennsylvania Bureau of Forestry continues to develop and implement best management practices (BMPs) to minimize and prevent water pollution and support and engage in research to restore degraded surface and groundwater resources. The Bureau's State Forest Resources Management Plan (available online at http://www.dcnr.state.pa.us/forestry/sfrmp/water.htm) outlines management guidelines for aquatic and riparian ecosystems. Preserving the riparian corridors along waterways is key to maintaining high water

quality. Timbering and road development or other construction activities should be kept well away from the riparian corridors in order to avoid degrading important aquatic and streamside habitat.

First Fork Sinnemahoning Creek - South BDA

This section of First Fork Sinnemahoning Creek and adjacent forest provide habitat for four dragonfly species of special concern. The entire BDA, which extends from First Fork Sinnemahoning Creek to the boundary of the immediate watershed, is contained within the Susquehannock State Forest. Dragonflies, as with other members of the Order Odonata, have three stages in their life cycle: egg, nymph, and adult. Eggs are laid in a variety of aquatic habitats and substrates depending on the species. After the eggs hatch, the nymphs remain in the water through several instars, feeding on small aquatic organisms until they eventually grow wings and emerge from the water as terrestrial adults (Dunkle 2000).

The **northern pygmy clubtail** (*Lanthus parvulus*), a vulnerable species in Pennsylvania, inhabits clear, small wooded streams with riffles and sandy substrate. Its range extends from Nova Scotia and Quebec south to Tennessee and South Carolina (NatureServe 2006). In Pennsylvania, this dragonfly is found in the upper Allegheny River watershed of the north central region and in the Juniata River watershed of Huntingdon County and is considered a vulnerable species. The **ocellated darner** (*Boyeria grafiana***)**, a vulnerable species in Pennsylvania, inhabits clear, fast-flowing, rocky streams and large clear lakes without much vegetation. Adults prefer forested uplands. In contrast to most dragonflies, the adults are active late in the day and prefer shaded areas (Massachusetts Division of Fisheries and Wildlife 2003). Its distribution extends from Quebec to Georgia west to Minnesota and Mississippi.

The **spine-crowned clubtail** (*Gomphus abbreviatus*), a dragonfly species of special concern, inhabits clear, medium to large rivers with rock, silt and mud substrate (Glotzhober and McShaffrey 2002). Its distribution extends from South Carolina to New Brunswick west to Ohio. In Pennsylvania, it is found mostly in eastern counties. This observation is a new county record for Potter County. The species is considered imperiled in Pennsylvania and globally vulnerable. The **superb jewelwing** (*Calopteryx amata*) is found from Quebec to North Carolina and west to Tennessee. The nymph of this dragonfly is found in clear, medium- to high-gradient streams and rivers. As an adult it prefers open sunlit areas including streamside plants and emergent stream vegetation (NatureServe 2006). The superb jewelwing is considered a state imperiled species.

Threats and Stresses

The largely contiguous forest found within the immediate watershed of this site is important in maintaining water quality of First Fork Sinnemahoning Creek and the health of adjacent habitats. A forested watershed functions to maintain water quality and natural nutrient cycles in its associated streams and rivers. Removal of forest cover on steep slopes is especially problematic because of the potential for increased runoff and erosion following storm events. Runoff from dirt and gravel roads in close proximity to the wetlands can contribute to physical degradation of the site by siltation and a decrease in dissolved oxygen. Dams and channelization also pose a threat to these species (NatureServe 2006).

Conservation Recommendations

The Pennsylvania Bureau of Forestry continues to develop and implement best management practices (BMPs) to minimize and prevent water pollution and support and engage in research to restore degraded surface and groundwater resources. The Bureau's State Forest Resources Management Plan (available online at http://www.dcnr.state.pa.us/forestry/sfrmp/water.htm) outlines management guidelines for aquatic and riparian ecosystems. Preserving the riparian corridors along waterways is key to maintaining high water quality. Timbering and road development or other construction activities should be kept well away from the riparian corridors in order to avoid degrading important aquatic and streamside habitat.

Hammersley Fork BDA

This BDA is contained within the Hammersley Wild Area of the Susquehannock State Forest and includes two sections of the stream that are occupied by the **northern pygmy clubtail** (*Lanthus parvulus*), a dragonfly species of special concern. Dragonflies, as with other members of the Order Odonata, have three stages in their life cycle: egg, nymph, and adult. Dragonflies lay their eggs in water and this species utilizes clear, small wooded streams with riffles and sandy substrate for egg laying. After the eggs hatch, the nymphs remain in the water through several instars, feeding on small aquatic organisms until they eventually grow wings and emerge from the water as terrestrial adults (Dunkle 2000). The northern pygmy clubtail has a range that extends from Nova Scotia and Quebec south to Tennessee and South Carolina (NatureServe 2006). In Pennsylvania, this dragonfly is found in the upper Allegheny River watershed of north central region and in the Juniata River watershed of Huntingdon County and is considered a vulnerable species.

Hammersley Fork, a DEP-designated Exceptional Value stream, flows through the core of the site. The supporting landscape is entirely forested and extends to the boundary of the immediate watershed. Habitats sampled within the site were within the main stem of the creek and a small unnamed tributary to Hammersley Fork at Dry Run Hollow. The open canopy forest at the site is dominated by black cherry (*Prunus serotina*) and a dense layer of hay-scented fern (*Dennstaedtia punctilobula*). Other woody species present are eastern hop hornbeam (*Ostrya virginiana*), American basswood (*Tilia americana*), American beech (*Fagus grandifolia*), hawthorn (*Crataegus* sp.), red maple (*Acer rubrum*), sugar maple (*Acer saccharum*), white ash (*Fraxinus americana*), blackberry (*Rubus* sp.), eastern white pine (*Pinus strobus*), quaking aspen (*Populus tremuloides*), and yellow birch (*Betula alleghaniensis)*. Herbs include milkweed (*Asclepias* sp.), bedstraws (*Galium* spp.), wood-sorrel (*Oxalis* sp.), false nettle (*Boehmeria cylindrica*), cinquefoil (*Potentilla* sp.), plumeless thistle (*Carduus acanthoides*), docks (*Rumex* spp.), jewelweeds (*Impatiens* spp.), yarrow (*Achillea millefolium*), buttercup (*Ranunculus* sp.), crooked stem aster (*Aster prenanthoides*), mint (*Mentha* sp.), Canada mayflower (*Maianthemum canadense*), partridge-berry (*Mitchella repens*), foam flower (*Tiarella cordifolia*), violets (*Viola* spp.), ramp (*Allium tricoccum*), Jack-in-the-pulpit (*Arisaema triphyllum*), wood fern (*Dryopteris* sp.), Christmas fern (*Polystichum acrostichoides*), and sensitive fern (*Onoclea sensibilis*).

Birds observed were ovenbird, red-eyed vireo, black-and-white warbler, hooded warbler, cerulean warbler, yellow-throated vireo, black-throated green warbler, least flycatcher, indigo bunting, brown-headed cowbird, hermit thrush, scarlet tanager, American redstart, yellow-bellied sapsucker, dark-eyed junco, common yellowthroat, black-capped chickadee, red-tailed hawk, brown creeper, eastern wood pewee, yellow-billed cuckoo, pileated woodpecker, rose-breasted grosbeak, American woodcock, eastern wood pewee, American robin, belted kingfisher, and tufted titmouse. See Appendix VII, pg. 152 for a list of scientific names.

Threats and Stresses

This BDA is under no imminent threat. Its designation as a Natural Area by the Pennsylvania Bureau of Forestry ensures that it "will be maintained in a natural condition by allowing physical and biological processes to operate, usually without direct human intervention" (PA Bureau of Forestry 2003a).

Conservation Recommendations

No specific management needs are anticipated, given that the current management program is aimed at sustaining the natural communities within the Natural Area.

Hammersley Fork BDA, 2006

RECOMMENDATIONS

The following are general recommendations for protection of Natural Heritage Areas (NHAs) within a county. Approaches to protecting an NHA are wide ranging and factors such as land ownership, time constraints, and tools/resources available should be considered when prioritizing protection of these areas. Prioritization works best when incorporated into a long-term, large-scale plan; however, opportunities may arise that do not conform to a plan and the decision on how to manage or protect an NHA may be made on a site-by-site basis. Keep in mind that personnel in our program or staff from state natural resource agencies are available to discuss more specific options as needed.

1. **Consider conservation initiatives for NHAs 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 organization 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 landowner and 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. Lease agreements can be a first step to help a landowner decide if he or she wants to pursue more permanent protection methods. Management agreements require a landowner and a land trust or other entity to work together to develop a plan for managing resources such as plant or animal habitat, or protection of a watershed, forest or agricultural land, with land trust offering technical expertise.

   Land acquisition by a conservation organization can be at fair market value or as a bargain sale in which a sale is negotiated for a purchase price below fair market value with tax benefits that reduce or eliminate the disparity. Acquisition projects are often key in creating new county or township parks. Sites that can serve more than one purpose such as wildlife habitat, flood and sediment control, water supply, and recreation would be particularly ideal. Private lands adjacent to public lands should be examined for acquisition when an NHA is present on either property and there is a need of additional land to complete protection of the associated natural features.

   Fee simple acquisition is when a buyer purchases land outright and has maximum control over the use and management of the property and its resources. This conservation initiative is appropriate when the property's resources are highly sensitive and protection cannot be guaranteed using other conservation approaches.

   Unrestricted donations of land can be arranged through land trusts. The donation of land entitles the donor to a charitable deduction for the full market value and 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. In some cases, stewardship endowments or mechanisms for funding are desired by the land trust when receiving donations.

   Local zoning ordinances are one of the best-known regulatory tools available to municipalities. Examples of zoning ordinances a municipality can adopt include overlaying 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.

2. **Prepare management plans that address species of special concern and natural communities.**
   Many of the already-protected NHAs are in need of additional management to ensure the continued existence of the associated natural elements. Incorporate site-specific recommendations into existing management plans or prepare new plans. Recommendations may include removal of exotic 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; and implementing sustainable forestry practices. For example, some species simply require continued availability of a particular natural community while others may need specific management practices such as canopy thinning, mowing, or burning to maintain the habitat they require.

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 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 informed about the importance of their land as it relates to habitat value, especially for species of special concern, and agreements should be advanced 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 ecosystem; especially those that protect biodiversity, supply drinking water, and are attractive recreational resources. Many rare species, unique natural communities, and locally significant habitats occur in wetlands and water bodies and are directly dependent on natural hydrological patterns and good 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. Hence, protection of high-quality watersheds is the only way to ensure the viability of natural habitats and good 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 buffers around NHAs.**
Development plans should provide for natural buffers between disturbances and NHAs. 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). County and township officials can encourage landowners to maintain vegetated buffer zones within riparian zones. Vegetated buffers (preferably of plant species native to Pennsylvania) help reduce erosion and sedimentation and shade/cool the water. These buffers benefit aquatic animal life, provide habitat for other wildlife species, and create a diversity of habitats along the creek or stream.

Watersheds or subwatersheds where natural communities and species of special concern occur (outlined on the township maps in this report) should be viewed as areas of sensitivity, although not all portions of the watershed may be zones of potential impact. Staff at the Pennsylvania Natural Heritage Program and state natural resources agencies can provide further guidance regarding buffer considerations appropriate for various kinds of natural resources within NHAs.

5. **Reduce fragmentation of surrounding landscape.**
Encourage development in sites that have already seen past disturbances. 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 reduced. Careful planning can maintain natural environments and 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, or brownfields development, for commercial and industrial projects presents one way to encourage economic growth while allowing ecologically sensitive areas to remain undisturbed. For example, reclaimed surface mines can be used for wind

development when feasible. Cluster development can be used to allow the same amount of development on much less land and leave much of the remaining land intact for wildlife and native plants. By compressing development into already disturbed areas with existing infrastructure (roads, existing right-of-ways), large pieces of the landscape can be maintained intact. Networks or corridors of woodlands or greenspace linking sensitive natural areas to each other should be preserved.

6. **Encourage the formation of 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, and 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.

7. **Manage for invasive species.**
Invasive species threaten native diversity by dominating habitat used by native species and disrupting the integrity of the ecosystems they occupy. Management for invasives depends upon the extent of establishment of the species. Small infestations may be easily controlled or eliminated but more well-established populations might present difficult management challenges. Below is a list sources for invasive species information.

   - The ***Mid-Atlantic Exotic Plant Pest Council*** (MA-EPPC) is a non-profit organization (501(c)(3)) dedicated to addressing the problem of invasive exotic plants and their threat to the Mid-Atlantic region's economy, environment, and human health by: providing leadership; representing the Mid-Atlantic region at national meetings and conferences; monitoring and disseminating research on impacts and controls; facilitating information development and exchange; and coordinating on-the-ground removal and training. A membership brochure is available as a pdf file at http://www.ma-eppc.org .

   - Several excellent Web sites exist to provide information about invasive exotic species. The following sources provide individual species profiles for the most troublesome invaders, with information such as the species' country of origin, ecological impact, geographic distribution, and an evaluation of possible control techniques.
     - The Nature Conservancy's Weeds on the Web at http://tncweeds.ucdavis.edu/
     - The Virginia Natural Heritage Program's invasive plant page at http://www.dcr.state.va.us/dnh/invinfo.htm
     - The Missouri Department of Conservation's Missouri Vegetation Management Manual at http://www.conservation.state.mo.us/nathis/exotic/vegman/
     - U.S. Department of the Interior, National Park Service invasive species monitoring resources at: http://science.nature.nps.gov/im/monitor/invasives.htm (under construction)
     - The following site is a national invasive species information clearinghouse listing numerous other resources on a variety of related topics: http://www.invasivespecies.gov/

8. **Incorporate CNHI information into planning efforts.**
Through internal planning, decision-making related to land-use development, and participation in regional planning initiatives, counties, and municipalities could profoundly shape the land and landscapes of Pennsylvania. Natural Heritage Areas can be readily included in comprehensive plans, greenway and open space plans, parks and recreation plans, and regional planning initiatives. DCNR-funded greenway and open space plans, Heritage Region plans, and River Conservation Plans are good examples of planning efforts that reach beyond county boundaries.

GLOSSARY

Alluvium: detrital deposits made by streams on riverbeds, flood plains, and alluvial fans; Especially a deposit of silt or silty clay laid down during time of flood.

Ambystomid: a small to moderate-sized terrestrial or semiaquatic New World salamander. Ambistomid salamanders possess lungs, as compared to plethodontid salamanders, which do not.

Anthropogenic: human caused.

Bedrock: the solid rock that underlies loose material, such as soil, sand, clay, or gravel.

Biocide: a natural or synthetic substance toxic to living organisms. Some ecologists advocate the use of this term instead of 'pesticides', since most pesticides are also toxic to species other than the target pest species. Indirectly, pesticides may also affect non-target organisms detrimentally in many other ways (e.g.,by loss of food species or loss of shelter) so that the effects of pesticides may also be felt throughout a whole ecosystem. The term 'biocide' indicates this property more clearly than 'pesticide'.

Biological Diversity Area (BDA): an area containing and important in the support of plants or animals of special concern at state or federal levels, exemplary natural communities, or exceptional native diversity.

Bituminous coal: coal that contains more than 14% volatile matter. It is dark brown to black and burns with a smoky flame. Bituminous coal is the most abundant type of coal.

Bog: a low-nutrient, highly acidic wetland where sphagnum peat accumulates to the point where plant roots have minimal contact with either surface water or groundwater.

Calcareous: containing calcium carbonate. When the term is used to describe a type of rock, it implies that as much as 50% of the rock is calcium carbonate. Limestone is the most important and widely distributed of the carbonate rocks.

Calciphilic: thriving in environments rich in calcium salts.

Colluvium: weathered rock debris that has moved down a hill slope chiefly by gravity; includes talus and cliff debris.

Ecology: the study of relations between organisms and their natural environment, living and nonliving.

Ecosystem: the biotic (living) community and its abiotic (nonliving) environment functioning as a system.

Endemic: a species or other taxonomic group that is restricted to a particular geographic region, owing to such factors as isolation or response to soil or climatic conditions.

Eutrophication: the process of nutrient enrichment (usually by nitrates and phosphates) in aquatic ecosystems, such that the productivity of the system ceases to be limited by the availability of nutrients. It occurs naturally over geologic time, but may be accelerated by human activities (e.g., sewage disposal or agricultural runoff).

Extirpated: species that have become locally extinct since the settlement of this area by people of European descent.

Food-web: a conceptual diagram that represents the feeding relationships of organisms within an ecosystem. It consists of a series of interconnecting food-chains, and shows the transfer of energy from primary producers (green plants) through a series of organisms that eat and are eaten. Only some of the many possible relationships can be shown in such a diagram and it is usual to include only one or two carnivores at the highest trophic levels.

Geomorphic: pertaining to the form of the earth or of its surface features.

Graminoid: grass or grass-like plant, including grasses (*Poaceae*), sedges (*Cyperaceae*), rushes (*Juncaceae*), arrow-grasses (*Juncaginaceae*), and quillworts (*Isoetes*).

Instar: an insect larva that is between one moult (ecdysis) of its exoskeleton and another, or between the final ecdysis and its emergence in the adult form. Instars are numbered and there are usually several during larval development.

Landscape Conservation Area (LCA): a large contiguous area; important because of its size, contiguous forest, open space, habitats, and/or inclusion of one or more Biological Diversity Areas, and although including a variety of land uses, has not been heavily disturbed and thus retains much of its natural character.

Mast: a fruit, especially of beech, but also of oak, elm, and other forest trees.

Mesic: refers to an environment that is neither extremely wet (hydric) nor extremely dry (xeric).

Mineral soil: a soil composed predominantly of, and having its properties determined Predominantly by, mineral matter. Usually contains < 20% organic matter, but may contain an organic surface layer up to 30 centimeters thick.

Mycorrhiza: a close physical association between a fungus and the roots of a plant, from which both fungus and plant appear to benefit; a mycorrhizal root takes up nutrients more efficiently than does an uninfected root. A very wide range of plants can form mycorrhizas of one form or another and some plants appear incapable of normal development in the absence of their mycorrhizal fungi.

Old-field ecosystem: develops on abandoned farmland as the land gradually reverts to forest.

Physiographic Province: a region of which all parts are similar in geologic structure and Climate and which has consequently had a unified geomorphic history; a region whose relief features and landforms differ significantly from that of adjacent regions.

Riparian: pertaining to or situated on the bank of a body of water, especially of a river.

Toe slope: the lowest part of a slope or cliff; the downslope end of an alluvial fan.

Trophic level: a step in the transfer of energy within a food-web. There may be several trophic levels within a system, for example: producers (autotrophs), primary consumers (herbivores), and secondary consumers (carnivores); further carnivores may form fourth and fifth levels.

Vernal: occurring in the spring.

Xeric: a dry, as opposed to a wet (hydric) or intermediate (mesic) environment.

Xerophyte: a plant that can grow in very dry conditions and is able to withstand periods of drought.

LITERATURE CITED

Abrams, M.D. 1998. The red maple paradox. BioScience 48(5): 355-364.

Allen, T.J. 1997. The butterflies of West Virginia and their caterpillars. University of Pittsburgh Press, Pittsburgh, PA. 388 pp.

Anonymous. 1985. A preliminary inventory of natural areas of the Hoosier National Forest. Indiana Department of Natural Resources, Indianapolis, Indiana. Unpublished report. 197 pp.

Askins, R.A., J.F. Lynch, and R. Greenberg. 1991. Population declines in migratory birds in eastern North America. Current Ornithology 7: 1-57.

Ball, P.W., A.A. Reznicek, and D.F. Murray. 2002. Cyperaceae. *In*: Flora of North America Editorial Committee, eds. 1993+. Flora of North America North of Mexico. 12+ vols. New York and Oxford. Vol. 23.

Blaustein, A. R., D. B. Wake, and W. P. Sousa. 1994. Amphibian declines: judging stability, persistence, and susceptibility of populations to local and global extinctions. Conservation Biology 8: 60-71.

Braun, E.L. 1950. Deciduous forests of eastern North America. The Free Press, MacMillan Publ. Co., New York. 596 pp.

Brauning, D.W. ed. 1992. Atlas of breeding birds in Pennsylvania. University of Pittsburgh Press, Pittsburgh. 484 pp.

Brody, A. J. and M. R. Pelton. 1989. Effects of roads on black bear movements in western North Carolina. Wildlife Society Bulletin 17: 5-10.

Canadian Soil Information System. Glossary. 2003. Retrieved from http://sis.agr.gc.ca/cansis/glossary/associationsoil.html on 22 April 2003.

Ciszek, D. 2002. "Lynx rufus." Animal Diversity Web. Accessed March 19, 2005. http://animaldiversity.ummz.umich.edu/site/accounts/information/Lynx_rufus.html.

Colburn, E.A. 2004. Vernal pools: natural history and conservation. McDonald and Woodward Publishing Company, Granville, Ohio. 456 pp.

Dahl, T.E. 1990. Wetlands losses the United States 1790's to 1980's. U.S. Depart. of the Interior, Fish and Wildlife Service, Washington, D.C. 13 pp.

Davis, A.F., T.L. Smith, A.M. Wilkinson, E.B. Drayton, and G.J. Edinger. 1990. A natural areas inventory of Lancaster County, Pennsylvania. Pennsylvania Science Office of the Nature Conservancy, Middletown, Pennsylvania. 165 pp.

Denny, C. S. 1951. Pleistocene frost action near the border of the Wisconsin drift in Pennsylvania. The Ohio Journal of Science 51: 116–125.

Dunkle, S.W. 2000. Dragonflies through binoculars. Oxford University Press, Oxford. 266 pp.

Evans Mack, D. and W. Yong. 2000. Swainson's thrush (*Catharus ustulatus*). *In* The Birds of North America, No. 540 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Fike, J. 1999. Terrestrial & Palustrine Plant Communities of Pennsylvania. Pennsylvania Natural Diversity Inventory. 86 p.

Fitch, H.S. 1954. Life history and ecology of the five-lined skink, *Eumeces fasciatus*. University of Kansas Publ. Museum Natural History. 8: 1-156.

Forman, R. T., and L. E. Alexander. 1998. Roads and their major ecological effects. Annual Review of Ecology and Systematics 29: 207-231.

Forman, R. T., and D. R. Deblinger. 2000. The Ecological Road-Effect Zone of a Massachusetts (U.S.A.) Suburban Highway. Conservation Biology 14: 36-46.

Goodman, K.V., J.C.F. Tedrow, R.W. Stem, L.G.Yearick, and W.H. Lyford.1958. Soil survey of Potter County, Pennsylvania. United States Department of Agriculture, Soil Conservation Service. Pennsylvania State University, College of Agriculture.

Goodrich, L. J., M. Brittingham, J.A. Bishop, and P. Barber. 2003. Wildlife habitat in Pennsylvania: past, present, and future. Pennsylvania Department of Conservation and Natural Resources. Harrisburg, PA. http://www.dcnr.state.pa.us/wlhabitat/.

Glotzhober, R.C. and D. McShaffrey. Eds. 2002. The Dragonflies and Damselflies of Ohio. Ohio Biological Survey Bulletin New Series Volume 14 Number 2. 364 pp.

Greenberg C.H., S.H. Crownover, D.R. Gordon. 1997. Roadside soils: A corridor for invasion of xeric scrub by nonindigenous plants. Natural Areas Journal. 17: 99–109.

Gross, D.A. 2002. The Current PA List of breeding birds of special concern and species under consideration. PSO Newsletter, 13(3): 8.

Haskell, D. G. 2000. Effects of forest roads on macroinvertebrate soil fauna of the southern Appalachian Mountains. Conservation Biology 14: 57-63.

Hays, M. 2001. Conservation assessment for creeping snowberry (*Galutheria hispidula*). USDA Forest Service , Eastern Region. http://www.fs.fed.us/r9/wildlife/tes/ca-overview/docs/plant_Gaultheria-hispidula-Creeping_Snowberry.pdf.

Heilman, G.E., J.R.Strittholt, N.C. Slosser, and D.A.Dellasala. 2002. Forest fragmentation can be measured and monitored in a powerful new way by combining remote sensing, geographic information systems, and analytical software. BioScience 52(5): 411-422.

Holmes, R.T. and T.W Sherry. 1988. Assessing populations of New Hampshire forest birds: local vs. regional patterns. The Auk 105: 756-768.

Hornbeck, J.H., D.J. Reyher, and C.H. Sieg. 2003. Species assessment of great-spurred violet in the Black Hills of South Dakota. United States Department of Agriculture Forest Service. Rocky Mountain Region. Black Hills National Forest, Custer, South Dakota.

Jones, A.L. and P.D. Vickery. 1997. Conserving grassland birds: managing small grasslands including conservation lands, corporation headquarters, recreation fields, and small landfills for grassland birds. Massachusetts Audubon Society, Lincoln, Massachusetts. 16 pp.

Kenney, L.P. and M.R. Burne. 2000. A field guide to vernal pools. Massachusetts Division of Fisheries and Wildlife, Natural Heritage & Endangered Species Program, Westborough, Massachusetts. 73 pp.

Latham, R.E., J. Beyea, M. Benner, C.A. Dunn, M. A. Fajvan, R.R. Freed, M. Grund, S.B. Horsley, A.F. Rhoads and B.P. Shissler. 2005. Managing white-tailed deer in forest habitat from an ecosystem perspective: Pennsylvania case study. Report by the deer management forum for Audubon Pennsylvania and Pennsylvania Habitat Alliance, Harrisburg. 340 pp.

Loos, G. and P. Kerlinger. 1993. Road mortality of saw-whet and screech-owls on the Cape May peninsula. J. Raptor Res. 27: 210–213.

Lynch, J.F., and D.F. Whigham. 1984. Effects of forest fragmentation on breeding bird communities in Maryland, USA. Biological Conservation 28: 287-324.

Massachusetts Division of Fisheries and Wildlife. 2003. Natural Heritage Endangered Species Program: Harpoon Clubtail Dragonfly. http://www.mass.gov/dfwele/dfw/nhesp/nhfacts/gomphus_descriptus.pdf. (Accessed: February 20, 2007).

Massachusetts Division of Fisheries and Wildlife. 2003. Natural Heritage Endangered Species Program: Ocellated darner dragonfly. http://www.mass.gov/dfwele/dfw/nhesp/nhfacts/boyeria_grafiana.pdf. (Accessed: November 16, 2006).

Massachusetts Executive Office of Environmental Affairs. 2001. BioMap: Guiding land conservation for biodiversity in Massachusetts. Boston, MA. 59 pp.

Matlack, G. R. 1993. Microenvironment variation within and among forest edge sites in the eastern United States. Biological Conservation 66:185-194.

Mazur, K. M., and P. C. James. 2000. Barred Owl (*Strix varia*). *In* The Birds of North America, No. 508 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA, and the American Ornithologists' Union, Washington, D.C.

Merritt, J.F. 1987. Guide to the mammals of Pennsylvania. University of Pittsburgh Press, Pittsburgh. 408p.

Muller, M. J., and R. W. Storer. 1999. Pied-billed Grebe (*Podilymbus podiceps*). *In* The Birds of North America, No. 410 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Murcia, C. 1995. Edge effects in fragmented forests: implications for conservation. Trends in Ecology and Evolution 10: 58-62.

Myers, W.L. et al. 2000. Pennsylvania Gap Analysis Project: Leading landscapes for collaborative conservation. Final Rep. U.S. Geol. Survey-Gap Analysis Program. (Available at: <http://www.orser.psu.edu/PAGAP/gappage.htm>. Accessed: December 14, 2006).

Naeem, S. (Chair), F.S. Chapin III., R. Costanza, P.R. Ehrlich, F.B. Golley, D.U. Hooper, J.H. Lawton, R.V. O'Neill, H.A. Mooney, O.E. Sala, A.J. Symstad, and D. Tilman. 1999. Biodiversity and ecosystem functioning: maintaining natural life support processes. Issues in Ecology #4. 11 pp.

NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.0. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: November 2006).

Ostroumov, S.A. 2002. New Definitions of the Concepts and Terms Ecosystem and Biogeocenosis. Doklady Biological Sciences 383: 141-143(3).

Oxley, D. J., M. B. Fenton, and G. R. Carmody. 1974. The effects of roads of populations of small mammals. Journal of Applied Ecology 11:51-59.

PA Bureau of Forestry. 2003a. Ecological considerations. *In*: State Forest Resource Management Plan – Final Draft. http://www.dcnr.state.pa.us/forestry/sfrmp/eco.htm - natural.

PA Bureau of Forestry. 2003b. Water resources. *In*: State Forest Resource Management Plan – Final Draft. http://www.dcnr.state.pa.us/forestry/sfrmp/water.htm#riparian.

PA Bureau of Forestry 2006. Hemlock woolly adelgid. http://www.dcnr.state.pa.us/forestry/woollyadelgid/index.aspx**.**

PA DEP. 2004. Pennsylvania integrated water quality monitoring and assessment report. PA Department of Environmental Protection, Bureau of Watershed Conservation. Harrisburg, PA

Parmalee, P.W. and A.E. Bogan. 1998. The freshwater mussels of Tennessee. The University of Tennessee Press, Knoxville. 328 pp.

Pearson, D.L., C.B. Knisley, and C.J. Kazilek. 2006. A field guide to the tiger beetles of the United States and Canada: Identification, natural history and distribution of the Cicindelidae. Oxford University Press, New York. 227 pp.

Penn State Timber Market Report. 1993. USDA Forest Service, Northeast Forest Experimental Station GTR NE-126.

Pennsylvania 21st Century Environment Commission. 1998. Report of the 21st Century Environment Commission. http://www.21stcentury.state.pa.us/2001/final.htm.

PA Bureau of Forestry. 2003a. Ecological considerations. *In*: State Forest Resource Management Plan – Final Draft. http://www.dcnr.state.pa.us/forestry/sfrmp/eco.htm - natural

PA Bureau of Forestry. 2003b. Water resources. *In*: State Forest Resource Management Plan – Final Draft. http://www.dcnr.state.pa.us/forestry/sfrmp/water.htm#riparian

Petit, D. R., J. F. Lynch, R. L. Hutto, J. G. Blake, R. B. Waide. 1995. Habitat use and conservation in the Neotropics. Pp. 145–197 in Ecology and management of Neotropical migratory birds (T. E. Martin and D. M. Finch, eds.). Oxford Univ. Press, New York.

Pulcinella, N. 1997. Eighth report of the Pennsylvania Ornithological Records Committee, June 1997. Pennsylvania Birds 11:126-133.

Reese, G.A., D.A. Albert, S.R. Crispin, L.A. Wilsmann, and S.J. Ouwinga. 1988. A natural Heritage inventory of Oakland County, Michigan. Volume I: Technical Report: Michigan Natural Features Inventory, Lansing, Michigan. 242 pp.

Reschke, C. 1990. Techniques used for the inventory of rare ecological communities in New York State. pp. 102 –105. In R.S. Mitchell, C.J. Sheviak and D.J. Leopold (eds.), Ecosystem management: rare species and significant habitats. New York State Museum Bulletin 471. 314 pp.

Rhoads, A.F. and T.A. Block. 2000. The plants of Pennsylvania: an illustrated manual. University of Pennsylvania Press, Philadelphia. 1061 pp.

Rhoads, A.F. and W.M. Klein, Jr. 1993. The vascular flora of Pennsylvania: annotated checklist and atlas. American Philosophical Society, Philadelphia. 636 p.

Robbins, C.R., D.K. Dawson and B.A. Dowell. 1989. Habitat area requirements of breeding forest birds of the middle Atlantic states. Wildlife Monographs 103: 1-34.

Robbins, C.S. 1980. Effects of forest fragmentation on breeding bird populations in the piedmont of the Mid-Atlantic Region. Atlantic Naturalist 33: 31-36.

Robinson, S. K. 1994. Nesting success of forest songbirds in northwestern Illinois. Final Report, Project W-115-R-3. Illinois Natural History Survey. Center of Wildlife. Ecology, Urbana.

Robinson, S.K., F.R. Thompson III, T.M. Donovan, D.R. Whitehead, and J. Faaborg. 1995. Regional forest fragmentation and the nesting success of migratory birds. Science 267: 1987-1990.

Sauer, J. R., J. E. Hines, and J. Fallon. 2004. The North American Breeding Bird Survey, Results and Analysis 1966 - 2004. Version 2005.2. USGS Patuxent Wildlife Research Center, Laurel, MD. http://www.mbr-pwrc.usgs.gov/bbs/bbs2004.html

Schmidt, W. 1989. Plant dispersal by motor cars. Vegetatio 80: 147-152.

Schultz, C. H., editor, 1999, The Geology of Pennsylvania, Pennsylvania Geological Survey Special Publication 1, 888p.

Scott, J.M., E.A. Norse, H. Arita, A. Dobson, J.A. Estes, M. Foster, B. Gilbert, D.B. Jensen, R.L. Knight, D. Mattson, and M.E. Soule. 1999. The issue of scale in selecting and designing biological reserves. pp. 19-37. *In* M.E. Soule and J. Terborgh (eds.), Continental conservation: scientific foundations of regional reserve networks. Island Press, Washington, DC. 227 p.

Seiler, A. 2001. Ecological effects of roads: a review. Introductory Research Essay No. 9, Swedish University of Agricultural Sciences, Upsala, Sweden.

Semlitsch, Raymond D. and J. Russell Bodie. 2003. "Biological criteria for buffer zones around wetlands and riparian habitats for amphibians and reptiles." Conservation Biology 17 (5): 1219-1228.

Smith, T.L. 1991. Classification of Natural Communities in Pennsylvania. Pennsylvania Natural Diversity Inventory and the Nature Conservancy. Middletown, PA.

Squires, J. R., and R. T. Reynolds. 1997. Northern Goshawk (*Accipiter gentilis*). *In* The Birds of North America, No. 298 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.

Thorne, S.G., K.C. Kim and K.C. Steiner, eds. 1996. A Heritage for the 21st Century: Conserving Pennsylvania's Native Biological Diversity. Pennsylvania Fish and Boat Commission. Harrisburg, PA.

Trombulak, S.C., and C.A. Frissell. 2000. Review of the ecological effects of roads on terrestrial and aquatic communities. Conservation Biology 14: 18-30.

Watkins, R.Z., J. Chen, J. Pickens, and K.D. Brosofske. 2003. Effects of forest roads on understory plants in a managed hardwood landscape. Conservation Biology 17: 411-419.

Williams, C.E. 1995. Effects of powerline corridors on forest ecosystem integrity. Pages 76-86 *in* S. K. Majumdar, E. W. Miller, and F. J. Brenner, editors. Environmental Contaminants, Ecosystems and Human Health. Pennsylvania Academy of Science, Easton, PA.

Yahner, R.H. 1995. Eastern deciduous forest: ecology and wildlife conservation. University of Minnesota Press, Minneapolis, Minn. 220 pp.

GIS DATA SOURCES

Bedrock geologic units of Pennsylvania, scale 1:250,000. Digital datasets prepared by C.E. Miles, T.G. Whitfield, from published 1980 state geologic map. 2001. Pennsylvania Bureau of Topographic and Geologic Survey, DCNR. Available online: http://www.dcnr.state.pa.us/topogeo/gismaps/digital.aspx. Accessed: 2004.

Bishop, Joseph A. 1998. Managed Lands in Pennsylvania. Pennsylvania GAP Analysis Project, Environmental Resources Research Institute.

Bishop, Joseph A. 2004. Pennsylvania Important Mammal Areas Project.

Ecological regions of North America, Level III. 1997. North American Commission for Environmental Cooperation. Available online: http://www.epa.gov/wed/pages/ecoregions/na_eco.htm. Accessed: March 2004.

ESRI Street Map USA. 2005.

National Elevation Dataset for Potter County, Pennsylvania, U.S. Geological Survey, EROS Data Center 1999.

National Agriculture Imagery Program (NAIP) 1-meter resolution color infrared mosaic of Potter County, Pennsylvania. 2004. USDA-FSA Aerial Photography. http://www.pasda.psu.edu/summary2.cgi/naip/naip_cirsid_potter_2004.xml

Pennsylvania Bureau of Forestry. Pennsylvania Department of Conservation and Natural Resources (PA DCNR). Natural and Wild Areas. Accessed: May 2006.

Pennsylvania Department of Transportation. 2005. PennDOT - Pennsylvania Municipality Boundaries. Bureau of Planning and Research, Cartographic Information Division. Pennsylvania Spatial Data Access (PASDA). http://www.pasda.psu.edu/

Pennsylvania Department of Transportation. 2006. PennDOT - Pennsylvania County Boundaries. Bureau of Planning and Research, Cartographic Information Division. Pennsylvania Spatial Data Access (PASDA). http://www.pasda.psu.edu/

Pennsylvania Natural Diversity Inventory (PNDI) Spatial Database. Pennsylvania Natural Heritage Program, 2006.

Pennsylvania Small Watershed, Environmental Resources Research Institute, Pennsylvania Department of Environmental Protection, 5/3/1997.

Pennsylvania Bureau of Topographic and Geologic Survey. 1995. Physiographic Provinces 1:100,000. PA DCNR. Pennsylvania Spatial Data Access (PASDA). http://www.pasda.psu.edu/.

State maintained roadway centerlines of Pennsylvania, 2006. Pennsylvania Department of Transprotation, Bureau of Planning and Research, Geographic Information Division.

USGS National Hydrography Dataset (NHD). Downloaded 2005. http://nhd.usgs.gov/index.html

U.S. Fish and Wildlife Service. 2005. National Wetland Inventory (NWI) for Pennsylvania – polygon. Pennsylvania Spatial Data Access (PASDA). www.pasda.psu.edu

USGS 1:24,000 Topographic quadrangles. Pennsylvania Spatial Data Access (PASDA), downloaded 2003. http://www.pasda.psu.edu/

Warner, Eric D. 2000. Pennsylvania Landcover. Penn State University (PSU). http://www.pasda.psu.edu/documents.cgi/orser/psu-palulc_2000.xml.

APPENDIX I: Pennsylvania Natural Heritage Program (PNHP)

The Pennsylvania Natural Heritage Program (PNHP) was established in 1982 as a joint effort of the Western Pennsylvania Conservancy, the Pennsylvania Department of Conservation and Natural Resources (formerly the Pennsylvania Department of Environmental Resources), the Bureau of Forestry, and the Pennsylvania Science Office of The Nature Conservancy. PNHP is part of a network of "Natural Heritage Programs" that utilize common methodology developed by The Nature Conservancy and refined through NatureServe – the organization that represents the network of Natural Heritage Programs – and the individual programs themselves. Natural Heritage Programs have been established in each of the 50 United States and in Canada, Latin America, and the Carribean.

PNHP collects and stores locational and baseline ecological information about rare plants, rare animals, unique plant communities, significant habitats, and geologic features in Pennsylvania. Presently, the PNHP database is Pennsylvania's chief storehouse of such information with approximately 15,500 detailed occurrence records that are stored as computer files. Additional data are stored in extensive manual files documenting over 150 natural community types, more than 5000 plant and animal species, and about 1100 managed areas. As part of its function, PNHP provides reviews of projects that require permits as issued by the Pennsylvania Department of Environmental Protection (DEP). This environmental review function of the PNHP is referred to as PNDI or the Pennsylvania Natural Diversity Inventory.

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 state rarity for resources that do not have official state status such as invertebrate animals and natural communities of organisms. A summary of global and state ranks can be found in Appendix V.

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

APPENDIX II: County Natural Heritage Inventory Site Survey Form

County: _____ Quad: _____ Date: _____ GPS'd?_____

Site #: _____ Site Name: _____ Photo? _____

Source Code: _____ Field Crew: _____

Site Description (incl snags, woody debris, scat, etc.):

Wildlife Observations:

Overstory Dominant(s): _____

Understory Dominant(s): _____

Herb Layer Dominant(s): _____

Impacts/Threats: _____

	Cover Class						
Woody spp.	SE	SA	U	O	SH	**Herbs**	**Ferns & Fern Allies**
							Graminoids

SE = seedling SA = sapling U = understory O = overstory SH = shrub

APPENDIX III: Classification of Natural Communities in Pennsylvania

Terrestrial & Palustrine Plant Communities of Pennsylvania (Fike 1999) is the most current community classification system for Pennsylvania's palustrine and terrestrial plant communities. This report was developed by the Pennsylvania Natural Heritage Program to update and refine Smith's 1991 report *Classification of natural communities in Pennsylvania (draft),* the first effort dedicated specifically to the classification of natural communities in the state. Work is ongoing to improve the current classification system. Future editions may define new community types or alter currently defined types. Aquatic communities (lakes, streams, and rivers), communities where vegetation is absent or not a definitive characteristic (caves, scree slopes), and communities resulting from extensive human disturbance (old agricultural fields, manmade wetlands, etc.), are not addressed in this classification. Until more extensive work can be completed to define these types of communities and incorporate them into a single statewide framework, the County Natural Heritage Inventory reports will provisionally refer to features of ecological interest that fall outside the Fike 1999 system using categories described in Smith 1991.

Community Ranks

As with species that are of concern, ranks have been assigned to rate the rarity of each natural community type identified for Pennsylvania. Appendix Vc list criteria for global and state ranks. In most cases, the global extent of these communities has yet to be fully evaluated, and no global rarity rank has been assigned. Work is ongoing to refine these ranks and to further develop the ranking system to rate the relative quality of communities within a type.

COMMUNITY TYPE (**Fike 1999**)	GLOBAL RANK	STATE RANK
TERRESTRIAL FORESTS*:*		
Hemlock (white pine) forest	G5	S4
Serpentine pitch pine – oak forest	G2	S1
Serpentine Virginia pine – oak forest	G2	S1
Pitch Pine – mixed oak forest	G?	S4
Virginia pine – mixed hardwood forest	G?	S5
Dry white pine (hemlock) – oak forest	G?	S4
Hemlock (white pine) – northern hardwood forest	G?	S5
Hemlock (white pine) – red oak – mixed hardwood forest	G?	S4
Hemlock – tuliptree – birch forest	G?	S4
Rich hemlock – mesic hardwoods forest	G?	S2S3
Dry oak –heath forest	G?	S4S5
Dry oak – mixed hardwood forest	G?	S3
Red oak – mixed hardwood forest	G?	S5
Northern hardwood forest	G?	S4
Black cherry – northern hardwood forest	G?	S4
Tuliptree – beech – maple forest	G?	S4
Sugar maple – basswood forest	G?	S4
Mixed mesophytic forest	G?	S1S2
Sweet gum – oak coastal plain forest	G?	S1
Red maple (terrestrial) forest	G?	S5
Black-gum ridgetop forest	G?	S3
Aspen/gray (paper) birch forest	G?	S?
Black locust forest	G?	SW

COMMUNITY TYPE (**Fike 1999**)	GLOBAL RANK	STATE RANK
***PALUSTRINE FORESTS**:*		
Black spruce – tamarack peatland forest	G?	S3
Red spruce palustrine forest	G?	S3
Hemlock palustrine forest	G5	S3
Hemlock – mixed hardwood palustrine forest	G?	S3S4
Red spruce – mixed hardwood palustrine forest	G?	S3
Bottomland oak – hardwood palustrine forest	G5	S2
Red maple – black-gum palustrine forest	G5	S3S4
Red maple – black ash palustrine forest	G?	S2S3
Red maple – magnolia Coastal Plain palustrine forest	G?	S1
Great Lakes Region lakeplain palustrine forest	G?	S1
Sycamore – (river birch) – box elder floodplain forest	G?	S3
Silver maple floodplain forest	G?	S3
Red maple – elm – willow floodplain swamp	G?	S2
TERRESTRIAL WOODLANDS:		
Pitch pine – heath woodland	G4	S2
Pitch pine – scrub oak woodland	G4	S2
Red spruce rocky summit	G?	S1
Pitch pine – rhodora – scrub oak woodland	G?	S1
Pitch pine – mixed hardwood woodland	G4	S2S3
Virginia pine – mixed hardwood shale woodland	G?	S2
Red-cedar – mixed hardwood rich shale woodland	G?	S1S2
Dry oak – heath woodland	G4	S3
Birch (black-gum) rocky slope woodland	G?	S2
Yellow oak – redbud woodland	G?	S2
Great Lakes Region scarp woodland	G?	S1S2
Great Lakes Region bayberry – cottonwood community	G?	S1
PALUSTRINE WOODLANDS:		
Pitch pine – leatherleaf woodland	G?	S2
Black spruce – tamarack palustrine woodland	G?	S2
Red spruce palustrine woodland	G?	S2S3
Red maple – highbush blueberry palustrine woodland	G5	S4
Red maple – sedge palustrine woodland	G5	S4
Red maple – mixed shrub palustrine woodland	G?	S4
TERRESTRIAL SHRUBLANDS:		
Red-cedar – prickly pear shale shrubland	G?	S2
Red-cedar – pine serpentine shrubland	G2	S1
Red-cedar – redbud shrubland	G?	S2
Low heath shrubland	G4	S1
Low heath – mountain ash shrubland	G?	S2
Scrub oak shrubland	G4	S3
Rhodora – mixed heath – scrub oak shrubland	G?	S1

COMMUNITY TYPE (**Fike 1999**)	GLOBAL RANK	STATE RANK
PALUSTRINE SHRUBLANDS:		
Buttonbush wetland	G?	S4
Alder – ninebark wetland	G?	S3
Alder – sphagnum wetland	G5	S4
Highbush blueberry – meadow-sweet wetland	G5	S5
Highbush blueberry – sphagnum wetland	G?	S5
Leatherleaf – sedge wetland	G?	S3
Leatherleaf – bog rosemary	G?	S2
Leatherleaf – cranberry peatland	G?	S2S3
Water-willow (*Decodon verticillatus*) shrub wetland	G?	S3
River birch – sycamore floodplain scrub	G?	S4
Poison sumac – red-cedar – bayberry fen	G2	S1
Buckthorn – sedge (*Carex interior*) – golden ragwort fen	G2G3	S1
Great Lakes Region scarp seep	G?	S1
Great Lakes Region bayberry – mixed shrub palustrine shrubland	G?	S1
TERRESTRIAL HERBACEOUS OPENINGS:		
Side-oats gramma calcareous grassland	G2	S1
Calcareous opening/cliff	G?	S2
Serpentine grassland	G?	S1
Serpentine gravel forb community	G?	S1
Great Lakes Region dry sandplain	G?	S1
HERBACEOUS WETLANDS:		
Bluejoint – reed canary grass marsh	G?	S5
Cat-tail marsh	G?	S5
Tussock sedge marsh	G?	S3
Mixed forb marsh	G3G4	S3
Herbaceous vernal pond	G?	S3S4
Wet meadow	G?	S5
Bulrush marsh	G?	S3
Great Lakes Region palustrine sandplain	G?	S1
Prairie sedge – spotted joe – pye – weed marsh	G?	S1S2
Open sedge (*Carex stricta, C. prairea, C. lacustris*) fen	G?	S1
Golden Saxifrage – sedge rich seep	G?	S2
Skunk-cabbage – golden saxifrage forest seep	G?	S4S5
Serpentine seepage wetland	G?	S1
Golden saxifrage – Pennsylvania bitter-cress spring run	G?	S3S4
Sphagnum – beaked rush peatland	G?	S3
Many fruited sedge – bladderwort peatland	G?	S2
Water-willow (*Justicia americana*) – smartweed riverbed community	G?	S4
Riverside ice scour community	G?	S1S2
Big bluestem – Indian grass river grassland	G?	S3
Pickerel-weed – arrow-arum – arrowhead wetland	G3G4	S4
Spatterdock – water lily wetland	G?	S4

COMMUNITY TYPE (**Fike 1999**)	GLOBAL RANK	STATE RANK
COMMUNITY COMPLEXES:	Complexes not ranked	
Acidic Glacial Peatland Complex		
Great Lakes Region Scarp Complex		
Erie Lakeshore Beach Dune Sandplain Complex		
Mesic Till Barrens Complex		
Serpentine Barrens Complex		
Ridgetop Acidic Barrens Complex		
River Bed Bank Floodplain Complex		

COMMUNITY TYPES (**Smith 1991**)	GLOBAL RANK	STATE RANK
SUBTERRANEAN COMMUNITIES:		
Solution Cave Terrestrial Community	G?	S3
Solution Cave Aquatic Community	G?	S3
Tectonic Cave Community	G?	S3S4
Talus Cave Community	G?	S2S4
DISTURBED COMMUNITIES*:*		
Bare Soil	G?	S?
Meadow/Pastureland	G?	S?
Cultivated Land	G?	S?
Successional Field	G?	S?
Young Miscellaneous Forest	G?	S?
Conifer Plantation	G?	S?
ESTUARINE COMMUNITIES:		
Deepwater Subtidal Community	G?	S1
Shallow-Water Subtidal Community	G?	S1
Freshwater Intertidal Mudflat	G3G4	S1
Freshwater Intertidal Marsh	G3G4	S1
RIVERINE COMMUNITIES:		
Low-Gradient Ephemeral/Intermittent Creek	G?	S5
Low-Gradient Clearwater Creek	G?	S3S4
Low-Gradient Clearwater River	G?	S2S3
Low-Gradient Brownwater Creek	G?	S2S3
Medium-Gradient Ephemeral/Intermittent Creek	G?	S5
Medium-Gradient Clearwater Creek	G?	S3
Medium-Gradient Clearwater River	G?	S?
Medium-Gradient Brownwater Creek	G?	S3
High-Gradient Ephemeral /Intermittent Creek	G?	S5
High-Gradient Clearwater Creek	G?	S3
High-Gradient Clearwater River	G?	S?
High-Gradient Brownwater Creek	G?	S?
Waterfall and Plungepool	G?	S3S4
Spring Community	G?	S1S2
Spring Run Community	G?	S1S2

COMMUNITY TYPES (**Smith 1991**)	GLOBAL RANK	STATE RANK
LACUSTRINE COMMUNITIES:		
Glacial Lake	G?	S1
Nonglacial Lake	G?	S2
Artificial Lake	---	---
Natural Pond	G?	S2S3
Artificial Pond	---	---
Stable Natural Pool	G?	S?
Ephemeral/Fluctuating Natural Pool	G?	S3
Artificial Pool	---	---
Ephemeral/Fluctuating Limestone Sinkhole	G?	S1

APPENDIX IV: Federal and State Endangered Species Categories

Several federal and state legislative acts have provided the authority and means for the designation of endangered, threatened, rare, etc. species lists. Those acts and status summaries follow. However, not all of the species or natural communities considered by conservation biologists (e.g., Pennsylvania Biological Survey) as "special concern resources" are included on the state or federal lists. In this county inventory report, "N" denotes those special concern species that are not officially recognized by state or federal agencies. Therefore: N = No current legal status, but is considered to be of special concern in Pennsylvania, or is under review for such consideration, by conservation biologists. Contact the Pennsylvania Natural Heritage Program for more information.

APPENDIX IVa: Federal Status

All Plants and Animals: Legislative Authority: U.S. Endangered Species Act (1973), U.S. Fish and Wildlife Service, February 21, 1990, Federal Register.

LE = Listed Endangered - Taxa in danger of extinction throughout all or a significant portion of their ranges.

LT = Listed Threatened - Taxa that are likely to become endangered within the foreseeable future throughout all or a significant portion of their ranges.

PE = Proposed Endangered - Taxa already proposed to be listed as endangered.

PT = Proposed Threatened - Taxa already proposed to be listed as threatened.

APPENDIX IVb: Pennsylvania Status

Native Plant Species: Legislative Authority: Title 25 Chapter 82, Conservation of Native Wild Plants, January 1, 1988; Pennsylvania Department of Environmental Resources.

PE = Pennsylvania Endangered - Plant species which are in danger of extinction throughout most or all of their natural range within this Commonwealth, if critical habitat is not maintained or if the species is greatly exploited by man. This classification shall also include any populations of plant species that are classified as Pennsylvania Extirpated, but which subsequently are found to exist in this Commonwealth.

PT = Pennsylvania Threatened - Plant species which may become endangered throughout most or all of their natural range within this Commonwealth, if critical habitat is not maintained to prevent their future decline, or if the species is greatly exploited by man.

PR = Pennsylvania Rare - Plant species which are uncommon within this Commonwealth because they may be found in restricted geographic areas or in low numbers throughout this Commonwealth.

PX = Pennsylvania Extirpated - Plant species believed by the Department to be extinct within this Commonwealth. These plants may or may not be in existence outside the Commonwealth.

PV = Pennsylvania Vulnerable - Plant species which are in danger of population decline within this Commonwealth because of their beauty, economic value, use as a cultivar, or other factors which indicate that persons may seek to remove these species from their native habitats.

TU = Tentatively Undetermined - A classification of plant species which are believed to be in danger of population decline, but which cannot presently be included within another classification due to taxonomic uncertainties, limited evidence within historical records, or insufficient data.

APPENDIX IVb: Pennsylvania Status (continued)

Animals - The following state statuses are used by the Pennsylvania Game Commission (Legislative Authority: Title 34, Chapter 133 pertaining to wild birds and mammals, Game and Wildlife Code, revised Dec. 1, 1990) and by the Pennsylvania Fish and Boat Commission (Legislative Authority: Title 30 Chapter 75 pertaining to fish, amphibians, reptiles and aquatic organisms, Fish and Boat Code, revised February 9, 1991):

PE = Pennsylvania Endangered

Birds & mammals - Species in imminent danger of extinction or extirpation throughout their range in Pennsylvania if the deleterious factors affecting them continue to operate. These are: 1) species whose numbers have already been reduced to a critically low level or whose habitat is so drastically reduced or degraded that immediate action is required to prevent their extirpation from the Commonwealth; or 2) species whose extreme rarity or peripherality places them in potential danger of precipitous declines or sudden extirpation throughout their range in Pennsylvania; or 3) species that are classified as "Pennsylvania Extirpated", but which are subsequently found to exist in Pennsylvania as long as the above conditions 1 or 2 are met; or 4) species determined to be "Endangered" pursuant to the Endangered Species Act of 1973, Public Law 93-205 (87 Stat. 884), as amended.

Fish, amphibians, reptiles & aquatic organisms - All species declared by: 1) the Secretary of the United States Department of the Interior to be threatened with extinction and appear on the Endangered Species List or the Native Endangered Species List published in the Federal Register; or 2) are declared by the Pennsylvania Fish and Boat Commission, Executive Director to be threatened with extinction and appear on the Pennsylvania Endangered Species List published by the Pennsylvania Bulletin.

PT = Pennsylvania Threatened

Birds & mammals - Species that may become endangered within the foreseeable future throughout their range in Pennsylvania unless the casual factors affecting the organism are abated. These are: 1) species whose population within the Commonwealth are decreasing or are heavily depleted by adverse factors and while not actually endangered, are still in critical condition; 2) species whose populations may be relatively abundant in the Commonwealth but are under severe threat from serious adverse factors that are identified and documented; or 3) species whose populations are rare or peripheral and in possible danger of severe decline throughout their range in Pennsylvania; or 4) species determined to be "Threatened" pursuant to the Endangered Species Act of 1973, Public Law 93-205 (87 Stat. 884), as amended, that are not listed as "Pennsylvania Endangered".

Fish, amphibians, reptiles & aquatic organisms - All species declared by: 1) the Secretary of the United States Department of the Interior to be in such small numbers throughout their range that they may become endangered if their environment worsens, and appear on a Threatened Species List published in the Federal Register; or 2) are declared by the Pennsylvania Fish and Boat Commission Executive Director to be in such small numbers throughout their range that they may become endangered if their environment worsens and appear on the Pennsylvania Threatened Species List published in the Pennsylvania Bulletin.

Internal Fish and Boat Commission Status Category:

PC = Pennsylvania Candidate

Species that exhibit the potential to become Endangered or Threatened in the future. Pennsylvania populations of these taxa are: 1) "rare" due to their decline, distribution, restricted habitat, etc.; 2) are "at risk" due to aspects of their biology, certain types of human exploitation, or environmental modification; or, 3) are considered "undetermined" because adequate data is not available to assign an accurate status. This category is unofficial and has no basis in any law (i. e., Chapter 75, Fish and Boat Code), as do the Endangered and Threatened categories.

Invertebrates - Pennsylvania Status: No state agency is assigned to develop regulations to protect terrestrial invertebrates, although a federal status may exist for some species. Aquatic invertebrates are regulated by the Pennsylvania Fish And Boat Commission, but have not been listed to date. Although no invertebrate species are presently state listed, conservation biologists unofficially assign numerous state status and/or state rank designations. NOTE: Invertebrate species are regularly considered under the U.S. Endangered Species Act for federal status assignments.

APPENDIX IVc: Global and State Ranking

Global and State Ranking is a system utilized by the network of 50 state natural heritage programs in the United States. Although similar to the federal and state status designations, the ranking scheme allows the use of one comparative system to "rank" all species in a relative format. Unlike state or federal status designation guidelines, the heritage ranking procedures are also applied to natural community resources. Global ranks consider the imperilment of a species or community throughout its range, while state ranks provide the same assessment within each state. Although there is only one global rank used by the heritage network, state ranks are developed by each state and allow a "one-system" comparison of a species or communities imperilment state by state. For more information, contact the Pennsylvania Natural Heritage Program.

Global Element Ranks

G1 = Critically imperiled globally because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.

G2 = Imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres)or because of some factor(s) making it very vulnerable to extinction throughout its range.

G3 = Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range or because of other factors making it vulnerable to extinction throughout its range; in terms of occurrences, in the range of 21 to 100.

G4 = Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.

G5 = Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.

GH = Of historical occurrence throughout its range, i.e., formerly part of the established biota, with the expectation that it may be rediscovered (e.g., Bachman's Warbler).

GU = Possibly in peril range-wide but status uncertain; need more information.

GX = Believed to be extinct throughout its range (e.g., Passenger Pigeon) with virtually no likelihood that it will be rediscovered.

G? = Not ranked to date.

State Element Ranks

S1 = Critically imperiled in state because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extirpation from the state.

S2 = Imperiled in state because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it vulnerable to extirpation from the state.

S3 = Rare or uncommon in state (on the order of 21 to 100 occurrences).

S4 = Apparently secure in state, with many occurrences.

S5 = Demonstrably secure in state and essentially ineradicable under present conditions.

APPENDIX IVc: Global and State Ranking (continued)

SA = Accidental (occurring only once or a few times) or casual (occurring more regularly but not every year) in state, including species which only sporadically breed in the state.

SE = An exotic established in state; may be native elsewhere in North America (e.g., house finch or catalpa in eastern states).

SH = Of historical occurrence in the state, perhaps having not been verified in the past 20 years, and suspected to be still extant.

SN = Regularly occurring, usually migratory and typically nonbreeding species for which no significant or effective habitat conservation measures can be taken in the state.

SR = Reported from the state, but without persuasive documentation which would provide a basis for either accepting or rejecting (e.g., misidentified specimen) the report.

SU = Possibly in peril in state but status uncertain; need more information.

SX = Apparently extirpated from the state.

SZ = Not of significant conservation concern in the state, invariably because there are no (zero) definable element occurrences in the state, although the taxon is native and appears regularly in the state.

S? = Not ranked to date.

NOTE: The study of naturally occurring biological communities is complex and natural community classification is unresolved both regionally and within Pennsylvania. The Global and State Ranking of natural communities also remains difficult and incomplete. Although many natural community types are clearly identifiable and are ranked, others are still under review and appear as G? and/or S?

APPENDIX V: Animals of Special Concern in Potter County documented in the Pennsylvania Natural Heritage Program database since 1970

Scientific Name	Common Name	State Rank	Global Rank
Accipiter gentilis	northern goshawk	S2S3B, S3N	G5
Ardea herodias	great blue heron	S3S4B, S4N	G5
Botaurus lentiginosus	American bittern	S1B	G4
Boyeria grafiana	ocellated darner	S3	G5
Calopteryx amata	superb jewelwing	S2S3	G4
Catharus ustulatus	Swainson's thrush	S2S3B,S5N	G5
Chlosyne harrisii	Harris' checkerspot	S3	G4
Cicindela limbalis	common claybank tiger beetle	S3	G5
Crotalus horridus	timber rattlesnake	S3S4	G4
Enallagma annexum	northern bluet	S3	G5
Etheostoma maculatum	spotted darter	S2	G2
Eumeces anthracinus	coal skink	S3	G5
Fusconaia subrotunda	long-solid	S1	G3
Gomphus abbreviatus	spine-crowned clubtail	S2	G3G4
Gomphus adelphus	mustached clubtail	S3S4	G4
Gomphus descriptus	harpoon clubtail	S1S2	G4
Gomphus rogersi	sable clubtail	S1	G4
Ichthyomyzon bdellium	Ohio lamprey	S2S3	G3G4
Ichthyomyzon greeleyi	Mountain brook lamprey	S2	G3G4
Lampetra appendix	American brook lamprey	S3	G4
Lanthus parvulus	northern pygmy clubtail	S3S4	G4
Lota lota	Burbot	S1S2	G5
Notropis dorsalis	bigmouth shiner	S2	G5
Ophiogomphus carolus	riffle snaketail	S2S3	G5
Ophiogomphus mainensis	Maine snaketail	S3	G4
Percina copelandi	channel darter	S2	G4
Percina macrocephala	longhead darter	S2S3	G3
Pieris virginiensis	West Virginia white	S2S3	G3G4
Pleurobema sintoxia	round pigtoe	S2	G4
Protonotaria citrea	Prothonotary warbler	S2S3	G5
Sorex palustris albibarbis	northern water shrew	S3	G5T5
Virginia valeriae pulchra	mountain earth snake	S3	G5T3T4

APPENDIX VI: Plants of Special Concern in Potter County documented in the Pennsylvania Natural Heritage Program database since 1970

Scientific Name	Common Name	State Rank	Global Rank
Bidens discoidea	small beggar-ticks	S3	G5
Cardamine maxima	large toothwort	S1	G5
Carex retrorsa	backward sedge	S1	G5
Carex foenea	Fernald's hay sedge	S2	G5
Epilobium strictum	downy willow-herb	S3	G5?
Gaultheria hispidula	creeping snowberry	S3	G5
Geranium bicknellii	cranesbill	S1	G5
Scirpus pedicellatus	stalked bulrush	S1	G4
Stellaria borealis	mountain starwort	S1S2	G5
Viburnum trilobum	highbush-cranberry	S3S4	G5T5
Viola selkirkii	great-spurred violet	S1	G5?

APPENDIX VII: Scientific names of birds listed in the report

Common	Scientific	Common	Scientific
pied-billed grebe	*Podilymbus podiceps*	winter wren	*Troglodytes troglodytes*
double-crested cormorant	*Phalacrocorax auritus*	golden-crowned kinglet	*Regulus satrapa*
great blue heron	*Ardea herodias*	eastern bluebird	*Sialia sialis*
Canada goose	*Branta canadensis*	veery	*Catharus fuscescens*
mallard	*Anas platyrhynchos*	Swainson's thrush	*Catharus ustulatus*
wood duck	*Aix sponsa*	hermit thrush	*Catharus guttatus*
broad-winged hawk	*Buteo platypterus*	American robin	*Turdus migratorius*
red-tailed hawk	*Buteo jamaicensis*	gray catbird	*Dumetella carolinensis*
ruffed grouse	*Bonasa umbellus*	bohemian waxwing	*Bombycilla garrulus*
American woodcock	*Scolopax minor*	cedar waxwing	*Bombycilla cedrorum*
mourning dove	*Zenaida macroura*	American redstart	*Setophaga ruticilla*
yellow-billed cuckoo	*Coccyzus americanus*	black-and-white warbler	*Mniotilta varia*
belted kingfisher	*Ceryle alcyon*	blackburnian warbler	*Dendroica fusca*
downy woodpecker	*Picoides pubescens*	black-throated blue warbler	*Dendroica caerulescens*
hairy woodpecker	*Picoides villosus*	black-throated green warbler	*Dendroica virens*
northern flicker	*Colaptes auratus*	worm-eating warbler	*Helmitheros vermivorus*
pileated woodpecker	*Dryocopus pileatus*	yellow-rumped warbler	*Dendroica coronata*
yellow-bellied sapsucker	*Sphyrapicus varius*	northern parula	*Parula americana*
eastern wood pewee	*Contopus virens*	cerulean warbler	*Dendroica cerulea*
yellow-bellied flycatcher	*Empidonax flaviventris*	chestnut-sided warbler	*Dendroica pensylvanica*
eastern phoebe	*Sayornis phoebe*	magnolia warbler	*Dendroica magnolia*
willow flycatcher	*Empidonax traillii*	ovenbird	*Seiurus aurocapillus*
least flycatcher	*Empidonax minimus*	mourning warbler	*Oporornis philadelphia*
acadian flycatcher	*Empidonax virescens*	Nashville warbler	*Vermivora ruficapilla*
great crested flycatcher	*Myiarchus crinitus*	hooded warbler	*Wilsonia citrina*
eastern kingbird	*Tyrannus tyrannus*	common yellowthroat	*Geothlypis trichas*
blue-headed vireo	*Vireo solitarius*	yellow warbler	*Dendroica petechia*
yellow-throated vireo	*Vireo flavifrons*	scarlet tanager	*Piranga olivacea*
red-eyed vireo	*Vireo olivaceus*	eastern towhee	*Pipilo erythrophthalmus*
blue jay	*Cyanocitta cristata*	song sparrow	*Melospiza melodia*
American crow	*Corvus brachyrhynchos*	swamp sparrow	*Melospiza georgiana*
common raven	*Corvus corax*	dark-eyed junco	*Junco hyemalis*
tree swallow	*Tachycineta bicolor*	rose-breasted grosbeak	*Pheucticus ludovicianus*
black-capped chickadee	*Poecile atricapillus*	indigo bunting	*Passerina cyanea*
tufted titmouse	*Baeolophrus bicolor*	red-winged blackbird	*Agelaius phoeniceus*
red-breasted nuthatch	*Sitta canadensis*	brown-headed cowbird	*Molothrus ater*
white-breasted nuthatch	*Sitta carolinensis*	Baltimore oriole	*Icterus galbula*
brown creeper	*Certhia americana*	purple finch	*Carpodacus purpureus*

APPENDIX VIII: Pennsylvania Element Occurrence Quality Ranks

A Excellent occurrence: all A-rank occurrences of an element merit quick, strong protection. An A-rank community is nearly undisturbed by humans or has nearly recovered from early human disturbance; further distinguished by being an extensive, well-buffered occurrence. An A-rank population of a sensitive species is large in area and number of individuals, stable, if not growing, shows good reproduction, and exists in natural habitat.

B Good occurrence: protection of the occurrence is important to the survival of the element in Pennsylvania, especially if very few or no A-rank occurrences exist. A B-rank community is still recovering from early disturbance or recent light disturbance, or is nearly undisturbed but is less than A-rank because of significantly smaller size, poorer buffer, etc. A B-rank population of a sensitive species is at least stable, in a minimally disturbed habitat, and of moderate size and number.

C Fair occurrence: protection of the occurrence helps conserve the diversity of a region's or county's biota and is important to statewide conservation if no higher-ranked occurrences exist. A C-rank community is in an early stage of recovery from disturbance, or its structure and composition have been altered such that the original vegetation of the site will never rejuvenate, yet with management and time partial restoration of the community is possible. A C-rank population of a sensitive species is in a clearly disturbed habitat, small in size and/or number, and possibly declining.

D Small occurrence: protection of the occurrence may be worthwhile for historical reasons or only if no higher ranked occurrences exist. A D-rank community is severely disturbed, its structure and composition been greatly altered, and recovery to original conditions, despite management and time, essentially will not take place. A D-rank population of a sensitive species is very small with a high likelihood of dying out or being destroyed, and exists in a highly disturbed and vulnerable habitat.

E Verified as extant, but has not been given a rank; additional information needed to evaluate quality.

APPENDIX IX: Sustainable Forestry Information Sources

The ***Pennsylvania Forest Stewardship Program*** is a voluntary program that assists forest landowners in better managing their forestlands by providing information, education, and technical assistance. Participation in the program is open to private landowners who own between 5 and 1,000 acres of forestland. Visit **http://www.cas.psu.edu/docs/CASDEPT/FOREST/Stewardship/1page.html** for more information or contact:

Jim Finley, Assistant Director for Extension
The Pennsylvania State University
School of Forest Resources
7 Ferguson Building
University Park, PA 16802
814- 863-0401; E-mail: fj4@psu.edu

The ***Forest Land Enhancement Program*** complements the Forest Stewardship Program by providing landowners with cost-share dollars to implement their management plans and follow-up technical assistance to encourage the achievement of their long-term forest management goals. For more information, contact:

Jim Stiehler, Forest Stewardship Coordinator
DCNR - Bureau of Forestry
6th Floor, Rachel Carson State Office Building
P.O. Box 8552
Harrisburg, PA 17105-8552
717-787-4777

The ***Forest Legacy Program*** acts to purchase conservation easements or title from willing private landowners. In this program, federal funding is administered through the state Bureau of Forestry to foster protection and continued use of forested lands that are threatened with conversion to non-forest uses. Emphasis is given to lands of regional or national significance. For more information, go to http://www.fs.fed.us/spf/coop/programs/loa/flep.shtml or contact:

Gene Odato, Chief, Rural & Community Forestry Station
DCNR – Bureau of Forestry
6th Floor, Rachel Carson State Office Building
P.O. Box 8552
Harrisburg, PA 17105-8552
717-787-6460; E-mail: godato@state.pa.us

The ***Sustainable Forestry Initiative*** (SFI) program is a voluntary, industry-driven effort developed to ensure that future generations will have the same abundant, healthy, and productive resources we enjoy today. Created in 1995 by the American Forest and Paper Association (the national trade organization representing the United States forest products industry), SFI is a program of comprehensive forestry and conservation practices. Through the SFI of PA program, landowners receive the information they need to enhance their ability to make good forest management decisions, and loggers learn safer, more productive skills and proper environmental practices. For more information, go to http://www.sfiofpa.org/ or contact:

SFI® of PA
315 S. Allen Street, Suite 418
State College, PA 16801
814-867-9299 or 888- 734-9366; E-mail: sfi@penn.com

The ***Forest Stewardship Volunteer Initiative Project*** has an excellent Web site providing general information and links to publications on sustainable forestry.
http://vip.cas.psu.edu/index.html