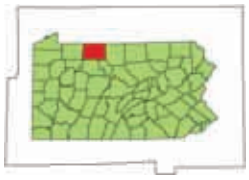

McKean County
Natural Heritage Inventory

Pennsylvania Natural Heritage Program

A NATURAL HERITAGE INVENTORY OF McKEAN COUNTY, PENNSYLVANIA February 2008

Submitted to:

McKean County Planning Commission
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McKean County Planning Commission
or
from the web in electronic format at:
http://www.naturalheritage.state.pa.us/CNAI_Download.aspx

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PREFACE

Since 1991, the Pennsylvania Natural Heritage Program has conducted County Natural Heritage Inventories (CNHIs) as a way to both gather new information and to pass along what we have learned to those responsible for making decisions about resources, as well as to community members of that county.

This report represents an important assemblage of that information. The McKean County Natural Heritage Inventory is not only a source of information; it is unique in providing a comprehensive look at the exceptional living resources in the county. In many ways, it is also an introduction and an overview of the county's biological wealth. Although areas are mapped and discussed, the details in the report do not do justice to the resources found there. It is up to the people of the county to fully explore and appreciate the resources in their communities.

Consider the inventory as an invitation for the people of McKean County to explore and discuss their natural heritage. Realize 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. Ultimately, it will be up to the landowners and the people of McKean County to determine how these areas might be used and protected.

Here are some examples of how the inventory and the Natural Heritage Areas (NHAs) identified 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 Army Corp 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 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. Natural Heritage Inventories 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 therefore see potential conflicts long before establishing footprints or alignments and before applying for permits. This allows projects to change early on when flexibility is at a maximum.

Additionally, environmental consultants are increasingly called upon to produce resource plans, such as Rivers Conservation Plans or Greenway Plans, that must integrate a variety of biological, physical, and social information. County Natural Heritage Inventories can be used to define watershed-level resources and priorities for conservation in these and other resource plans.

Developers: Working with environmental consultants, developers can consider options for development that add value and protect key resources. Incorporating greenspace, wetlands, and forest riparian buffers into various kinds of development can attract homeowners and businesses that desire to have natural amenities and attractive

landscapes nearby. Just as parks have traditionally raised property values, so too can natural areas. County Natural Heritage Inventories 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 communities that are critical to maintaining biological diversity. Teachers can use Natural Heritage Inventories to show students where and why local and regional diversity occur. With proper 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 sort of planning and prioritization, and are now engaged in conservation efforts on highly significant sites in individual counties and for the state in general.

The results presented in this report represent a snapshot in time, highlighting the sensitive natural areas within McKean County. The sites in the McKean County Natural Heritage Inventory have been identified to help guide wise land use and county planning. The McKean County Natural Heritage Inventory is a planning tool, but 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.

ACKNOWLEDGEMENTS

We would like to acknowledge the citizens and landowners of McKean County and surrounding areas who volunteered information, time, and effort to the inventory and granted permission to access land.

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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.

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.

Beth Brokaw
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McKean County Natural Heritage Inventory Site Index

Scale 1:200,000

0 1 2 4 6 8 10 Miles

0 2 4 8 12 16 Kilometers

Site and LCA Identification # and Significance

- *exceptional significance*
- *high significance*
- *notable significance*
- *local significance*

- Core Habitat
- Supporting Natural Landscape
- Landscape Conservation Area

PNHP Pennsylvania Natural Heritage Program

- TOWNSHIP BOUNDARIES
- *USGS Quadrangles*

CORYDON · FOSTER · BRADFORD · CERES · OTTO · ELDRED · ANNIN · HAMILTON · LAFAYETTE · KEATING · LIBERTY · HAMLIN · NORWICH · WETMORE · SERGEANT

L-56 · L-57 · L-58 · L-50 · L-51 · L-52 · L-53 · L-54 · L-55

CORNPLANTER RUN · CORNPLANTER BRIDGE · STICKNEY · WESTLINE · BRADFORD · LEWIS RUN · CYCLONE · DERRICK CITY · ELDRED · SMETHPORT · PORT ALLEGANY · BULLIS MILLS · ROULETTE · SHINGLEHOUSE · LUDLOW · KANE · MOUNT JEWETT · HAZEL HURST · CROSBY · RUSSELL CITY · JAMES CITY · WILCOX · GLEN HAZEL · WILDWOOD FIRE TOWER · RICH VALLEY · NORWICH · EMPORIUM · KEATING SUMMIT

#	Conservation Area Name
1	Oswayo Creek
2	Bullis Mills
3	Indian Crossing Swamp
4	Lower Knapp Creek
5	Allegheny River at Larabee
6	Coryville Railroad Grade
7	Upper Knapp Creek
8	Allegheny River at Turtlepoint
9	Allegheny Portage Creek
10	Potato Creek – Cole Creek
11	Smethport Upland
12	Ormsby Swamp
13	Route 59 Roadside
14	Kinzua Gorge
15	Kasson Railroad Grade
16	Potato Creek
17	Havens Run
18	Keating Summit
19	Cobb Hollow Upland
20	Brown Valley
21	West Branch Tunungwant Creek
22	Bingham
23	Mount Alton Roadside
24	Mount Alton Wetland
25	Pine Run Roadside
26	Cathrine Swamp
27	Elk State Forest
28	Midmont Swamp
29	Hutchins
30	Burning Well
31	Willow Bay
32	Coffey Run
33	Whitney Run
34	Sugar Bay
35	Sugar Run Mouth
36	Sugar Run
37	Klondike Upland
38	Briggs Run
39	Chappel Bay
40	Kiasutha Campground
41	Red Bridge
42	Kinzua Creek
43	Kinzua Creek below Westline
44	Swede Hill
45	South Branch Kinzua Creek
46	Pigeon Run Headwater
47	Tionesta Natural Areas
48	Crane Run
49	Martin Run

#	Landscape Conservation Area
L-50	Allegheny Wetland Complex
L-51	Upper Allegheny River
L-52	Lookout Mountain
L-53	Keating Summit
L-54	Potato Creek
L-55	Elk River
L-56	State Line
L-57	Tracy Ridge
L-58	Stickney

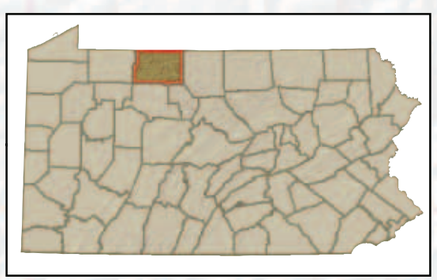

Table 1. Natural Heritage Areas categorized by significance. The results of the Natural Heritage Inventory are summarized below in both graphic and tabular form. Figure 1 shows the spatial distribution of Natural Heritage Areas across the county. Table 1 summarizes the Natural Heritage Areas, in order of their ecological significance. Significance ranks are Exceptional, High, Notable, and County (for a full explanation of these ranks, see Table 4 on pg. 33).

Site	Municipality	Description	Page
Exceptional Significance			
Allegheny Portage Creek CA	Liberty Township	Aquatic habitat occupied by one fish and two mussel species and sensitive species of concern 1, 2, and 3.	119
Allegheny River at Turtlepoint CA	Annin Township	Stream habitat that supports one fish and two mussel species of conservation concern and sensitive species of concern 2, 3, and 5.	49
Bingham CA	Keating Township, Lafayette Township	Disturbed habitat and adjacent wetland that serve as habitat for three plant species of concern.	101, 111
Cathrine Swamp CA	Hamlin Township, Sergeant Township	Wetland complex serving as habitat for two plant, six dragonfly, and 1 butterfly species of special concern.	95, 135
Indian Crossing Swamp CA	Eldred Township	Wetland complex with globally rare black ash - balsam fir swamp natural community providing habitat for two plants species, Wilson's snipe, and sensitive species of concern 8.	77
Kinzua Creek CA	Hamilton Township, Wetmore Township	Section of Kinzua Creek and riparian forest providing habitat for American brook lamprey and six species of river odonates.	89, 143
Midmont Swamp CA	Sergeant Township, Jones Township, Elk County	Beaver-influenced wetland complex supporting hemlock palustrine forest, Wiegand's sedge, bog sedge, creeping snowberry, northern Harrier, and sensitive species of concern 9.	138
Ormsby Swamp CA	Keating Township	Wetland complex serving as habitat for two plant, seven dragonfly, and six butterfly species of special concern and sensitive species of concern 11.	104
Oswayo Creek CA	Ceres Township	Stream habitat supporting populations of Ohio lamprey and three mussel species of special concern.	61
Potato Creek CA	Keating Township, Norwich Township,	Section of upper Potato Creek and its tributaries support American brook lamprey and Ohio lamprey and sensitive species of concern 2 and 3.	103, 125
Potato Creek at Farmers Valley CA	Keating Township,	Section of lower Potato Creek and its tributaries support American brook lamprey, three mussel species of concern, and sensitive species of concern 2, 3, and 5.	103
Potato Creek LCA	Foster Township, Keating Township, Liberty Township, Norwich Township, Otto Township, Sergeant Township	Section of Potato Creek, its tributaries, and supporting riparian corridors that encompass a number of smaller-scale aquatic Conservation Areas.	42
State Line LCA	Corydon Township, Warren County, New York State	Landscape encompassing nearly 12,500 acres of highly contiguous forest.	43
Swede Hill CA	Hamilton Township, Wetmore Township	Section of South Branch Kinzua Creek and riparian forest that serves as habitat for three species of river-breeding odonates.	143
Tracy Ridge LCA	Corydon Township, Warren County	Landscape encompassing nearly 9,800 acres of highly contiguous forest.	43

Table 1. Natural Heritage Areas categorized by significance (cont.).

Site	Municipality	Description	Page No.
Exceptional Significance (cont.)			
Upper Allegheny River LCA	Annin Township, Eldred Township, Keating Township, Liberty Township, Norwich Township, Potter County	Sections of Allegheny Portage Creek, Allegheny River, their tributaries, and supporting riparian corridors that encompass a number of smaller-scale aquatic Conservation Areas.	42
High Significance			
Allegheny River at Larabee CA	Eldred Township	Stream habitat that supports elktoe mussel, blue-tipped dancer dragonfly, and long dash butterfly, all species of special concern.	75
Allegheny Wetland Complex LCA	Annin Township, Eldred Township, Keating Township,	Landscape encompassing a wetland complex along the Allegheny River greater than 6,000 acres.	41
Briggs Run CA	Hamilton Township	Small stream supporting a population of great-spurred violet.	87
Brown Valley CA	Bradford Township	Mixed hemlock - hardwood riparian forest that supports a breeding pair of Swainson's thrush.	55
Bullis Mills CA	Eldred Township	Riparian wetland habitat occupied by a nesting pair of Wilson's snipe and sensitive species of concern 7.	76
Burning Well CA	Sergeant Township	Seepy valley head occupied by a small stand of balsam poplar, a critically imperiled plant species in Pennsylvania.	135
Chappel Bay CA	Hamilton Township	Shoreline along reservoir serving as habitat for thread rush, a state-rare plant species.	87
Cobb Hollow Upland CA	Bradford Township, Foster Township	Upland forest that supports a breeding pair of Swainson's thrush.	56, 83
Coffey Run CA	Corydon Township	Hemlock-dominated forest along Coffey Run that supports a breeding pair of Swainson's thrush, a species of conservation concern in PA.	67
Coryville Railroad Grade CA	Eldred Township, Keating Township	Marshy habitat along an active railroad grade that supports a relatively large population of stalked bulrush, a critically imperiled plant in Pennsylvania.	77, 102
Crane Run CA	Wetmore Township, Elk County	Aquatic habitat for American brook lamprey and ocellated darner dragonfly, both species of conservation concern.	143
Elk River LCA	Norwich Township, Sergeant Township Elk County	Landscape encompassing over 35,000 acres of contiguous forest.	43
Elk State Forest CA	Sergeant Township	Section of abandoned railroad grade serving as habitat for Case's Ladies'-tresses, a critically imperiled orchid species in PA.	137
Havens Run CA	Norwich Township	Section of stream that provides habitat for American brook lamprey, a fish species of special concern.	125
Hutchins CA	Sergeant Township	Upland forest habitat supporting sensitive species of concern 4.	137
Kasson Railroad Grade CA	Hamlin Township, Keating Township	Open habitat along railroad grade supporting a population of Case's ladies'-tresses, a critically imperiled orchid species.	96, 101
Keating Summit LCA	Liberty Township, Norwich Township, Elk County, Potter County	Landscape encompassing an area of contiguous forest greater than 18,200 acres.	43

Site	Municipality	Description	Page No.
High Significance (cont.)			
Kiasutha Campground CA	Hamilton Township	Upland habitat occupied by sensitive species of concern 7.	88
Kinzua Creek below Westline CA	Hamilton Township, Lafayette Township	Section of creek supporting a population of ocellated darner, a dragonfly species of concern.	90, 112
Klondike Upland CA	Corydon Township, Hamilton Township	Mature northern hardwood forest that provides habitat for sensitive special of concern 6.	89, 89
Lower Knapp Creek CA	Eldred Township	A section of Knapp Creek and its associated riparian forest that provides habitat for two animal species of concern: American brook lamprey and Leonard's skipper butterfly.	78
Martin Run CA	Wetmore Township, Elk County	Aquatic habitat that serves as habitat for American brook lamprey, a fish species of conservation concern.	143
Mount Alton Wetland CA	Lafayette Township	Beaver-influenced, shrub-dominated wetland complex that serves as habitat for two dragonfly and one butterfly species of concern.	113
Pine Run Roadside CA	Lafayette Township	Roadside habitat occupied by a population of American feverfew. This is the only population of this species currently documented in Pennsylvania.	114
Red Bridge CA	Hamilton Township	Portion of reservoir and shoreline that serves as a nest site for Osprey and habitat for thread rush.	87
Route 59 Roadside CA	Keating Township	South-facing road bank serving as habitat for Case's Ladies'-tresses, a critically imperiled orchid species in Pennsylvania.	101
Smethport Upland CA	Keating Township	Upland habitat supporting sensitive species of concern 4.	107
South Branch Kinzua Creek CA	Wetmore Township	Stream occupied by American brook lamprey, a species considered vulnerable in Pennsylvania.	143
Stickney LCA	Corydon Township	Landscape encompassing an area of contiguous, relatively unfragmented forest greater than 5,600 acres.	43
Sugar Bay CA	Corydon Township	Section of Allegheny Reservoir that supports a nesting pair of Osprey, an imperiled species in Pennsylvania.	68
Sugar Run CA	Bradford Township, Corydon Township, Lafayette Township	Headwater stream and riparian forest that provides habitat for the northern water shrew, a Pennsylvania Candidate Rare species.	56, 70, 114
Sugar Run Mouth CA	Corydon Township	Section of Sugar Run and adjacent forest that serves as habitat for two rare, river-breeding odonate species: ski-tailed emerald & superb jewelwing.	69
Tionesta Natural Areas CA	Wetmore Township	Old-growth Hemlock (white pine) - Northern Hardwood Forest. This is the largest remaining tract of old-growth forest in the mid-Atlantic region.	144
Upper Knapp Creek CA	Otto Township	Aquatic habitat that supports sensitive species of concern 2.	131
West Branch Tunungwant Creek CA	Bradford Township	Section of stream that provides habitat for American brook lamprey, a fish species of special concern.	56
Whitney Run CA	Corydon Township	Headwater stream and riparian forest that provides habitat for the northern water shrew, a Pennsylvania Candidate Rare species.	70
Willow Bay CA	Corydon Township	Section of Allegheny Reservoir supporting a nesting pair of Osprey.	68
Notable Significance			
Keating Summit CA	Norwich Township, Potter County	Rocky, roadside habitat occupied by sensitive species of concern 10.	127

Site	Municipality	Description	Page No.
Notable Significance (cont.)			
Lookout Mountain LCA	Liberty Township, Potter County	Landscape encompassing over 13,000 acres of contiguous forest.	43
Mount Alton Roadside CA	Lafayette Township	Roadside habitat supporting a population of queen-of-the-prairie, a plant species of conservation concern in PA.	112
Pigeon Run Headwater CA	Wetmore Township	Power corridor through forested habitat that supports a population of northern myotis, a candidate rare bat species.	144
County Significance			
Kinzua Gorge CA	Hamlin Township, Keating Township	Deep, forested section of Kinzua Creek. Location of the Kinzua Viaduct, which is on the National Register of Historic Places.	96

EXECUTIVE SUMMARY

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. One of the first steps in ensuring protection of our natural environment is 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 are used to illustrate the results of the inventory. Additionally, areas identified for conservation by other conservation groups are included in the report to provide information relating to the natural heritage of McKean County that readers of this report may not otherwise be aware of.

Natural Heritage Areas

Conservation Area (CA):

Definition: An area containing plants or animals of special concern at state or federal levels, exemplary natural communities, or exceptional native diversity. CAs include both the immediate habitat and surrounding lands important in the support of these special elements.

Conservation Planning Application: CAs 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" is an area that maintains vital ecological processes or secondary habitat; these areas typically can accommodate some degree of low-impact activities.

Landscape Conservation Area (LCA):

Definition: A large contiguous area that is important because of its size, open space, habitats, and/or inclusion of one or more CAs. 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:

Across the state, a number of organizations have undertaken conservation planning efforts at a landscape scale. The areas identified through these efforts frequently overlap with sites identified by County Natural Heritage Inventories, and serve to emphasize the importance of focusing conservation efforts in those areas. The results of three such planning efforts are included here in order to provide information relating to the natural heritage of McKean County that readers of this report may not otherwise be aware of.

Conservation Priority River Reaches and Watersheds:

The Pennsylvania Aquatic Community Classification (ACC) was developed by the Pennsylvania Natural Heritage Program to create a structural framework of the flowing water ecosystems in Pennsylvania and its watersheds. The ACC defines types of stream and river reaches based on aquatic communities, their habitats, and watershed properties.

Conservation Planning Application: Combining data from many parts of the Aquatic Community Classification project has resulted in a means of identifying the unique riverine conditions that designate certain watersheds to be of greater

conservation concern than others. Utilizing this information should make conservation and restoration work in Pennsylvania more efficient, more measurable, and more effective.

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, naturally high population density, 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/).

Conservation Planning Application: 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; thus, the recommendations for LCA stewardship to minimize fragmentation are applicable. Natural communities that have a particular habitat value for birds (e.g., wetland) 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-seven out of sixty-seven county inventories have been completed in Pennsylvania to date. The McKean County Natural Heritage Inventory followed the same methodologies as previous inventories, which proceeded in the following stages: site selection, ground survey, and then data analysis and mapping.

Site Selection

A review of the Pennsylvania Natural Diversity Inventory (PNDI) database determined where sites for special concern species and important natural communities were known to exist in McKean 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 McKean 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. 161) 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 Conservation Areas (CAs). 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 CA were based on physical and ecological factors, and specifications for species protection provided by jurisdictional government agencies. The CAs were then assigned a rank denoting ecological significance 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 CAs, or large blocks of contiguous forest identified using GIS-based spatial analysis. County municipalities served as the organizing unit for the data.

Results

The McKean County Natural Heritage Inventory recognizes 58 areas of ecological significance - 49 Conservation Areas and 9 Landscape Conservation Areas.

Discussion and Recommendations

Status of natural features today. The landscape and waterways of McKean County have undergone considerable change over the course of human settlement, most notably from timber extraction. 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. 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, over-browsing 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 McKean 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 McKean 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 several areas in McKean 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

Provision for the future health of ecological resources in McKean 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. McKean County's waterways, ranging from headwater mountain streams to the Allegheny River, include some of Pennsylvania's more scenic features. Objectives for large-scale planning should include preservation of water quality in the county's waterways by limiting development in riparian corridors.

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 McKean 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 McKean County Conservation and Planning Departments before beginning any development project. 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 other relevant 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 McKean County Natural Heritage Inventory is ***not*** intended 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 Department of Conservation and Natural Resources(DCNR)* 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, 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.

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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 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" (NHESP 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" (NHESP 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. Over 20,000 species are known to occur in the state, and the extensive tracts of forest in the northern and central parts of the state represent a large portion of the remaining areas of suitable habitat in the mid-Atlantic region for many forest-dependent species of birds and mammals. Unfortunately, biodiversity and ecosystem health are seriously threatened in many parts of the state by pollution and habitat loss. Of the 3,500 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 (Pennsylvania 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, 60% 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 has been assessed for water quality and nearly 11,000 miles have been designated as impaired due to abandoned mine discharges, acid precipitation, and agricultural and urban runoff (PA DEP 2004). The species that depend on these habitats are correspondingly under threat: 58% of threatened or endangered plant species are wetland or aquatic species; 13% of Pennsylvania's 200 native fish species have been lost, while an additional 23% 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% of Pennsylvania's land area was forested. Today, 60% of the state is still forested, but much of this forest is fragmented by non-forest uses such as roads, utility rights-of-way, agriculture, and housing: only 42% 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), over-browsing 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 goal of this report is 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 Conservation Areas (CAs). 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 CA 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 mapping from other conservation planning efforts such as the Pennsylvania Audubon's Important Bird 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 living heritage depends.

NATURAL FEATURES

The climate, topography, geology, and soils are key to the biogeography of species, and are particularly important in the development of ecosystems (forests, fields, wetlands) and physical features (streams, rivers, mountains) that occur in a region. Anthropogenic disturbance has been influential in forming and altering many of the ecosystems in the unglaciated Allegheny Plateau region, resulting in the extinction of some species and the introduction of others. These combined factors provide the framework for locating and identifying exemplary natural communities and species of special concern in the county. The following sections provide a brief overview of the natural history of McKean County.

Climate

The climate in McKean County is humid and temperate. Based on temperature and precipitation data recorded at Bradford, the mean annual temperature for the region is 43° F (6° C). In winter, the mean temperature is 21° F (-6° C), with an average daily minimum temperature of 13° F (-10.5° C). In summer, the mean temperature is 63° F (17° C) and the average daily maximum temperature is 74° F (23° C). The growing season, calculated as the number of days with the minimum temperature higher than 32° F, ranges from 114 to 165 days, depending on aspect and elevation. Precipitation is evenly distributed throughout the year, but is significantly heavier on the windward, west facing slopes than in the valleys. The average annual precipitation is 42.5 in. (108 cm), while the average annual snowfall is 84 in. (213 cm; Olson 1987).

Physiography and Geology

A physiographic province is a geographic region in which all parts are similar in geologic structure and climate and which has a unified geomorphic or surficial history. Physiography relates in part to a region's topography and climate. These two factors, along with bedrock type, significantly influence soil development, hydrology,

Figure 2. Physiographic province and sections of McKean County, Pennsylvania.

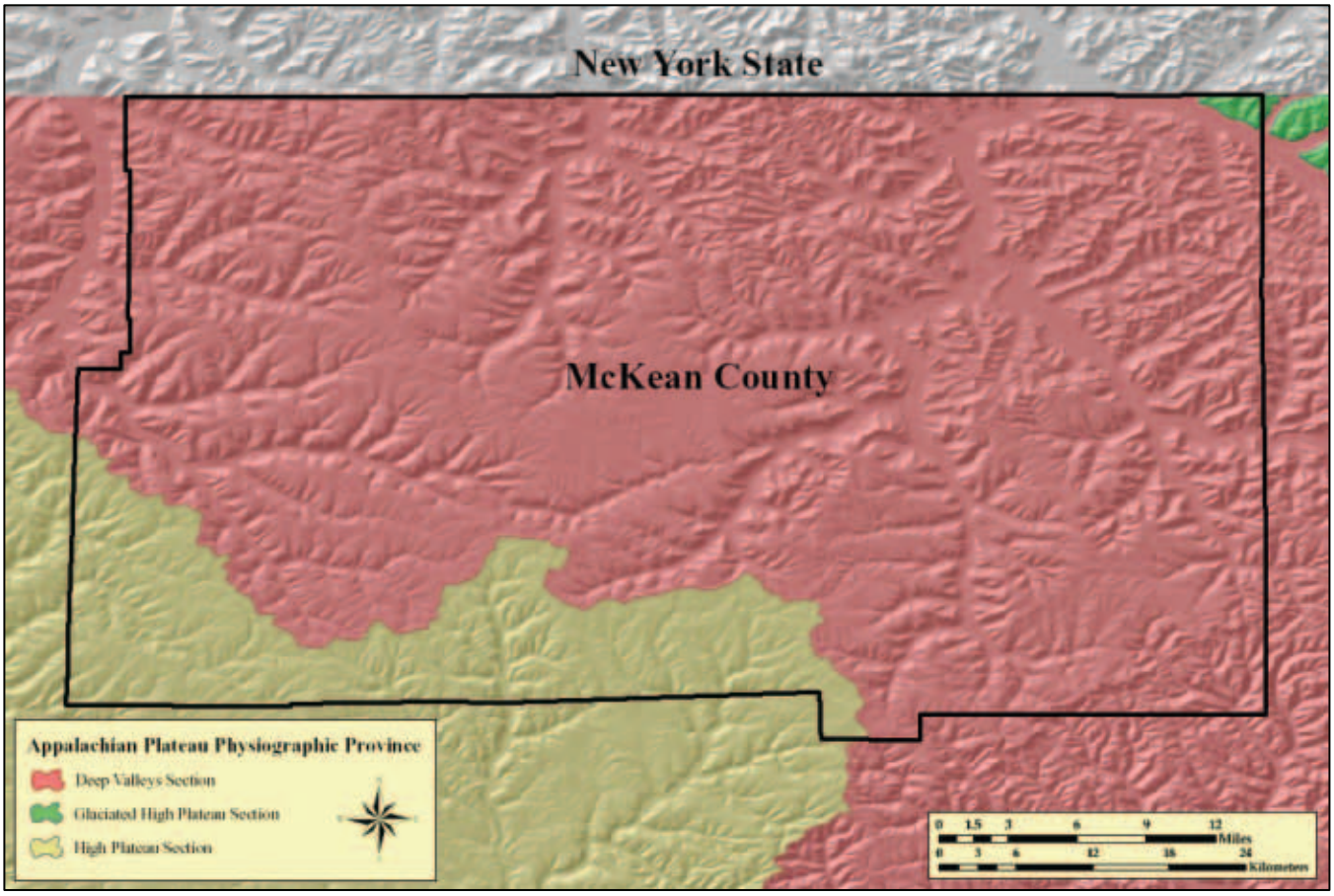
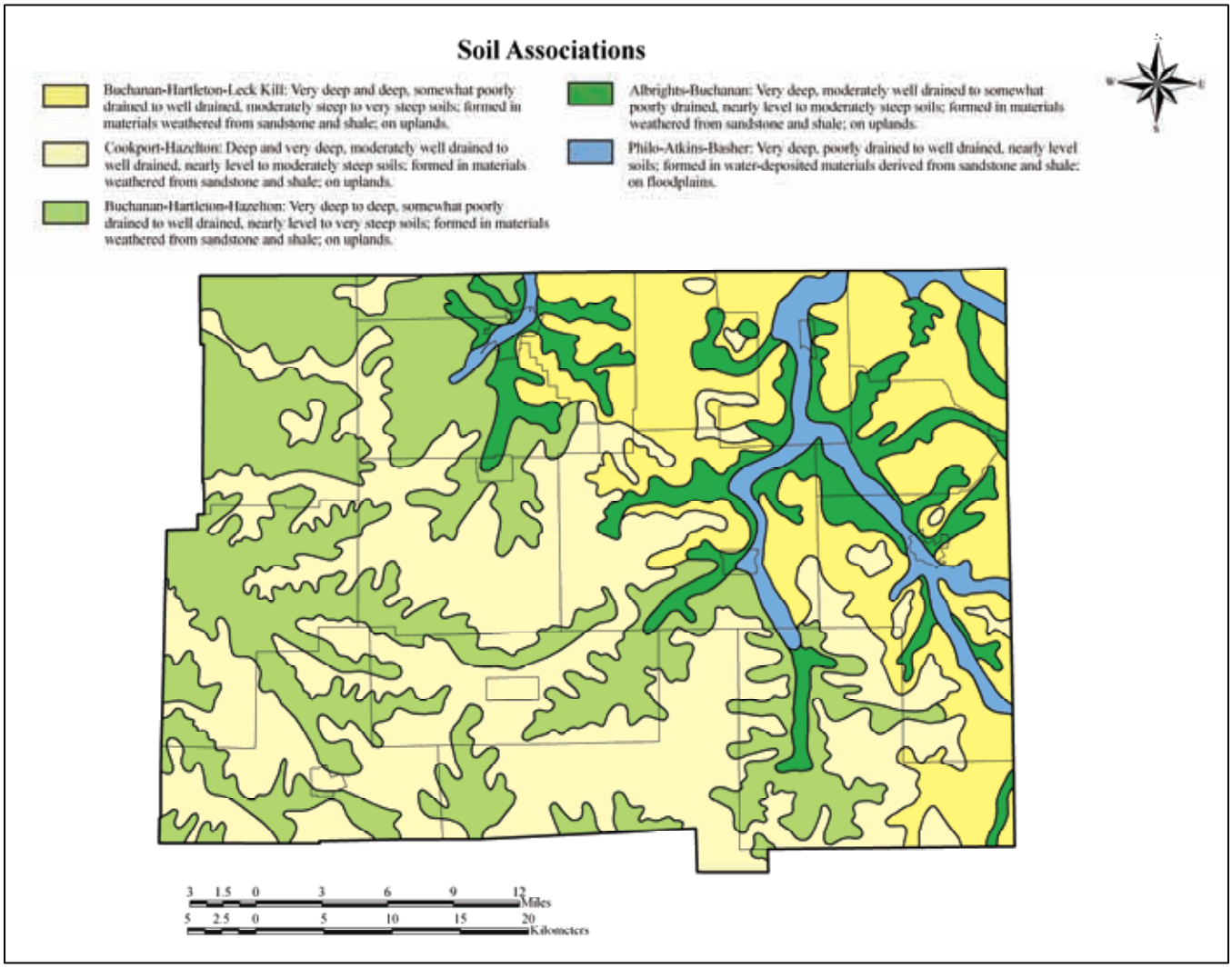


Figure 3. Soil associations of McKean County, Pennsylvania (adapted from Churchill 1987).



and land use patterns of an area. Additionally, both physiography and geology are important to the patterns of plant community distribution, which in turn influences animal distribution. Because of the differences in climate, soils, and moisture regimes, certain plant communities would be expected to occur within some provinces and not others.

McKean County lies entirely within the Appalachian Plateau (or Allegheny Plateau) Physiographic Province and includes portions of the unglaciated High Plateau Section, Deep Valleys Section, and Glaciated High Plateau Section (see Figure 2, pg. 3). Broad, rounded to flat uplands with deep, angular valleys characterize the High Plateau Section. As its name implies, the Deep Valley Section is distinguished by very deep, narrow valleys, while the uplands are often formed by narrow ridges. The Glaciated High Plateau is characterized by flat to gently rounded uplands separated by shallow valleys. The stream drainage pattern within McKean County is dendritic, resembling the branching of trees.

The bedrock geology in McKean County was formed during the Pennsylvanian, Mississippian, and Devonian Periods of the Paleozoic Era (about 280 million to 405 million years before the present). During that span of time, repeated sea advances and retreats deposited layers of sand, silt, clay, and lime sediments. Over time, these deposits in turn formed the sequence of sedimentary rocks that are found in the county today. Minor uplift occurring about 200 million years ago, caused in part by the Allegheny Orogeny (mountain building event), added to the present bedrock structure. Since that time, streams have eroded and dissected the plateau, exposing the younger rock at the higher elevations and the successively older rock of the valley walls and bottoms. The surficial geology of the county is dominated by sandstone, shale, and siltstone (Olson 1987).

Soils

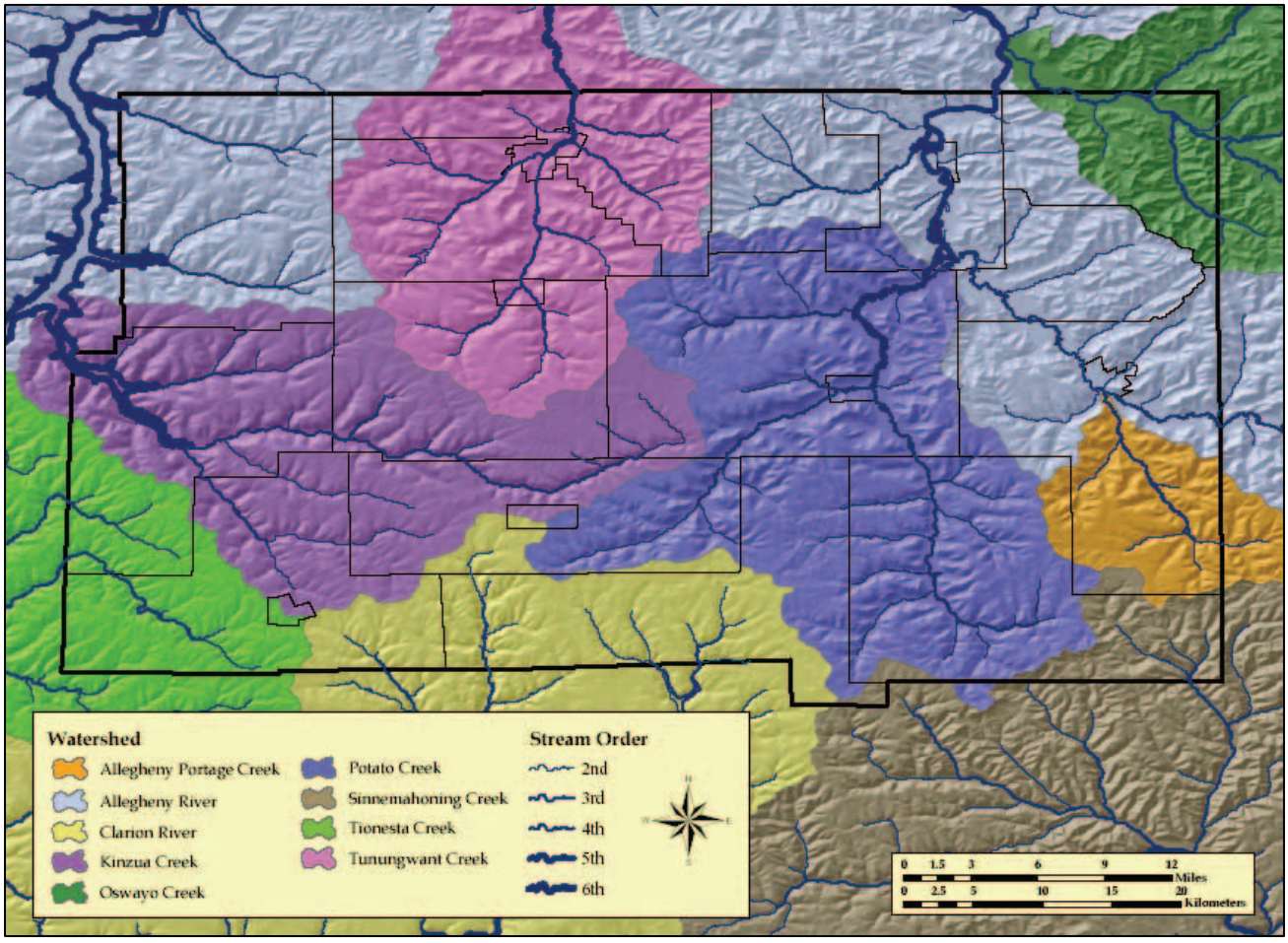
The soils of McKean County are primarily derived from siltstone, shale, and sandstone, and tend to be acidic in nature. On a coarser scale, the soils of the county are gray-brown podzolic soils that typically underlie mixed northern conifer-hardwood forest (Braun 1950, Jennings 1953). On a finer scale, the county's forty-three soil types have been grouped into five associations – assemblages of soils based on similarities in climatic or physiographic factors and soil parent materials. The distribution and descriptions of the soil associations are shown in Figure 3.

Water Resources

McKean County lies almost entirely within the Ohio River drainage basin, and is drained primarily by the Allegheny River and its tributaries. The Eastern Continental Divide, separating the Atlantic slope drainage from the Mississippi River drainage, passes through the southeastern corner of the county. Within McKean County, the divide separates the westward-draining Clarion River, Potato Creek, and Allegheny Portage Creek watersheds from the eastward-draining Sinnemahoning Creek watershed (Figure 4). A more detailed subwatershed map can be found on page 27 (Figure 8) in the Aquatic Community Classification section.

Wetlands on the unglaciated Allegheny Plateau typically occur at the heads of streams, within stream riparian zones, as seeps and springs where groundwater emerges at the surface of the ground, at beaver-impounded streams, and in depressions underlain by an impermeable soil layer. The types of wetlands in McKean County range from forested seeps where groundwater saturates the surface only when heavy precipitation raises the water table, to open marshes that are continuously flooded, to low areas along streams that are flooded during high water events, to beaver-influenced meadows where water levels fluctuate over decades as beavers colonize, abandon, and re-colonize, and forested depression wetlands.

Figure 4. Major watersheds of McKean County, Pennsylvania.



Vegetation

McKean County lies within the hemlock-white pine-northern hardwood forest region of the Braun classification (1950) and the hemlock-northern hardwood forest and Appalachian oak forest types of the Kuchler classification (1964). Prior to European settlement, the forests of the Unglaciated Allegheny Plateau were dominated by hemlock (*Tsuga canadensis*) and American beech (*Fagus grandifolia)* on moister plateaus and stream valleys, and oak-chestnut (*Quercus rubra, Q. montana, Castanea dentata*) on drier ridges and outcrops (Marquis 1975, Whitney 1990, Abrams and Ruffner 1995).

Prior to 1890, small stands of white pine and hemlock were selectively cut, leaving much of the virgin forest intact. Following the advent of logging railroads and specialized locomotives in the late 1800s, the Allegheny Plateau was almost entirely clear-cut. Virtually everything extracted from the forest had economic value: hemlock bark was used in tanning leather; logs were processed for lumber, railroad ties, shingles, barrel staves, lath, furniture, and tool handles; distillation produced acetic acid, wood alcohol, and other chemicals; homes were heated and power was generated using slabs, edgings, and sawdust (Marquis 1975). The miles of narrow gauge rail bed running up the tributary valleys remain as evidence of the massive clearings that began over 100 years ago. Fires often followed the cuttings - many ignited by locomotive sparks, some begun intentionally - and for some years, parts of the plateau appeared as a ravaged landscape. The extensive logging that occurred between 1890 and 1930 produced the Allegheny hardwood forest type that now covers much of the region. Dominant tree species of this forest type include black cherry (*Prunus serotina*), red and sugar maples (*Acer rubrum*, *A. saccharum*), and yellow birch (*Betula lenta*; Marquis 1975, Whitney 1990, Abrams and Ruffner 1995).

Disturbance

Disturbances, 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 in Table 2.

Table 2. 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/landslide	commercial development
landslide	modern agriculture
ice storm	mining
	logging
	grazing

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

Natural Disturbance

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 ilicifolia*) 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.

On the unglaciated Allegheny Plateau, tornadoes and other windstorms commonly cause catastrophic disturbances on sites tens to thousands of acres in size. Lightning may be an important cause of individual tree mortality, and ice storms have periodically caused large-scale crown dieback (McNab and Avers 1994).

In contrast, deer have been attributed to a number of negative impacts on Pennsylvania flora and fauna (Rhoads and Klein 1993, Latham et al. 2005). Over-browsing 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 Disturbances

In some cases, human-caused disturbance has been clearly destructive to natural habitats and the species associated with them. In McKean County, intensive human uses of the land, including some logging practices, and oil and gas development, have played a major role in altering the landscape over the past one hundred years.

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.

MAMMALS AND MAMMALIAN HABITATS

Nearly one half of the land area in McKean County is contained within public lands including the Allegheny National Forest, Pennsylvania State Gamelands, and DCNR property. The vast tracts of public lands in the county may allow for considerable mammal habitat conservation, as long as best forest management practices are employed. As a predominantly forested county, the tourist industry remains one of the areas leading economic concerns, ranking just below the logging industry and above other, non-industrial industries such as agriculture.

white-tailed deer (*Odocoileus virginianus*)
photo source: Jim Hart (PNHP)

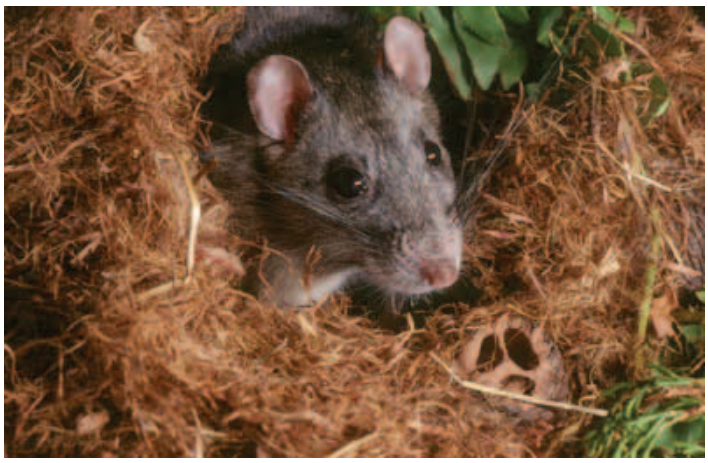
White-tailed deer (*Odocoileus virginianus*) hunting, a very important economic activity in the county, adds to the tourist industry and increased its economic impact in McKean County. With over 10,500 deer being taken during hunting season in 2002 it is easily understood why many people throughout Pennsylvania travel to McKean County during the many opportunities to hunt the state's most popular game species. The black bear (*Ursus americanus*) population within the county remains stable; between 35 and 108 bears are being harvested annually. The ruggedness and remoteness of much of McKean County's terrain contributes to the fluctuating bear harvest numbers. While black bear and white-tailed deer are the most well known game species within the county, other important mammal species occurring in the county contribute to the hunting economy. These include the gray and fox squirrels (*Sciurus carolinensis* & *S. niger*), eastern cottontail rabbit (*Sylvilagus floridanus*) and many fur-bearer species such as the mink (*Mustela vision*) and other weasels, and muskrat and beaver (*Ondatra zibethicus* and *Castor canadensis*). What is less well known is that these same forested habitats support a diverse and important non-game mammal fauna as well.

white-footed mouse (*Peromyscus leucopus*)
photo source: Dick Cooper, Northeast Research Unit USFS

Many of the species occurring throughout the county possess abilities that ensure their survival in a wide range of habitat types and are well represented throughout Pennsylvania. These species are termed "generalists" and include 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 striped skunks (*Mephitis mephitis*), Virginia opossums (*Didelphis virginiana*), coyote (*Canis latrans*) and the ubiquitous eastern chipmunk (*Tamias striatus*). All of these species occur throughout the many and diverse habitats within McKean County and their populations are currently secure in the landscape. One generalist found in the county, the northern raccoon (*Procyon lotor*), is seeing an increase in its populations. Because raccoons adapt well to human settings they have been able to take advantage of recent suburban development. This species is a known vector for several diseases including canine distemper, canine parvovirus, roundworm, and rabies and has been implicated in recent declines in Allegheny woodrat (*Neotoma magister*) populations.

Other species have fairly restricted habitat needs and are termed "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. Examples of these species include the meadow vole (*Microtus*

pennsylvanicus; grasslands and meadows), the fisher (*Martes pennanti*; forest interiors), Allegheny woodrat (upper elevation ridges), muskrats and beaver (wetlands and streams) and most of the bat species (caves and mines).



Allegheny woodrat (*Neotoma magister*)
photo source: John Hall

Several species that historically occurred within the county are of special concern due to population declines within other parts of the state or throughout their 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 and very specific habitat types. One species that remains unreported from McKean County, but may occur during the summer months, is the federally endangered Indiana bat (*Myotis sodalis*). This species also requires large blocks of mature forest.

Habitat availability is just one of a number of factors that determine whether a species of mammal is going to persist within certain areas. Food resources are an extremely important factor as reproductive females and dispersing individuals require consistent and substantial amounts in order to bear young, nurse, and travel between nesting and foraging areas, or to find new nest sites. Species such as the Allegheny woodrat have most likely declined due to a lack of food resources as their primary foodstuff of historic times, the American chestnut (*Castanea dentata*), was lost to the chestnut blight during the early 1900's. Forced now to rely on more ephemeral food resources like the mast of oaks and other forest trees and a diverse array of greens, they become energy-stressed when food resources become limited or when food caches created during the fall decay in mild and damp winters. Competition for these resources with other, more numerous mammal species also reduces the survival chances for these populations, especially when they are isolated from other woodrat populations.

Wetlands and streams play a major role in providing habitat for mammals as well as serving as corridors for dispersal throughout the county. Whenever biologists research mammals, some of the first habitats investigated are marshes, bogs, and streams, as they are often sites where the number of species of mammals, or diversity, is highest. It is not uncommon to find 6 species of shrews, 9-10 species of rodents, 4-5 species of weasels, and 6-7 species of bats as well as sign of various medium-sized carnivores, squirrels, bear, and deer along these habitats. One species found around small streams in McKean County is the northern water shrew (*Sorex palustris albibarbis*), a shrew species rarely observed in Pennsylvania. Once thought to be extremely rare, recent evidence seems to indicate that this species is more widespread in the northern tier counties of Pennsylvania than previously thought. One of the larger shrew species, the northern water shrew swims and dives in pools along the smaller tributaries that empty into moderate to larger sized streams. Since its diet consists primarily of macro-invertebrates such as caddisflies, stoneflies, mayflies and other aquatic insect species, it depends on clean, un-degraded streams and wetlands. The shrew thus may serve as an "indicator species", a species that may alert us to

American beaver (*Castor canadensis*)
photo source: Kansas Department of Parks and Recreation

arising environmental problems such as abandoned mine drainage or acid rain. Recent surveys in McKean County have shown that it likely occurs along small streams of the county.

Open land in the form of meadows and reverting grasslands are habitat types that are not usually associated with much of McKean County. Normally a product of agricultural practices, these habitats are more often than not found within the small stream valleys and along plateaus throughout the county. The most well known mammal occurring in these grasslands is the meadow vole (*Microtus pennsylvanicus*) a very successful disperser along mountain trails and right-of-ways. The runways formed by this medium-sized rodent can be spotted under decaying vegetation during the summer months and under the icy crust forming on snow during the winter months. Meadow voles are so successful at dispersing that they are sometimes found in grassy forest clearings within large tracts of forest having made their way there along the forest roads, pipelines, and power right-of-ways. Several other species of mammal are known to occur within open lands including the eastern cottontail rabbit, woodchuck (*Marmota monax*) and red fox (*Vulpes vulpes*).

northern flying squirrel (*Glaucomys sabrinus*)
photo source: Larry Masters

While open lands as mentioned above are familiar to many, one type that is often overlooked are scrub-shrub openings. Although commonly made up of scrub oak (*Quercus ilicifolia*), blueberry (*Vaccinium* spp.) and other low-growing plants, they do not have the large expanses of canopy high overhead as found in forests. The understory in these types of habitats is fairly open in that there are few very low-growing plants except in areas that may have suffered from recent burns, common along these dry sites. These habitats are extremely important to several species as either foraging areas or nesting sites and include the black bear, Appalachian cottontail (*Sylvilagus obscurus*) and snowshoe hare (*Lepus americanus*). Open lands such as these can most often be found along upper elevation forests in areas where soils are thin and the climate fairly dry.

Bats are a common component of the forests of McKean County, most often encountered during the summer months along the streams and open bodies of water that occur throughout the county. One rarely encountered bat species, the silver-haired bat (*Lasionycteris noctivagans*), occurs within McKean County during the early spring or late fall months as it migrates through the state on its way to and from its summer habitat in the northern portion of the United States and in Canada. During the winter months, however, 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*) probably migrate either to large mines in New York or south to caves occurring in the central portion of Pennsylvania. Several species, such as the hoary bat (*Lasiurus cinereus*) and red bat (*Lasiurus borealis*), do not over-winter in the state at all and migrate further south to states like the Carolinas and Florida where they spend their winter months in hibernation under deep patches of leaf and forest floor litter.

black bear (*Ursus americanus*)
photo source: Hal Korber (PGC)

silver-haired bat (*Lasionycteris noctivagans*)
photo source: Dr. Merlin Tuttle (BCI)

Historically, several species have either disappeared from McKean County or their populations had become so low that they were thought to be gone from the county. Two of these species, the fisher and the river otter (*Lontra canadensis*), have been re-introduced by the Pennsylvania Game Commission in portions of their range where their potential habitat still occurs. These populations have expanded into other portions of the state and these species likely now occur in McKean County. It is expected that they will be spotted in the future by hunters and fishermen along water courses throughout the county as well as interior portions of the existing forests.

As outlined here, McKean County is very diverse in terms of the habitats available to the mammal fauna of Pennsylvania. In many portions of the state, most habitats are fragmented and the ecosystems necessary for the survival of many species have become small, occupied blocks within a matrix of inhospitable habitat. Development of land, splitting of habitats by un-crossable barriers such as major highways, drainage of wetland areas, and environmental degradation have all served to confine many mammal species to very localized populations that become limited in their ability to survive any major change in food resources, availability of nesting habitat, or increased predation. These populations may be doomed to what is termed as "localized extinction". If enough of these populations disappear from the landscape, these species' existence in Pennsylvania may be in jeopardy. Although McKean has become a popular destination for residents of Pennsylvania during the various hunting seasons and has a brisk tourist trade, uncontrolled and unplanned growth has not yet developed into a major issue unlike many other parts of the state. Large blocks of forested land and vegetated stream corridors serve as avenues of dispersal to the diverse list of mammals noted to occur in the county. Continued vigilance as well as enlightened management will ensure that this list will not be shortened and may grow in the future providing opportunities to all Pennsylvanians for viewing the state's mammalian wildlife. This, in turn, will enhance the county's wealth as the ecotourism industry continues to flourish in Pennsylvania.

Important Mammal Areas

The objective of the Important Mammal Area Project is to identify a network of sites throughout Pennsylvania that are essential for sustaining populations of mammal species of concern. This process begins with the nomination of a site that is then reviewed by the Mammal Technical Committee of the Pennsylvania Biological Survey to determine if there is a need to protect the habitat for mammals of conservation concern. Once a site is selected for designation, a qualified mammalogist conducts an assessment of the area in order to detail priority habitat types, list mammal species located at the site, describe significant flora or fauna, describe conservation issues, outline research needs, note threats that may impact the site, list stakeholders involved with the site, and suggest conservation actions that will improve habitat for priority mammals.

fisher (*Martes pennanti*)
photo source: www.mass.gov/dfwele/ dfw/dfw_fisher.htm

McKean County includes portions of two Important Mammal Areas (IMAs): Hickory Creek and Tionesta Creek Drainages; and Northern Alleghany Plateau. These IMAs extend beyond the boundaries of McKean County; therefore, features described below pertain to the entire IMAs and are not necessarily confined to the county (Figs. 5 and 6).

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

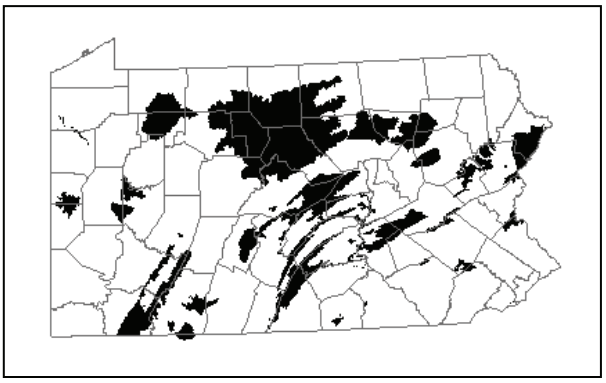


Figure 5. Important Mammal Areas in PA. These areas denote areas of high mammal diversity or numbers of rare and endangered species.

Hickory Creek and Tionesta Creek Drainages IMA

Located mostly in Allegheny National Forest east of SR 62 in Warren County, this IMA includes the Tionesta Scenic Area, Tionesta Research Natural Area, Hearts Content Scenic Area, the Hickory Creek Wilderness Area, Chapman State Park, and State Game Land #29. It also includes private inholdings, with the largest landowner being The Collins Companies (Kane Hardwood). This IMA covers 316,774 acres of largely forested lands. The forest cover is primarily second-growth northern hardwoods, but includes much of Pennsylvania's remaining virgin forests with trees up to 400 years old (beech, hemlock, white pine, sugar maple). Bogs and swamps are also present. This tract is the largest area of old-growth forest between the Adirondacks and the Smoky Mountains. The area is drained by East Hickory and Middle Hickory Creeks, which support populations of native brook trout.

This area satisfies the following IMA criteria:

- The site supports high-density populations: the fisher (*Martes pennanti)* population within this site is considered a core population.
- Site supports species or subspecies listed as endangered or threatened by the Pennsylvania Biological Survey: the site supports a confirmed viable resident population of fishers, which are listed as endangered.
- Site supports species or subspecies that are declining or vulnerable nationally or listed as candidate species by the Pennsylvania Biological Survey: the site supports a confirmed viable resident population of northern river otters (*Lontra canadensis*), which are listed as Candidate - At Risk. The northern water shrew (*Sorex palustris albibarbis*), listed as a Pennsylvania - Rare species, has been recorded in at least two locations. Also occurring are the snowshoe hare (*Lepus americanus*, Candidate – At Risk), northern Myotis (*Myotis septentrionalis*, listed as Rare), and silver haired bats (*Lasionycteris noctivagans*, Candidate - Rare).

Conservation Concerns:

Contamination of Tionesta Creek by runoff from outhouses and inadequate waste treatment measures has been a problem in the past and may still affect water quality in some areas. A number of camps with inadequate or nonexistent septic systems have been eliminated from Kane Hardwood property and the Allegheny National Forest. The towns of Sheffield and Ludlow are either expanding their waste treatment systems or installing new ones. The consensus seems to be that water quality is much improved compared with 20-30 years ago. Severe over-browsing by white-tailed deer is negatively affecting the abundance and diversity of understory and forest floor plants, and interfering with tree regeneration in forest openings. Insect and disease agents of importance include chestnut blight, elm spanworm, and beech bark disease. The hemlock woolly adelgid is predicted to reach the area in the near future. The region receives a large amount of acid rain, but impacts on stream quality and aquatic invertebrates have not been analyzed. Oil and gas drilling (and associated infrastructure development), as well as logging, impact the habitat.

Northern Allegheny Plateau IMA

This extensive area of north central Pennsylvania is the location of the largest Pennsylvania IMA, spanning portions of nine counties. It covers an area of approximately 4,000,000 acres and includes most of the region north of Interstate 80, west of Pine Creek Gorge, and north of State Route 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 relatively unfragmented forest habitat (mostly northern hardwoods) remaining in the state. Within this region, there are focal areas that are important for specific mammal species.

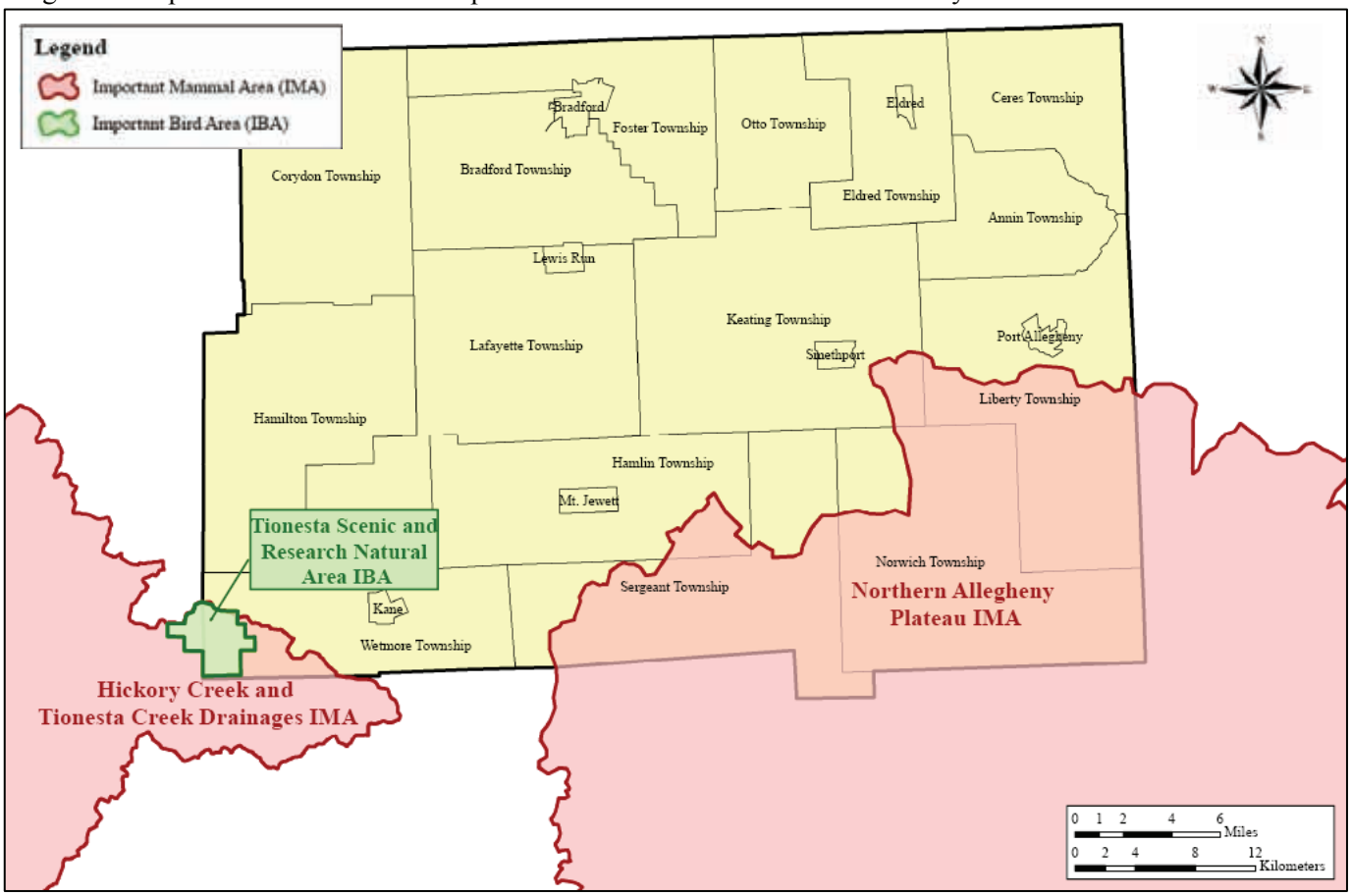
This area satisfies the following IMA criteria:

- 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.

Conservation Concerns:

A number of Important Bird Areas (IBAs) are included in this IMA, with designations based on the occurrence of forest interior species and Neotropical migrants, as well as Bald Eagle, Osprey, Northern Saw-whet Owl, and northern harrier. Timber rattlesnakes also occur within this region. Major habitat impacts are over-browsing by white-tailed deer and natural diseases. Long-term monitoring of small mammals is ongoing at the Parker Dam State Park tornado site.

Figure 6. Important Bird Areas and Important Mammal Areas in McKean County



BIRDS AND BIRD HABITAT

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. McKean 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 McKean County vegetation in previous section).

Forest Interior Birds and Contiguous Forest

As forested landscapes are fragmented into smaller patches due to development, road construction, timber harvesting, and resource extraction, 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). This critical habitat is declining on a statewide basis; of the Commonwealth's remaining core forest, seventy percent is found in small patches of 5,000 acres or less (PA DCNR 2006).

Common Forest Interior Bird Species	
Acadian Flycatcher	*Empidonax virescens*
Barred Owl	*Strix varia*
Black and White Warbler	*Mniotilta varia*
Black-throated Green Warbler	*Dendroica virens*
Broad-winged Hawk	*Buteo platypterus*
Hairy Woodpecker	*Picoides villosus*
Ovenbird	*Seiurus aurocapillus*
Pileated Woodpecker	*Dryocopus pileatus*
Scarlet Tanager	*Piranga olivacea*
Partners In Flight (PIF) Priority Forest Interior Birds	
Canada Warbler	*Wilsonia canadensis*
Cerulean Warbler	*Dendroica caerulea*
Golden-winged Warbler	*Vermivora chrysoptera*
Kentucky Warbler	*Oporornis formosus*
Louisiana Waterthrush	*Seiurus motacilla*
Olive-sided Flycatcher	*Contopus cooperi*
Wood Thrush	*Hylocichla mustelina*
Worm-eating Warbler	*Helmitheros vermivorus*
Pennsylvania State Listed Forest Interior Birds	
Long-eared Owl	*Asio otus*
Prothonotary Warbler	*Protonotaria citrea*
Yellow-bellied Flycatcher	*Empidonax flavescens*
Listed Conifer-dependent Forest Interior Bird Species	
Northern Goshawk	*Accipiter gentilis*
Swainson's Thrush	*Catharus ustulatus*
Conifer-dependent Forest Interior Bird Species	
Blackburnian Warbler	*Dendroica fusca*
Hermit Thrush	*Catharus fuscescens*
Northern Saw-whet Owl	*Aegolius acadicus*
Red-breasted Nuthatch	*Sitta canadensis*
Solitary Vireo	*Vireo solitarius*
Winter Wren	*Troglodytes troglodytes*

Cerulean Warbler (*Dendroica caerulea*)
photo source: Ron Austing

Forest interior dwelling bird species are dependent upon large tracts of forest for reproduction; these birds include neotropical migrant songbirds, residents, and short-distance migrants. Numerous studies have confirmed the negative impacts of forest fragmentation on forest interior bird species with recent declines in these populations partially attributed to forest fragmentation and direct habitat loss (Jones et. al. 2000). Increased forest edges, created by forest management practices such as logging and gas line development, can expose nesting birds to greater dangers such as brood parasitism and nest predation. For example, many forest songbirds nesting near edges fall prey to nest parasitism by Brown-headed Cowbirds (*Molothrus ater*), which eject host nest eggs and lay their own for other birds to rear (Robertson and Norman 1976). Many forest interior birds cannot recognize Cowbird eggs and raise them as their own (Jones et al. 2000).

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 McKean County are also conifer dependent or require conifer-dominated habitats in order to successfully breed. 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. Due to collection pressure, the localities of Northern Goshawk occurrences are not given in this report. See the Northern Goshawk fact sheet on pg. 177 for information on this species.

Northern Saw-whet Owl (*Aegolius acadicus*)
photo source: Jim Chestney

To sustain viable populations of birds, forest structure must retain a diversity of microhabitats to be exploited by different species. The structural diversity of the forest, both horizontal (i.e., natural openings in the canopy) and vertical (i.e., shrub, understory, and canopy layers, large woody debris on the forest floor and standing snags) provides more types of feeding, perching, and nesting habitats. Contiguous forest tracts are inherently necessary to support a wider variety of breeding songbirds and more foraging areas for larger birds of prey, like the Northern Goshawk. In addition, there are several forest management implications for the maintenance of healthy breeding populations of songbirds; this includes maximizing the size of forest tracts by cutting around the borders of the forest, keeping larger forest patches near other forest patches, creating irregular edges when timber harvesting, avoid clear-cutting by leaving some trees of varying species and different size classes, and retain decaying and standing dead trees (Rodewald 2001).

Common Wetland Dependent Birds in McKean County	
Great Blue Heron	*Ardea herodias*
Great Egret	*Ardea alba*
Red-shouldered Hawk	*Buteo lineatus*
Red-winged Blackbird	*Agelaius phoeniceus*
Song Sparrow	*Melospiza melodia*
Swamp Sparrow	*Melospiza georgiana*
Wetland bird species of special concern in PA	
American Bittern	*Botaurus lentiginosus*
American Coot	*Fulica americana*
Bald Eagle	*Haliaeetus leucocephalus*
Common Moorhen	*Gallinula chloropus*
King Rail	*Rallus elegans*
Least Bittern	*Ixobrychus exilis*
Marsh Wren	*Cistothorus palustris*)
Osprey	*Pandion haliaetus*
Sedge Wren	*Cistothorus platensis*
Sora	*Porzana carolina*
Virginia Rail	*Rallus limicola*

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). McKean 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 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 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.

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

Sora (*Porzana carolina*)
photo source: Ron Austing

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 McKean 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. However, the creation of additional grassland habitats should not be a primary activity for biodiversity conservation in McKean County.

In addition to conservation efforts for rare species, maintaining viable populations of common birds increases natural community diversity and habitat quality. Although conservation of rare and endangered species is important, there is also a need for sustaining populations of more common species. Efforts such as projects by Partners in Flight, The Audubon Society of Pennsylvania, and The North American Bird Conservation Initiative are focused on reversing the decline of neo-tropical migrants and sustaining healthy populations of native birds (Rosenberg et al.1999).

Important Bird Areas

An Important Bird Area (IBA) is a region designated by the Pennsylvania Chapter of the National Audubon Society that recognizes sites vital to promote proactive avian habitat conservation in Pennsylvania. Over 80 IBA sites encompassing over two million acres of public and private land have been identified. These areas include migratory staging areas, winter roost sites and prime breeding areas for songbirds, wading birds, shorebirds, and other species.

Criteria used in determining IBAs include exceptional concentrations or diversity of birdlife, populations of species on the PA 'special concern' list, sites with representative,

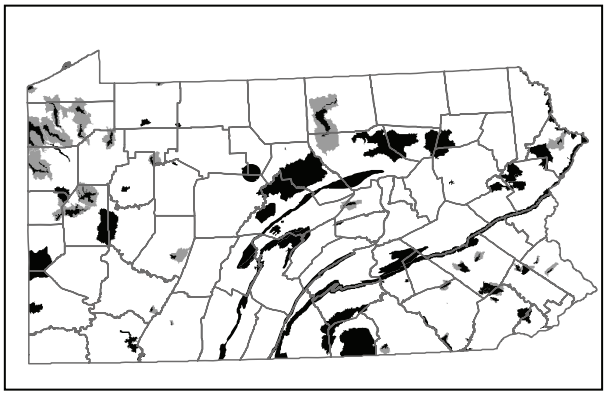


Figure 7. Important Bird Areas in Pennsylvania. Areas denoted in gray indicate conservation areas that support ecological functions within the IBA.

rare or unique bird habitats, or site where long-term avian research is ongoing. More information on the IBA program is available from the Pennsylvania Chapter of the National Audubon Society.

McKean County includes a portion of one Important Bird Area (IBA): Tionesta Scenic and Research Natural Area (Figure 6, pg. 13). The IBA extends beyond McKean County; therefore, features described below pertain to the entire IBA and are not necessarily confined to the county (Figure 7).

Note: the following information is adapted from the Audubon Society of Pennsylvania IBA site descriptions (Audubon 2002).

Tionesta Scenic and Research Natural Area IBA

The Tionesta is a tract of land within the Allegheny National Forest comprising the largest tract of old-growth forest in Pennsylvania. Dominant species include eastern hemlock and American beech, with sugar maple, black cherry, red maple, yellow poplar, and cucumber-tree filling the forest gaps left by wind-throws and death. Seventy-four bird species breed in the Tionesta, including an abundance of raptors, chimney swifts, woodpeckers, flycatchers, thrushes, wood warblers, and the highest density of Blue-headed Vireos within the Allegheny National Forest. Tionesta also appears to provide critical habitat for winter migrants and residents alike.

This area satisfies the following IBA criteria:

- Breeding forest bird diversity is high in this site with 74 confirmed species;
- Yellow-bellied Flycatcher has bred in the Cherry Run drainage in three different years. Olive-sided Flycatcher has occasionally been reported during the spring and summer census periods within the blow-down area of Cherry Run drainage;
- Northern Goshawk is a breeding bird within this area. Swainson's Thrush is a common bird during breeding season among the old-growth conifer stands of the Tionesta and along the forested ravines;
- Tionesta is the largest area in Pennsylvania representing American beech and eastern hemlock old-growth forest. It is also the largest such tract between the Adirondacks and Great Smoky Mountains;
- The Allegheny National Forest has been conducting owl call-response driving transects for approximately 10-15 years, and walking breeding bird point-count transects within parts of the Tionesta for the past 9 years. The Forestry Sciences Lab in Irvine, PA has avian research data (point-count format) for the Tionesta for 7 different forest stands within the Tionesta.

Conservation Concerns:

The most serious threat to this habitat is declining forest health. The Tionesta area has experienced Gypsy Moth and Elm Spanworm infestations in the mid-1980's and 1992-94 respectively. The American Beech in the area is under attack by beech bark disease, and Sugar Maple is exhibiting evidence of stress from sugar maple decline. Over-browsing by white-tailed deer limits the success of the new regeneration in the large and isolated wind-throw areas. As a result, many of the smaller forest gaps created are occupied by beech brush in the form of root-suckers from the already diseased source tree. The extraction of minerals within the Scenic Natural Area of the Tionesta could become a threat to the area's habitat quality as a result of road building and the increase in the noise accompanied with such operations. Bird point counts are conducted annually to establish a long-term data set and monitor trends in populations.

Broad-winged Hawk (*Buteo platypterus*)
photo source: Ron Austing

REPTILES AND AMPHIBIANS AND THEIR HABITAT

The herpetofauna makeup of Pennsylvania is unique. Today, the Commonwealth is home to 72 native herptile species, including those common in the glaciated regions of the Canadian Shield, many of the southern species from the lower regions of the Appalachians, several associated with western prairies, and a few connected with the coastal plain. The ranges of most Pennsylvania reptiles and amphibians are restricted to certain regions of the state, a testament to the varied topography, and physiographic providences within the region. Pennsylvania's mixed landscapes create a great diversity of habitats for a wide range of reptile and amphibian species.

Young Snapping Turtle (*Chelydra serpentina*)
photo source: PNHP

McKean County is home to many common, generalist species, such as 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*). These species occur in many different habitats, exist throughout the entire state, and are the most commonly encountered reptiles and amphibians in the Commonwealth. Along with these common species, McKean County possesses several less common species of reptiles and amphibians. Many of these rarer species have restricted ranges or are considered specialists, meaning their life histories have more specific habitat requirements.

Much of Pennsylvania has succumbed to a large amount of habitat degradation, destruction, and fragmentation due to land development. McKean County has retained many large forested tracts, providing a tremendous amount of contiguous habitat for the oft-overlooked reptiles and amphibians of the state. The array of habitats within these large forested blocks serves both the generalist and specialist species.

The terrestrial woodland salamanders depend on canopied forests with adequate amounts of leaf litter. These salamanders are voracious predators of the forest floor. 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. glutinosus*, *P. hoffmani*, and *P. wehrlei*) are the most common woodland species throughout McKean County's forests.

The numerous waterways and small mountain streams of McKean County provide habitat for the brook salamanders, including the Northern and Mountain Dusky Salamanders (*Desmognathus fuscus*, *D. ochrophaeus*), the Two-lined and Long-tailed Salamanders (*Eurycea bislineata*, *E. longicauda*) and the Northern Spring Salamander (*Gyrinophilus porphyriticus*). In the seepy cold-water drainages of the county, the brilliant Northern Red Salamander (*Pseudotriton ruber*) can be found under the litter and rocks in spring heads. All of the streamside salamanders require high water quality, and forested stream edges.

The largest salamander on the continent, the Eastern Hellbender (*Cryptobranchus alleganiensis*), may still be found in the moderately sized creeks where suitable habitat exists. Able to reach over two feet in length, this bizarre looking, harmless salamander is rarely seen as it spends the majority of the time under large flat rocks in swift moving, high quality waters. Hellbender populations have been declining very rapidly due to introductions of aggressive exotic crayfish and decreases in water quality. 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

Slimy Salamander (*Plethodon glutinosus*)
photo source: PNHP

retains its gills throughout the adult stage. This is the only species in Pennsylvania which 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.

Portions of the county support complexes of ephemeral/fluctuating natural pools, more commonly known as vernal 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. The Wood Frog (*Rana sylvatica*), and the Jefferson and Spotted Salamanders (*Ambystoma jeffersonianum*, *A. maculatum*), all of which are vernal pool obligates, are known from McKean County. These species cannot reproduce without the presence of vernal pools. Therefore, the health of these species' populations relies upon the integrity of vernal pools in the county.

Spotted Salamander (*Ambystoma maculatum*)
photo source: Andrew Strassman

The Four-toed Salamander (*Hemidactylium scutatum*) is not a vernal pool obligate, but is often found in association with these habitats. This diminutive salamander lays its eggs in peat mosses (*Sphagnum* spp.) and can be found in the margins of seeps, springs, streamsides, and vernal pools where Sphagnum moss is found above cool, clear water. The Four-toed Salamander tends its clutch, which is laid in vertical mats of Sphagnum, until the young hatch. In addition to this species, many frogs and toads that are not vernal pool obligates can also be found using these habitats. The American Toad (*Bufo americanus*), Spring Peeper (*Pseudacris crucifer*), and the Grey Tree Frog (*Hyla versicolor*) are regular visitors to vernal pools and may use these wetlands to breed and forage.

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 undiscovered reasons. Many are now concerned with the future of this species.

The semi-aquatic Wood Turtle (*Glyptemys insculpta*) relies on wooded creeks and rivers, and can be locally common in areas. This turtle gets its name from the rough, sculpted appearance of its shell, resembling a carved piece of wood. The Spiny Softshell Turtle (*Apalone spinifera*) is known from McKean County and can be found in the large lakes and rivers that have sand or mud bottoms. This species is more closely tied to water than the wood turtle, though the species does bask when conditions are suitable and many can be seen sprawled on sandbars and teetering on logs overhanging water. Riverine turtle nests are generally laid in suitable soft substrates along waterways. These sites are frequently used by many nesting females and are easily targeted by overpopulations of raccoons, skunks, and opossums. There is now concern for many of Pennsylvania's turtles, because numerous populations are devoid of juvenile turtles indicating that there is little successful recruitment occurring.

Four-toed Salamander (*Hemidactylium scutatum*) tending her clutch of eggs
photo source: Charlie Eichelberger

The Eastern Box Turtle (*Terrapene carolina*) was likely gone from McKean County by the time of European settlement. Box Turtle remains are a common find in archeological digs from western New York State. It is thought that Box Turtles were components of western New York State and northern Pennsylvania but were wiped out of these regions by over collecting by Native Americans.

The Northern Coal Skink (*Eumeces anthracinus*) and Five-lined Skink (*Eumeces fasciatus*) are the only lizard species

Northern Water Snake (*Nerodia sipedon*)
photo source: Andrew Strassman (PNHP)

known from McKean County. Both of these species occur in relatively small, isolated populations in dry habitats with an abundance of cover objects and basking areas. These habitats often include many sun exposed rocks and dead woody debris. These species are particularly susceptible to localized extinction because of their populations' small sizes and isolation from other lizard populations.

The Northern Black Racer (*Coluber constrictor*) and the Black Rat Snake (*Elaphe allegheniensis*), two fairly common species in the state, can be found in many different habitats across the county. These two species prey upon small mammals including mice and squirrels. The brilliantly patterned Milk Snake (*Lampropeltis triangulum*) can be found in a variety of habitats and though it is common, this species is rather secretive and is rarely seen. A more frequently observed snake, Northern Water Snake (*Nerodia sipedon*) is a widespread resident of McKean County. This species hunts along open waterways, searching for amphibians and small fish.

Pennsylvania accounts for about 90% of the global range for the Shorthead Garter Snake (*Thamnophis brachystoma*). This species can be locally common and are considered habitat generalists, but their extremely restricted range makes them a globally vulnerable species. The Shorthead Garter Snake feeds exclusively on earthworms.

The Smooth Green Snake (*Liochlorophis vernalis*) is likely common in grassy areas but is difficult to locate because their camouflage allows them 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 occipitomaculata*), the Northern Brown Snake (*Storeria dekayi*), the Ring-necked Snake (*Diadophis punctatus*), and the Mountain Earth Snake (*Virginia pulchra*; fact sheet page 185). With the exception of the Mountain Earth Snake, these species are fairly common residents and can be found beneath rocks and decaying wood and bark. Nearly 80% of the Mountain Earth Snake's global range is in Pennsylvania. This species is thought of as "vulnerable" in the state because of its extremely restricted range. More survey work is needed for this species in the state.

Mountain Earth Snake (*Virginia pulchra*)
photo source: PNHP

The Timber Rattlesnake (*Crotalus horridus*; fact sheet page 184) has long been persecuted in northeast. Although these snakes may deliver a serious bite if threatened, the danger they pose has been drastically over exaggerated. In fact, there has never been a recorded human fatality in Pennsylvania from a rattlesnake bite. The forested ridges of McKean County provide wonderful habitat for this species and there are records of this species in the county. Rattlesnakes are able to use a wide range of habitats and may be encountered throughout the forested regions of the county. They primarily occur on rocky slopes where they can find refuge in spaces between the boulders as well as thermoregulate in the sunny openings. This species forage in a variety of habitats, but favor forested areas with healthy small mammal populations. Hibernacula, or dens, often are found under canopy cover but are usually located within several hundred meters of an open basking site. Persistence of these sites relies on forestry practices that maintain a diversity of open areas adjacent to forested foraging habitat.

Timber Rattlesnakes are still considered a game species by the Pennsylvania Fish and Boat Commission and can be collected with an appropriate PAFBC permit. Despite the allowance of rattlesnake hunting, the Timber Rattlesnake is considered a species of special concern because it is declining from human persecution. The American Society of Ichthyologists and Herpetologists (2006) has stated that rattlesnake roundups and hunts cannot co-exist with rattlesnake conservation and should be ended if we are to maintain Timber Rattlesnake populations in the Commonwealth. Timber Rattlesnakes are a protected species in every surrounding state where the snake occurs and are considered during environmental review in Pennsylvania. The wooded habitats along the ridges of McKean County provide a tempting location for housing development, however housing locations at these sites are not recommended to reduce human-snake encounters.

black and yellow color phases of the Timber Rattlesnake (*Crotalus horridus*)
photo source: Charlie Eichelberger

McKean County is a significant spot in the state for the Commonwealth's reptiles and amphibians. The large, unfragmented forested tracts with numerous waterways provide critical habitat for the reptiles and amphibians. Of utmost importance to the conservation of the county's herpetofauna is the protection of the regions forests and wetlands, including the communities of vernal pools. The rich and diverse herpetofauna of McKean County is unique to Pennsylvania and should be considered in the long term plan of the region.

This text has been created by examining range maps, records found in museums, databases, and various monographs. While this information has been based on decades of scientific research and inventories, the secretive nature of herptiles make them difficult to survey for. Therefore, there may be other herptile species that occur in the county that have not yet been recorded.

Pennsylvania Fish and Boat Commission Regulations

In Pennsylvania, the Fish and Boat Commission has jurisdiction over the reptiles and amphibians. Recently, regulations concerning the herptiles were reviewed and there have been considerable changes with how this group is managed. The regulations now include a list of "no-take" species that are thought to be declining. More information on the amphibian and reptile regulations can be found on the Fish and Boat Commission's website at http://sites.state.pa.us/PA_Exec/Fish_Boat/regs_nongame.htm.

Pennsylvania Herpetological Atlas

The Pennsylvania Herpetological Atlas, begun in 1997, serves to fill some of the gaps in our knowledge of herptile distributions in the state. The atlas is a volunteer based project and citizens are encouraged to submit records for species of conservation concern to the atlas. Submissions may be made online at http://webspace.ship.edu/tjmare/herp.htm.

LEPIDOPTERA AND ODONATES AND THEIR HABITAT

Butterflies and Moths

Butterflies and moths are grouped together in the scientific order called Lepidoptera. Lepidoptera comes from the Greek words 'lepido,' which means scale, and 'ptera,' which means wing. A butterfly or moth has two forewings and two hindwings. When inspected closely with a hand lens, each wing will reveal thousands of neatly arranged scales of different colors, which form patterns on the wings. Lepidoptera are also characterized by a coiled, tubular mouthpart called the proboscis, which is used to drink nectar. Finally, lepidoptera are a group of insects that undergo complete metamorphosis in a life cycle that includes eggs, caterpillars, pupae, and adults.

Life history and habitats

Puddling blues, swallowtails, and Red-spotted Purples
photo source: PNHP

The Lepidoptera cycle of life starts with an egg laid on a specific plant. The egg hatches and a tiny caterpillar (larva) emerges. The caterpillar feeds and grows larger, and will shed its skin several times to allow for growth. After the caterpillar has grown through several molts, typically 4-6, it is ready to pupate. The pupa emerges when a fully-grown caterpillar sheds its skin and exposes a protective shell. Inside this shell the transformation from caterpillar to adult takes place. After a period of time that varies from species to species, the adult emerges with a plump abdomen and withered wings and immediately begins pumping fluids from the abdomen into the wing veins until they are fully expanded. Then the fluids are withdrawn from the wing veins, the wings harden, and the moth or butterfly takes off on its maiden flight.

Butterflies and moths are closely related insects, and they share many features. They have similar life histories and utilize a similar suite of habitats. Butterfly adults have thread-like antennae with a small rounded club at the end. Moths can have plumose (feather-like) or thread-like antennae, but they will not have a small club at the end. Some moths have very plump and fuzzy bodies, while butterflies tend to have sleeker and smoother bodies. Moths typically land and spread their wings open flat, while butterflies will often land and close their wings together over their back, or at 45-degree angles (the skippers). Moths are mostly active at night and butterflies fly during the day, but there are also many day-flying moths. Butterfly pupae have a smooth exterior called a chrysalis, while moth pupae form a cocoon, which is typically wrapped in silky fibers.

Many Lepidoptera depend not only on a specific habitat, but also a specific plant within that habitat. The larvae of many species will often use only a single host plant. The Monarch (*Danaus plexippus*) uses only milkweed (*Asclepias* sp.) or closely related plants. The Spicebush Swallowtail caterpillar (*Papilio troilus*) prefers to feed on spicebush (*Lindera benzoin*). The same type of relationship exists with many moths.

Zabulon Skipper (*Poanes zabulon*)
photo source: PNHP

Species Diversity in Pennsylvania

In North America north of the Mexican border, there are an estimated 13,000 butterfly and moth species (Wagner, 2005). Pennsylvania's varied habitats support a large range of butterflies. Altogether, the state has about 156 species of butterflies and the closely related skippers, and probably a minimum of 1,200 species of moths (Wright, 2007; PNHP,

Clouded Sulphur (*Colias philodice*)
photo source: Andrew Strassman (PNHP)

2006). However, no state agency is directly responsible for managing Lepidoptera, and scientists suspect the population trends for many species are decreasing. For a list of butterfly species known to occur in McKean County see Appendix VII (pg 172).

Dragonflies and Damselflies

Damselflies and dragonflies are grouped together in the scientific order called Odonata (or informally, the odonates). Odonata comes from the Greek word 'odon,' which means 'tooth'. Both adult and larval (immature) odonates possess mouthparts armed with serrated, tooth-like edges and grasping hooks that help them catch and eat their prey.

Life history and Habitat

Adult odonates lay their eggs (oviposit) in or near water. There are two common methods of oviposition. Some species lay their eggs inside the stems or leaves of living or dead plant material. Other species lay their eggs in the water, singly or in a mass. Odonate eggs develop at different rates depending on the species, but in general development quickens as temperature increases (Brooks 2003). In temperate regions like Pennsylvania, eggs develop over a period of several weeks to several months.

As larvae, odonates are found in a wide variety of aquatic habitats, such as seeps, seasonal pools, streams, rivers, ponds, lakes, and other wetlands. Within each habitat, larvae seek out favorable microhabitats with the right combination of water flow, vegetation, substrate texture, etc. They feed on the other insect larvae that share their aquatic habitat, such as mosquitoes, midges, gnats, and other flies. During larval development, odonates undergo 5-15 molts (Westfall and May 1996) over a period of a few months for some species and up to several years for others. The number of molts depends upon the species and also on environmental conditions.

When a larva is fully developed, it undergoes metamorphosis inside its larval skin. Then it crawls out of the water for its final molt. This movement of the larva out of the aquatic habitat to shed its larval skin is called emergence. Once properly positioned, the larval skin is shed one last time and a winged adult emerges.

Odonates emerge from the water, transforming from camouflaged stalkers into jeweled fighter planes. Adult odonates continue to feed on the community of insects with whom they shared an underwater life. They also add to their diet additional insects they encounter for the first time as adults, such as butterflies.

Adult odonates are closely associated with the larval habitat during mating and subsequent oviposition when the eggs are laid in suitable habitat. However, it is important to recognize the additional habitat requirements of the adults. For example, some species have specific perching preferences, and will not use a habitat that lacks proper perches, even when suitable larval habitat is present (Westfall and May 1996). Feeding areas are also very important for odonates. After the process of metamorphosis and emergence, a fresh adult has very little energy in reserve and must begin feeding as soon as possible. Young adult females in particular avoid breeding areas for a period of time while they build up mass, mostly in growth of their ovaries. Males and females can frequently be found feeding far

Ebony Jewelwing (*Calopteryx maculata*)
photo source: Andrew Strassman (PNHP)

Damselflies ovipositing on a leaf
photo source; PNHP

away from breeding habitat, along roadsides, in wooded glades, in open meadows, and other upland and aquatic habitats. Some males and females disperse long distances from their natal aquatic habitat to find new breeding areas, an important process that strengthens populations by diversifying the gene pool.

Species in Pennsylvania

In North America, there are an estimated 350 species of dragonflies (Needham et. al. 2000) and 161 species of damselflies (Westfall and May 1996). In Pennsylvania, 121 species of dragonflies and 55 species of damselflies are currently known (PNHP, 2006). For a list of odonate species known to occur in McKean County see Appendix IIX (pg. 173).

Conservation Recommendations for Insects

The specific habitat requirements of many insects are not well known. Protecting habitats where species of special concern currently occur is a first step towards ensuring their long-term survival. Alteration or destruction of habitat is the greatest threat to populations of Odonata and Lepidoptera and other insects.

There are a few important pieces of information needed when developing conservation and management plans for Odonata and Lepidoptera that are unique to these taxa:

1) Research and define the specific habitat requirements of each life stage of the species of concern.

Most research on the habitats of Odonata and Lepidoptera has focused on the larval habitat and food plants. This makes sense because of the more sedentary nature of the larvae compared to the adults and the subsequently tighter association of larvae to habitat. The adults are also associated with the larval habitat during mating and oviposition when the eggs must be placed in suitable habitat. However, it is important not to lose sight of the additional habitat requirements of the adults such as perching/puddling and upland feeding areas.

2) Acknowledge and maintain the balance that is necessary between predators and their prey.

Larval and adult odonates feed on the other insects that share their environment such as mosquitoes, midges, gnats, and other flies. Odonates help control insect species that are considered pests. However, when housing developments encroach upon wetland habitats, municipalities and homeowners often take pest control into their own hands. The pesticides used to control mosquitoes and other nuisance insects have many negative effects on non-target species. Direct mortality of all insect species occurs when broad-based killing agents are used. More specific killing agents are available that only harm black flies or mosquitoes, but indirectly this still affects predators such as fish and insects, which experience a decrease in food availability when their formerly abundant prey items are eliminated. Additionally, the application of pesticides can raise pest populations in the long run by

Exemplary dragonfly and damselfly habitat
photo source: PNHP

disrupting the intricate natural food webs in these wetland systems. Pesticides may eliminate odonates which are slower to rebound from die offs, causing a population explosion of the pest species in subsequent years.

Indirect effects of pest control can also severely reduce populations of butterflies and moths. These species are vulnerable to changes in the distribution and abundance of the food plants. Applications of herbicides or vegetation removal (e.g., mowing) while the eggs or larvae are on the plants can cause declines in Lepidoptera and interrupt stages of the life cycle of these animals. In an effort to slow the spread of gypsy moth and to protect timber resources, various insecticides including lead arsenate, DDT, and carbaryl (Sevin), have been sprayed over the years. Presently, the biological insecticide *Bacillus thuringiensis* (*Bt*) and the insect growth regulator diflubenzuron (Dimilin) are considered more environmentally safe than other sprays and are the primary means of gypsy moth control. However, both chemicals affect species of insects beyond the target gypsy moth. The *Bt* variety used against gypsy moth (*Bt kurstaki*) is toxic primarily to caterpillars, or larvae of Lepidoptera. Species with 1st and 2nd instars at the time of spraying and that feed on foliage are most at risk. Butterflies seem to be particularly susceptible to *Bt*, though there have not been studies to evaluate the effect on all butterflies. In order to protect rare or small populations of non-target organisms, the size of the spray blocks and the timing of spraying for gypsy moths can be adjusted on a site-by-site basis.

3) Protect the species and habitats within a healthy, functioning ecosystem.

Landscape scale conservation of wetland, meadow, and forested habitats and the supporting upland habitat is needed for long term survival of healthy odonate and lepidoptera populations. Without an intact ecosystem that can provide the whole suite of environmental services these species need, from natal habitat to adult foraging grounds, we run the risk of losing these species.

AQUATIC COMMUNITY CLASSIFICATION

A statewide project of the PNHP, the Pennsylvania Aquatic Classification Project, collected aquatic datasets from state and federal agencies, interstate basin commissions, and universities, analyzed information with standard statistical methods, and identified community types and habitat associations (Walsh et al. 2007a, 2007b). The most common community type per watershed was chosen to represent typical watershed organisms and habitats (Table 3, pg. 28). Although other community types may exist in a particular watershed, the major predicted community type is described.

What is an aquatic community?

An aquatic community represents a group of organisms that occur together in a particular habitat. The organisms require similar habitat features, may be dependent on each other for food or other resources, and/or may be dependent on similar processes in their environment. The aquatic communities in this report refer to three types of organisms: fish, macroinvertebrates, and mussels. Aquatic communities for each type of organism can be used to describe the aquatic resources, habitat types, and stream quality.

Where do aquatic communities occur?

Flowing water habitats, such as rivers and streams, and their community types are addressed herein. Aquatic community types such as lakes, wetlands, and ponds, which are closed systems, have not been assessed to date. Aquatic communities are identified within watersheds. The term watershed describes an area of land that drains down slope to the lowest point. The water moves through a network of drainage pathways, both underground and on the surface. Generally, these pathways converge into streams and rivers, which become progressively larger as the water moves on downstream, eventually reaching an estuary and the ocean. Watersheds can be large or small, but all land is part of a watershed. Every stream, tributary, and river has an associated watershed, with small watersheds merging to become larger watersheds. In this report, relatively small watersheds (hydrologic unit code 12 or HUC12) are described by their community types. For example, the Mid-Atlantic Region is a HUC1 covering many states, while a small unnamed headwater would be a HUC14 or higher. For more information on the HUC system see: http://water.usgs.gov/GIS/huc.html.

What do fish, macroinvertebrates, and mussels tell me about my streams and watersheds?

All three types of organisms hold unique places in Pennsylvania's streams and rivers. Macroinvertebrates include aquatic insects, worms, and crustaceans, like crayfish, which occupy the lower levels of food webs in aquatic systems. The presence of certain macroinvertebrates reflects food availability, water quality, and habitats, and gives an overall picture of stream health. Additionally, these organisms are the major recyclers within any aquatic system.

Fish then prey upon macroinvertebrates and other stream organisms. Food resources and spawning habitats can be specific for fish. They, too, are influenced by the stream quality and the entire watershed environment. For example, fine sediment from unnatural land erosion may enter a stream and cover gravel and cobble habitats where fish lay their eggs. Developing eggs and fry will be smothered by such an event.

As filter-feeders, mussels also require relatively clean water to thrive. These organisms collect food by filtering large volumes of water through their gills. Thus, they are particularly sensitive to even small amounts of industrial discharge, mine drainage, and urban runoff pollution. Mussels require habitats where they can burrow into the stream bottom and typically occur in larger streams and in rivers that contain sufficient food particles.

Many factors influence the occurrence of aquatic communities, including natural variations in stream habitats. Fast-flowing, cold streams arising on ridges provide a different environment than slow, warm rivers meandering through valleys, and aquatic communities reflect their environment. Geology also varies across Pennsylvania and the chemical composition of flowing water is effected by the rock that it contacts.

Any alteration to the landscape causes variation within the connected aquatic environments. If implemented improperly, timber harvest, agriculture, urban development, and roads may cause decreases in water quality and stream habitats from both direct and nonpoint source pollution. Additional point sources include pollutants form sewage treatment plant discharges, mines drainage, and industrial and agricultural sources.

How are communities described?

Communities of fish and macroinvertebrates are given descriptive names and mussel communities are named by the commonly occurring mussels in the community type. Other organisms that may be found in the community are also listed. While not every organism described in a community will occur in every community location, organisms listed by community types give a general account of what organisms to expect in a community.

Species of concern (considered state or globally rare) that may occur within each community type are listed with state and global rank. Definitions of these ranks are available in Appendix III (pg. 163). Environmental and water quality habitats typically associated with the community type are also described.

Each community type occurring in McKean County has a one-page description in Appendix X (page 195). These descriptions include:

1) Community description and habitat – The environment of the stream where the community occurs is described by watershed and stream characteristics. Average values of the community characteristics across their entire range from a large dataset are presented. Size of the stream and watershed, gradient (slope), and elevation are a few habitat characteristics that may be important to the community type. Local conditions are also mentioned.
2) Stream quality rating - Community locations are generally ranked as low, medium, or high quality based on habitat, water chemistry, and sensitivity of organisms to pollution. The more susceptible a community is to human modification, the higher its quality.

Figure 8. Subwatersheds of McKean County identified by the Aquatic Community Classification Project (adapted from Walsh et al. 2007b).

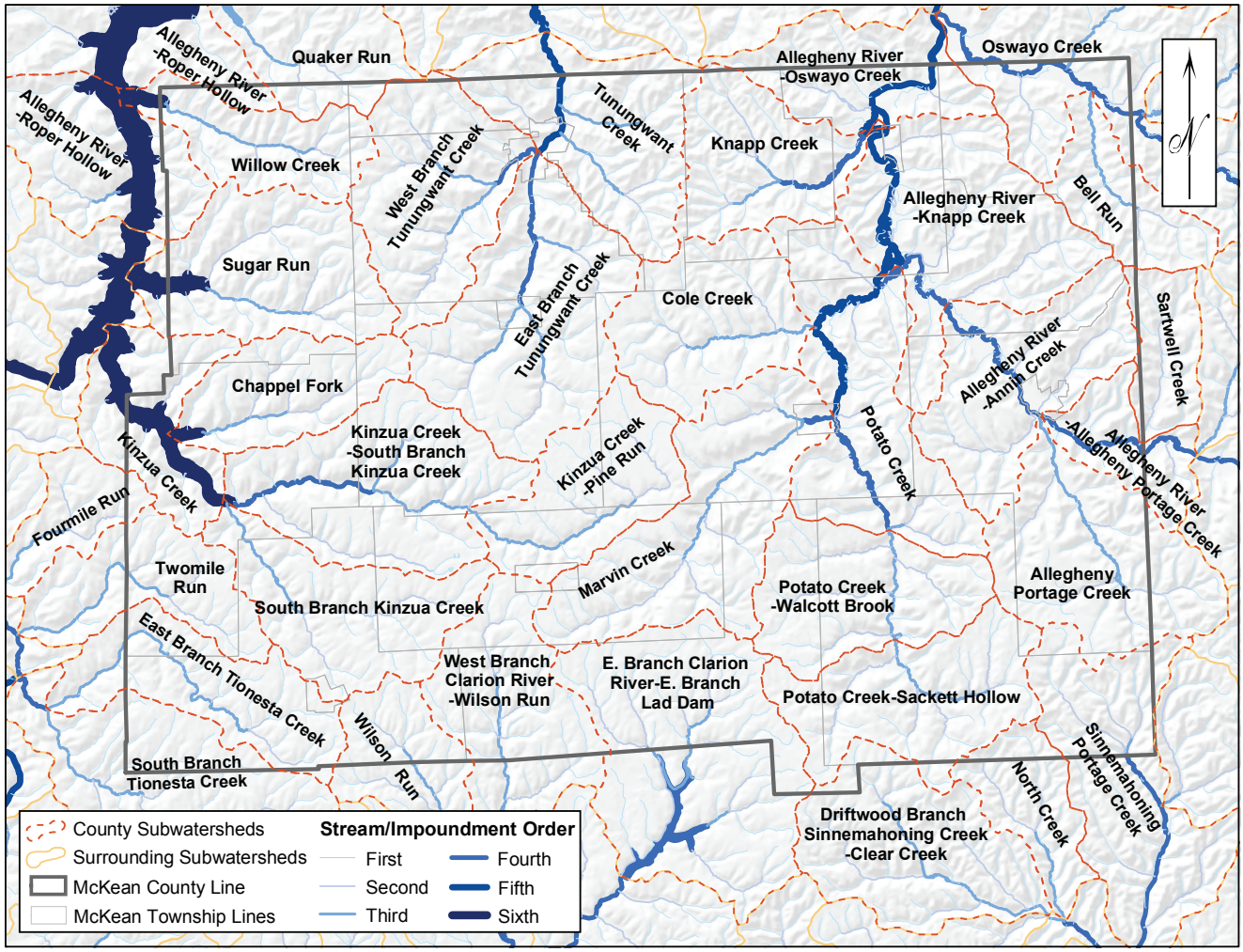


Table 3
Watersheds in McKean County and their fish, macroinvertebrate, and mussel community types.

HUC-12 Subwatershed[†]	Trout Stocking[*]	Dominant Communities[**] Fish[1]	Macroinvertebrate[2]	Mussel
Allegheny Basin				
Allegheny Portage Creek	Yes	Coolwater (pg. 203)	High Quality Large Stream	Undetermined
Allegheny River-Allegheny Portage Creek	Yes	Coldwater (pg. 202)	High Quality Large Stream (pg. 198)	Spike mussel (pg. 201)
Allegheny River-Annin Creek	Yes	Warmwater (pg. 204)	High Quality Large Stream	Fatmucket
Allegheny River-Knapp Creek	No	Warmwater	High Quality Large Stream	Fatmucket
Allegheny River-Oswayo Creek	No	Warmwater	High Quality Small Stream (pg. 197)	Fatmucket (pg. 200)
Allegheny River-Roper Hollow	No	Coldwater	High Quality Small Stream	Undetermined
Bell Run	Yes	Coolwater	High Quality Small Stream	Fatmucket
Chappel Fork	Yes	Coldwater	High Quality Small Stream	Undetermined
Cole Creek	No	Coldwater	High Quality Small Stream	Undetermined
E. Branch Clarion River-E. Branch Lad Dam	Yes	Coldwater	High Quality Small Stream	Undetermined
East Branch Tionesta Creek	Yes	Coldwater	High Quality Small Stream	Undetermined
East Branch Tunungwant Creek	No	Coldwater	High Quality Small Stream	Undetermined
Fourmile Run	Yes	Coldwater	High Quality Small Stream	Undetermined
Kinzua Creek	Yes	Warmwater	High Quality Small Stream	Undetermined
Kinzua Creek-Pine Run	Yes	Coldwater	High Quality Small Stream	Undetermined
Kinzua Creek-South Branch Kinzua Creek	Yes	Coldwater	High Quality Small Stream	Undetermined
Knapp Creek	No	Coldwater	High Quality Small Stream	Fatmucket
Marvin Creek	Yes	Coldwater	High Quality Small Stream	Fatmucket
Oswayo Creek	No	Warmwater	High Quality Large Stream	Spike mussel
Potato Creek	Yes	Coldwater	High Quality Large Stream	Spike mussel
Potato Creek-Sackett Hollow	Yes	Coldwater	High Quality Small Stream	Undetermined
Potato Creek-Walcott Brook	Yes	Coolwater	High Quality Small Stream	Undetermined
Quaker Run	No	Coldwater	High Quality Small Stream	Undetermined
Sartwell Creek	Yes	Coldwater	High Quality Small Stream	Fatmucket
South Branch Kinzua Creek	Yes	Coldwater	High Quality Small Stream	Undetermined
South Branch Tionesta Creek	Yes	Coldwater	High Quality Small Stream	Undetermined
Sugar Run	Yes	Coldwater	High Quality Small Stream	Undetermined
Tunungwant Creek	No	Coldwater	High Quality Small Stream	Undetermined
Twomile Run	Yes	Coldwater	High Quality Small Stream	Undetermined
West Branch Clarion River-Wilson Run	Yes	Coldwater	High Quality Small Stream	Undetermined
West Branch Tunungwant Creek	Yes	Coldwater	High Quality Small Stream	Undetermined
Willow Creek	Yes	Coldwater	High Quality Small Stream	Undetermined
Wilson Run	Yes	Coldwater	High Quality Small Stream	Undetermined
Susquehanna Basin				
Driftwood Branch Sinnemahoning Creek-Clear Creek	No	Coldwater	High Quality Small Stream	Eastern Elliptio (pg. 199)
North Creek	Yes	Coldwater	High Quality Headwater Stream(pg.196)	Eastern Elliptio
Sinnemahoning Portage Creek	Yes	Coldwater	High Quality Small Stream	Eastern Elliptio

[†]Pennsylvania Watershed Boundary Dataset DRAFT, USDA, Natural Resources Conservation Service: Watershed (10-digit hydrologic unit area) and Subwatershed (12-digit hydrologic unit area) delineation based on *Federal Standard for Delineation of Hydrologic Unit Boundaries, October 2004* publication. For more information, go to **http://www.ncgc.nrcs.usda.gov/products/datasets/watershed/**

[*]Surveys by the Pennsylvania Fish and Boat Commission found one or more fish (trout or warm-water game fish) present of hatchery origin. This suggests that this watershed or a nearby watershed is stocked. While prized by anglers, the introduction of non-native fish species disrupts the natural balance of the aquatic community and can decrease the overall quality of the waterway.

[**]A subwatershed may contain more than one community type for each of the community categories. When more than one community type occurred within a subwatershed the dominant type was chosen to represent the entire watershed.

[1] Fish community types were developed for all Pennsylvania watersheds (Walsh et al., 2007).

[2] Macroinvertebrate community types were described in Walsh et al., 2007.

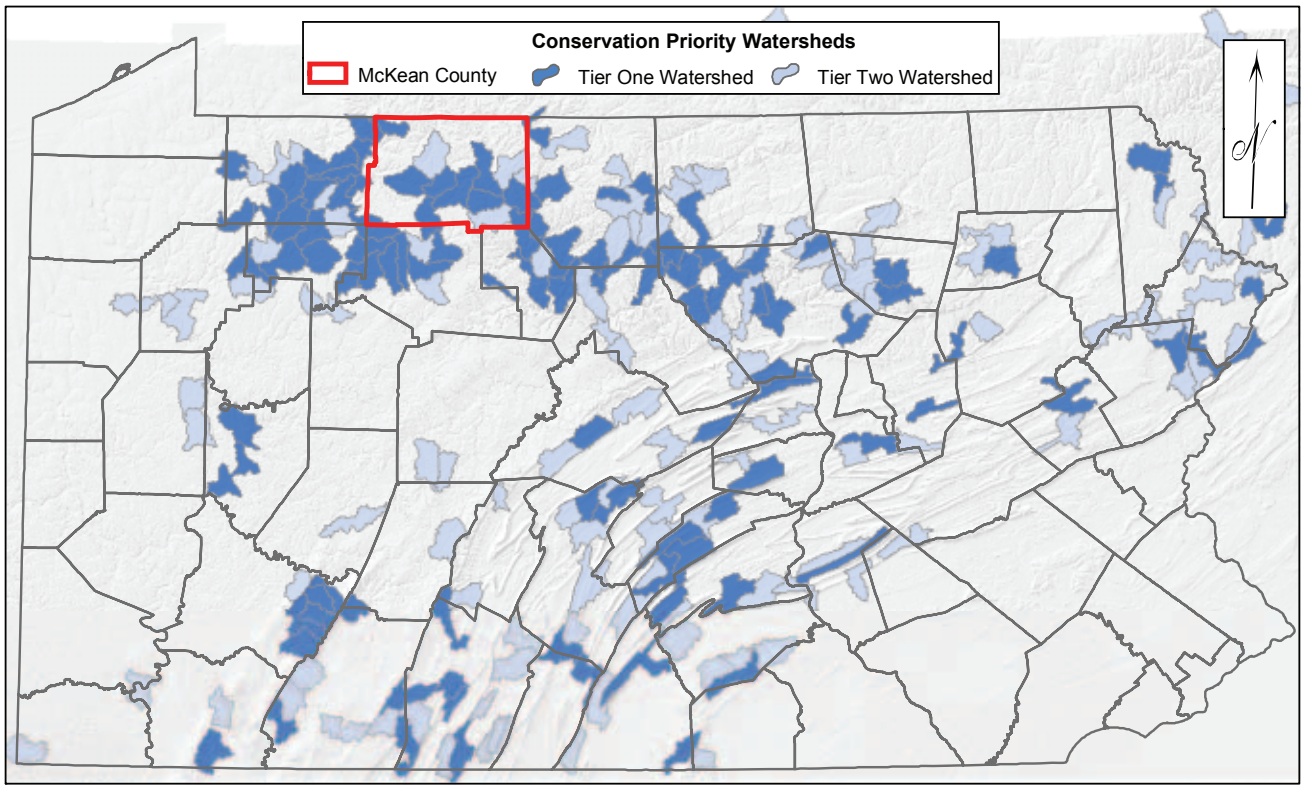


Figure 9. Conservation priority areas for Pennsylvania and surrounding watersheds identified by the Aquatic Community Classification Project (adapted from Walsh et al. 2007b).

3) Threats and disturbances - Potential pollution sources or other threats that may alter the natural state of the community are listed where known.
4) Conservation recommendations – Created for the county natural resource managers and land planners to consider in protection and management of the watersheds and communities.

Other Landscape-Scale Conservation Areas

Across the state, a number of organizations have undertaken conservation planning efforts at a landscape scale. The areas identified through these efforts frequently overlap with sites identified by County Natural Heritage Inventories, and serve to emphasize the importance of focusing conservation efforts in those areas. The results of three such planning efforts are included in this section in order to provide information relating to the natural heritage of McKean County that readers of this report may not otherwise be aware of.

Conservation Priority River Reaches and Watersheds

The Pennsylvania Aquatic Community Classification (ACC) was developed by the Pennsylvania Natural Heritage Program to create a classification system of flowing water ecosystems in Pennsylvania and its watersheds. The ACC defines types of stream and river reaches based on aquatic communities, their habitats, and watershed properties. The project products were designed for natural resource applications including assessment, monitoring, resource planning, and conservation.

Combining data from many parts of the Aquatic Community Classification project has resulted in a means of identifying the unique riverine conditions that designate certain watersheds to be of greater conservation concern than others. Some watersheds may be of importance due to a single occurrence of a natural feature, such as the presence of a rare species or a high quality mussel community, but watersheds that hold multiple traits of conservation value should be set apart as a higher protection priority.

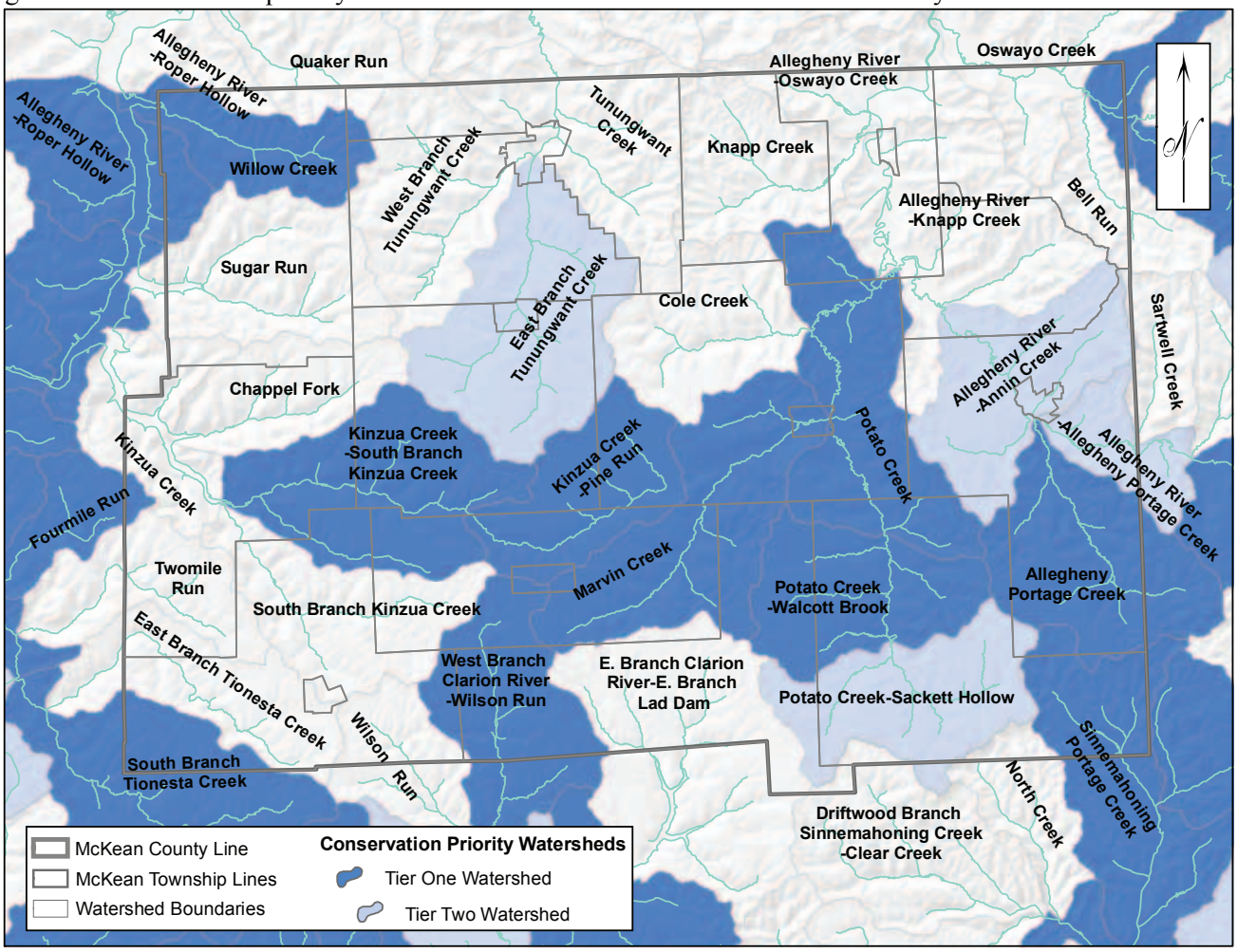
Least Disturbed Streams (LDS) were selected based on evidence of little human disturbance as indicated by watershed and riparian land cover, mines and point pollutions sources, road-stream crossings, and dams.

Watershed conservation and restoration priorities were indicated by the density of least disturbed streams, by community habitats, and community quality metrics. Conservation priority river reaches and watersheds were selected and then ranked as either Tier 1 or Tier 2 based on community types, metrics of community quality, and least-disturbed stream condition. The results of this analysis are illustrated in Figure 9 on page 29; Figure 10 shows the conservation priority river reaches and watersheds identified within McKean County.

Least disturbed streams (LDS) were common in areas that are largely forested areas and have less human influence than other regions. Concentrations of LDS streams were found in the north-central region of Pennsylvania and the West Branch of the Susquehanna River basin, in the forested watersheds of Laurel Highlands, in the upper Allegheny watershed, and the headwaters of the Delaware River watershed. Watershed conservation priorities included those with high concentrations of LDS. Priorities also included the best examples of select habitats with calcareous geology habitats, Waynesburg Hills Physiographic Section and Piedmont Physiographic Province, French Creek, and large river habitats.

McKean County has a very high concentration of high quality conservation priority watersheds relative to the rest of the state. One caveat, however, is that stream pH was not factored into the analysis due to a lack of data. The Allegheny plateau of northern Pennsylvania experiences acid deposition rates that are among the highest in North America (National Atmospheric Deposition Program [NADP] 2002). The NADP/National Trends Network monitors a location in the Kane Experimental Forest; the mean hydrogen ion concentration of precipitation at this site, measured as pH, is among the most acidic of the more than 200 sites monitored nationwide. Thus, many of the headwater streams and watersheds otherwise considered to be of high quality in McKean County may be seriously impacted by acid precipitation. More information on the Aquatic Community Classification is available from the Pennsylvania Natural Heritage Program (http://www.naturalheritage.state.pa.us/aquatics.aspx).

Figure 10. Conservation priority river reaches and watersheds within McKean County.



METHODS

Fifty-seven county inventories have been completed in Pennsylvania as of this writing. The methods used in the McKean 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, and recommendations from local experts; 2) ground surveys; and 3) data analysis and mapping.

PNHP Data System

The Pennsylvania Natural Heritage Program (PNHP) was established in 1982 as a joint venture between the PA Department of Environmental Resources, The Nature Conservancy (TNC), and the Western Pennsylvania Conservancy (WPC). Today this partnership continues under the leadership of WPC, the Department of Conservation and Natural Resources (DCNR), the Pennsylvania Game Commission (PGC), and the Pennsylvania Fish and Boat Commission (PFBC). The database maintained by the PNHP has become Pennsylvania's chief storehouse of information on outstanding natural habitat types (natural communities) and sensitive plant and animal species of special concern. Several other noteworthy natural features are also stored in the database, including the Department of Environmental Protection (DEP)-designated Exceptional Value Streams (Shertzer 1992) and outstanding geologic features (based on recommendations from Geyer and Bolles 1979 and 1987).

The database includes known existing and historic data on occurrences of species and communities of special concern, gathered from publications, herbarium, and museum specimens, and the knowledge of expert botanists, zoologists, ecologists, and naturalists. From this foundation, PNHP has focused its efforts on, and conducts systematic inventories for, the best occurrences of the priority species and natural communities.

The database has recorded over 18,350 detailed occurrences of species and communities of special concern as of January 2007, largely the result of field surveys. These are stored in computer and manual files and denoted on topographic maps and geographic information system (GIS) files. Additional data are stored in extensive manual and digital files set up for over 200 natural community types, 1,400 animals, and 3,500 plant species. These files are organized by each of Pennsylvania's 881 7½-minute USGS topographic quadrangle maps using GIS.

In order to conduct an inventory of significant flora, fauna, and natural communities in a county, scientists from the PNHP first consult the database of rare plants, animals, and communities. They then used a systematic inventory approach to identify the areas of highest natural integrity in the county. The natural community and sensitive species data are the basis for judging the biological values of sites within the county. Protecting the sites with the best occurrences of the county's natural communities, and viable populations of sensitive plant and animal species can help to ensure that a full range of biological diversity is preserved with the county for the future.

Map and Air Photo Interpretation

PNHP ecologists familiarized themselves with the air photo characteristics of high quality natural communities already documented (Appendix IV, pg. 166). Additional data from vegetation maps, soil survey maps, field survey records, and other sources were consulted to gain familiarity with McKean County's natural systems. This information, along with references on physiography, geology, and soils, was used to interpret photos and designate probable vegetation types and potential locations for exemplary communities and rare species. In many instances, vegetation was classified at an ecosystem level, and it was therefore critical that an ecologist or person with similar training interpret the maps and aerial photos.

Work progressed systematically within the area encompassed by each USGS topographic map. The natural area potential of all parcels of land was assessed using aerial photographs. Areas continuing into adjacent counties were examined in their entirety. Topographic maps used during field surveys were marked to indicate locations and types of potential natural areas based on characteristics observed on the photos. For example, an uneven

canopy with tall canopy trees could indicate an older forest; a forest opening, combined with information from geology and soils maps, could indicate a seepage swamp community with potential for several rare plant and animal species. Baseline information on sites appearing to have good quality communities or potential for rare species was compiled to help prioritize fieldwork.

After an initial round of photo interpretation, field surveys were conducted to evaluate the potential natural areas. Locations with minimally disturbed natural communities or with species of special concern were outlined on topographic quadrangle maps. The photo signatures (characteristic patterns, texture, tone of vegetation, and other features on the photos) of these sites were then used as a guide for continued photo interpretation and future field surveys. Photo signatures of poor quality sites led to the elimination of further fieldwork on other sites with similar signatures.

Ground Surveys

Areas identified as inventory sites were scheduled for ground surveys. Biologists conducted field surveys throughout McKean County between 2004 and 2006. 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 I, pg. 160) were completed for each site. If a species of special concern was recorded and the population was of sufficient size and vigor, a voucher specimen was collected and archived in the herbarium of the Carnegie Museum of Natural History. The flora, fauna, level of disturbance, approximate age, and condition of forest community, and local threats were among the most important data recorded for each site. In cases where landowner permission for site visits was not obtained or enough information was available from other sources sites were not ground surveyed.

Experienced PNHP staff conducts botanical surveys and habitat assessments for species of special concern. All sites are evaluated for their natural condition. Associated disturbances and threats are noted and recommendations are made to minimize negative impacts.

Photo source: Shana Stewart (PNHP)

Data Analysis and Mapping

Data on species of special concern and natural communities obtained during the 2003 and 2004 field seasons were combined with prior existing data and summarized.

Two types of Natural Heritage areas are identified in County Natural Heritage Inventories:

Conservation Areas (CAs) are areas containing plants or animals of special concern at state or federal levels, exemplary natural communities, or exceptional native diversity. CAs 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. A "Core" area delineates essential habitat that cannot absorb significant levels of activity without substantial impact to the elements of concern. A "Supporting Natural Landscape" includes the area necessary to maintain vital ecological processes or secondary habitat; these areas typically can accommodate some degree of development or low-impact activities.

Landscape Conservation Areas (LCAs) are large contiguous areas that are important because of their size, open space, habitats, and/or inclusion of one or more CAs. 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.

Plant and animal nomenclature follows that adopted by the Pennsylvania Biological Survey. Community descriptions primarily follow Fike (1999); for systems not addressed in Fike (i.e. subterranean and non-vegetated habitats), Smith (1991) was followed. All sites with rare species and/or natural communities, as well as exceptional examples of more common natural communities were selected for inclusion in Conservation Areas (CAs). Spatial data on the element of concern were then compiled in a Geographic Information System (GIS) format using ESRI ArcGIS 9.1 software. Boundaries defining core habitat and supporting natural landscape for

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.

each CA were derived from the occupied habitat data based upon Pennsylvania Natural Heritage Program conservation planning specifications for the elements of concern within the CA. Specifications outline protocols for identifying lands important in the support of elements of concern and are based on scientific literature and professional judgment for individual species or taxonomic groups of species. They may incorporate physical factors (e.g., slope, aspect, hydrology), ecological factors (e.g., species composition, disturbance regime), and specifications 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 areas of very different size and extent for support if one receives mostly ground water and the other mostly surface water, or if one supports migratory waterfowl and the other does not. CAs were then assigned a significance rank to help prioritize future conservation efforts. This ranking is based on the extent, condition, and rarity of the unique feature, as well as the quality of the surrounding landscape (see Table 4, pg. 33).

Landscape Conservations Areas (LCAs) were delineated to include important landscape features and functions. These features include large blocks of contiguous forest, extensive wetland complexes, areas linking ecologically significant features such as those recognized for CAs, and otherwise comparatively (relative to an individual county) undisturbed, ecologically intact portions of the landscape. LCAs delineated around contiguous forest were identified by means of GIS analysis, refined through aerial photograph inspection, and selected based on size. Forested areas were identified though a classification of 1992 National Land Coverage Data (NLCD), compiled from Landsat TM (thematic mapping) satellite imagery with a resolution of 30 meters, downloaded from the Pennsylvania Spatial Data Access (PASDA) website (http://pasda.psu.edu). Land coverage types used in the analysis were transitional, deciduous forest, coniferous forest, mixed forest, woody wetlands, and emergent herbaceous wetlands. Roads, active railroads, and utility rights-of-way were considered fragmenting features. Existing GIS data for roads, which included interstates, US and state highways, state, county and township roads, Pennsylvania Bureau of Forestry roads, Allegheny National Forest roads, some private forest roads, and active railroads, were combined with utility right-of-way locations digitized from aerial photos. Analysis to identify contiguous blocks of forest was conducted using the map calculator function of the Spatial Analyst Extension in ArcView 3.2. Forest blocks less than 1 acre were removed and those remaining were grouped into five size classes: 1-250 acres, 251-1,000 acres; 1,001-5,000 acres; 5,001-10,000 acres; 10,001-15,783 acres. Perimeter-to-area ratios, a measure of habitat quality, were calculated for the four forest blocks greater than 10,000 acres; the forest block with the smallest ratio was selected as an LCA. A detailed description of the GIS analysis is available upon request from the Pennsylvania Natural Heritage Program.

RESULTS

The results of the McKean County Natural Heritage Inventory are presented in three sections. The Summary Results section summarizes the rare elements documented throughout the entire county. The Landscape-Scale Results section presents the results of a GIS-based landscape analysis identifying large areas of contiguous forest. The Results by Municipality section discusses species and natural communities of special concern on a site-by-site basis, and is organized alphabetically by township.

The focus of this report is rare natural elements, namely rare plant and animal species, rare or exemplary natural communities, and notable geologic features. Common species are discussed in site descriptions to help draw a picture of the habitat that supports rare elements. For those interested in a more comprehensive look at the common species that have been documented with McKean County, a list of sources has been compiled in Appendix VI (pg. 171). Currently, no all-inclusive list of species occurring within Pennsylvania, broken down by county, exists.

Summary of Results

The McKean County Natural Heritage Inventory has identified 58 areas of ecological significance - 49 Conservation Areas and 9 Landscape Conservation Areas (see Figure 1, pg. vii; Table 1, pg. ix). This report incorporates only data on rare elements documented since 1986, since records of natural element occurrences collected within the last 20 years are the most likely to result in potential conflicts during the environmental review stage of a land development project. Altogether, 66 elements of conservation concern (49 animal species, 13 plant species, 3 natural community type, and 1 geologic feature type) are covered in this report. A complete list is presented below in Table 5. Additionally, while the northern Goshawk (*Accipiter gentilis*) and timber rattlesnake (*Crotalus horridus*) are found throughout this part of the Commonwealth; because of collection pressure they are only noted at the county level. For further information on the northern goshawk please see the fact sheet on page 177 and for the timber rattlesnake see the fact sheet on page 184.

Table 5. Elements of conservation concern documented in McKean County since 1986 (*denotes species not named elsewhere in this report at request of regulatory officials due to threat of human disturbance).

Taxon	Common Name	Scientific Name	Fact Sheet
Geologic Features	Erosional remnant		-
Natural Communities	Black ash - balsam fir swamp		-
	Hemlock (white pine) – northern hardwood forest		-
	Hemlock palustrine forest community		-
Plants	American fever-few	*Parthenium integrifolium*	-
	Balsam poplar	*Populus balsamifera*	-
	Bog sedge	*Carex paupercula*	-
	Case's ladies'-tresses	*Spiranthes casei*	-
	Creeping snowberry	*Gaultheria hispidula*	193
	Downy willow-herb	*Epilobium strictum*	-
	Great-spurred violet	*Viola selkirkii*	-
	Oblong-fruited serviceberry	*Amelanchier bartramiana*	-
	Queen-of-the-prairie	*Filipendula rubra*	194
	Small yellow lady's-slipper*	*Cypripedium calceolus var. parviflorum*	-
	Stalked bulrush	*Scirpus pedicellatus*	-
	Thread rush	*Juncus filiformis*	-
	Wiegand's sedge	*Carex wiegandii*	-
Dragonflies/ Damselflies	American emerald	*Cordulia shurtleffii*	-
	Black-tipped darner	*Aeshna tuberculifera*	-
	Blue-tipped dancer	*Argia tibialis*	-
	Brush-tipped emerald	*Somatochlora walshii*	-
	Comet darner	*Anax longipes*	-
	Crimson-ringed whiteface	*Leucorrhinia glacialis*	-
	Forcipate emerald	*Somatochlora forcipata*	-

Table 5. Elements of conservation concern documented in McKean County since 1986 (*denotes species not named elsewhere in this report at request of regulatory officials due to threat of human disturbance).

Taxon	Common Name	Scientific Name	Fact Sheet
Dragonflies/ Damselflies	Green-striped darner	*Aeshna verticalis*	-
	Harpoon clubtail	*Gomphus descriptus*	-
	Maine snaketail	*Ophiogomphus mainensis*	-
	Northern pygmy clubtail	*Lanthus parvulus*	-
	Ocellated darner	*Boyeria grafiana*	-
	Red-waisted whiteface	*Leucorrhinia proxima*	-
	Ski-tailed emerald	*Somatochlora elongata*	192
	Superb jewelwing	*Calopteryx amata*	-
	White-faced meadowhawk	*Sympetrum obtrusum*	-
	Zebra clubtail	*Stylurus scudderi*	-
Butterflies/ Skippers	Aphrodite fritillary	*Speyeria aphrodite*	-
	Atlantic fritillary	*Speyeria atlantis*	-
	Eyed brown	*Satyrodes eurydice*	-
	Harris' checkerspot*	*Chlosyne harrisii*	-
	Leonard's skipper	*Hesperia leonardus*	-
	Long dash	*Polites mystic*	-
	Northern pearly-eye	*Enodia anthedon*	-
	Silver-bordered fritillary	*Boloria selene myrina*	-
Freshwater Mussels	Creek heelsplitter	*Lasmigona compressa*	191
	Elktoe	*Alasmidonta marginata*	190
	Long-solid	*Fusconaia subrotunda*	-
	Round pigtoe	*Pleurobema sintoxia*	-
	Wavy-rayed lampmussel	*Lampsilis fasciola*	-
Fish	American brook lamprey	*Lampetra appendix*	-
	Bigmouth shiner*	*Notropis dorsalis*	-
	Burbot*	*Lota lota*	186
	Channel darter*	*Percina copelandi*	188
	Longhead darter*	*Percina macrocephala*	189
	Ohio lamprey	*Ichthyomyzon bdellium*	187
Reptiles	Timber rattlesnake*	*Crotalus horridus*	184
	Mountain earth snake*	*Virginia valeriae pulchra*	185
Birds	Bald eagle*	*Haliaeetus leucocephalus*	179
	Great blue heron*	*Ardea herodias*	183
	Northern harrier	*Circus cyaneus*	181
	Northern goshawk*	*Accipiter gentilis*	177
	Osprey	*Pandion haliaetus*	180
	Sedge wren*	*Cistothorus platensis*	-
	Swainson's thrush	*Catharus ustulatus*	182
	Wilson's snipe	*Gallinago delicata*	-
Mammals	Northern flying squirrel*	*Glaucomys sabrinus*	-
	Northern myotis bat	*Myotis septentrionalis*	176
	Northern water shrew	*Sorex palustris albibarbis*	175

Landscape Fragmentation

Prior to European settlement, forest covered more than 90 percent of Pennsylvania (Goodrich et al. 2003). Today, 62 percent of the state is forested, comprising an area of over 17 million acres (Figure 11 pg. 38; 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, and railroads, as well as non-forest lands. 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. Few if any terrestrial species are immune. 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 one-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 & 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 2005). A total of 637 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 dead raptors representing 12 species along a 90-mile section of road (Loos and Kerlinger 1994, 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 meters. 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). Songbirds seem to be especially sensitive to traffic noise; it interferes with their vocal communication and thus affects 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, such as 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 formerly 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. If a habitat fragment lacks required microhabitat(s), or is smaller than the minimum area required by a given species, individuals of that species will not likely be found within that habitat fragment (Lynch and Whigham 1984). For example, the Louisiana waterthrush (*Seiurus motacilla*) is rarely found in small woodlots because they require upland forest streams within their territory, and most small woodlots lack this necessary component (Robbins 1980, Robinson 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 2007).

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). Edge forest is typically characterized by a harsher environment than that of interior forest. 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).

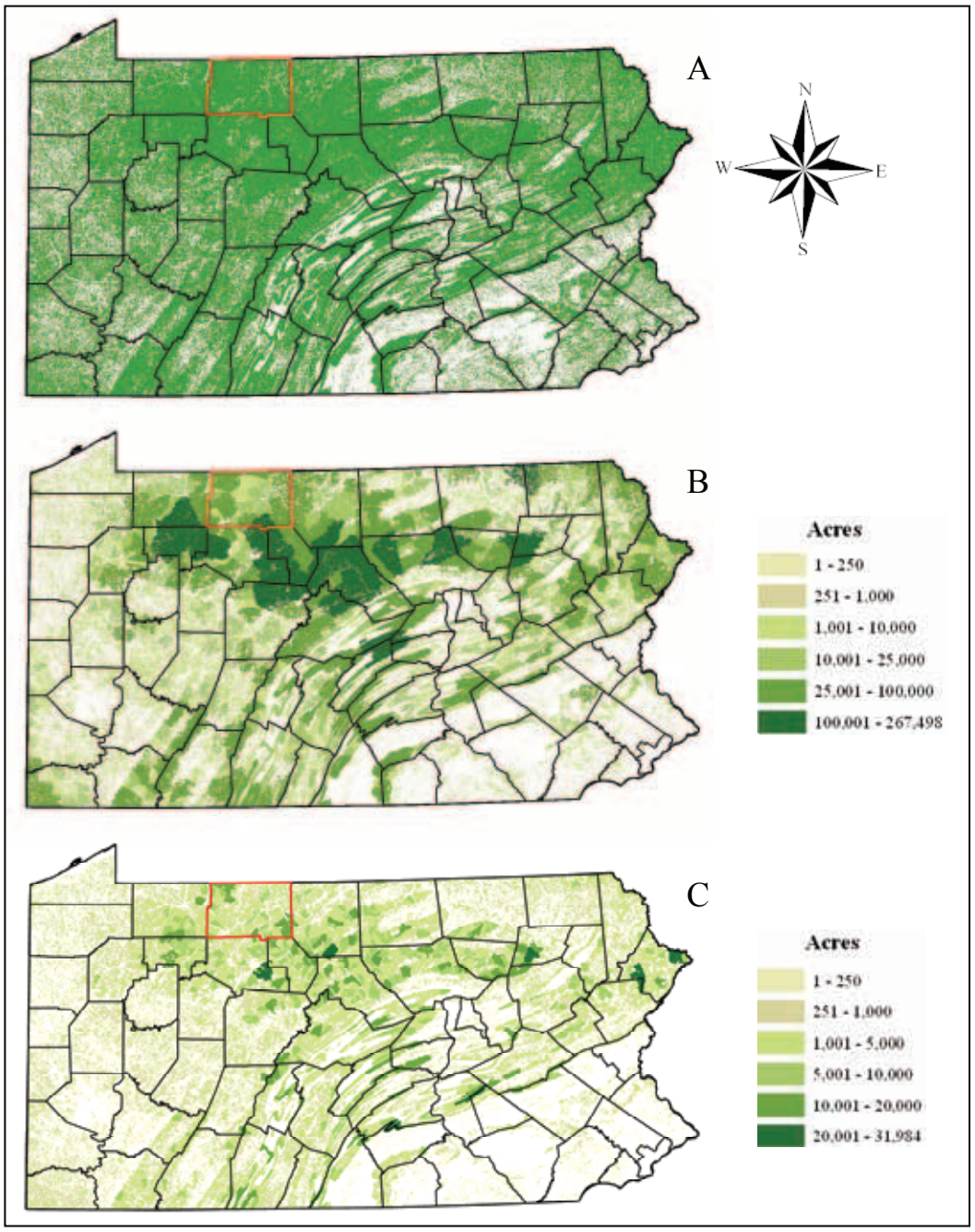
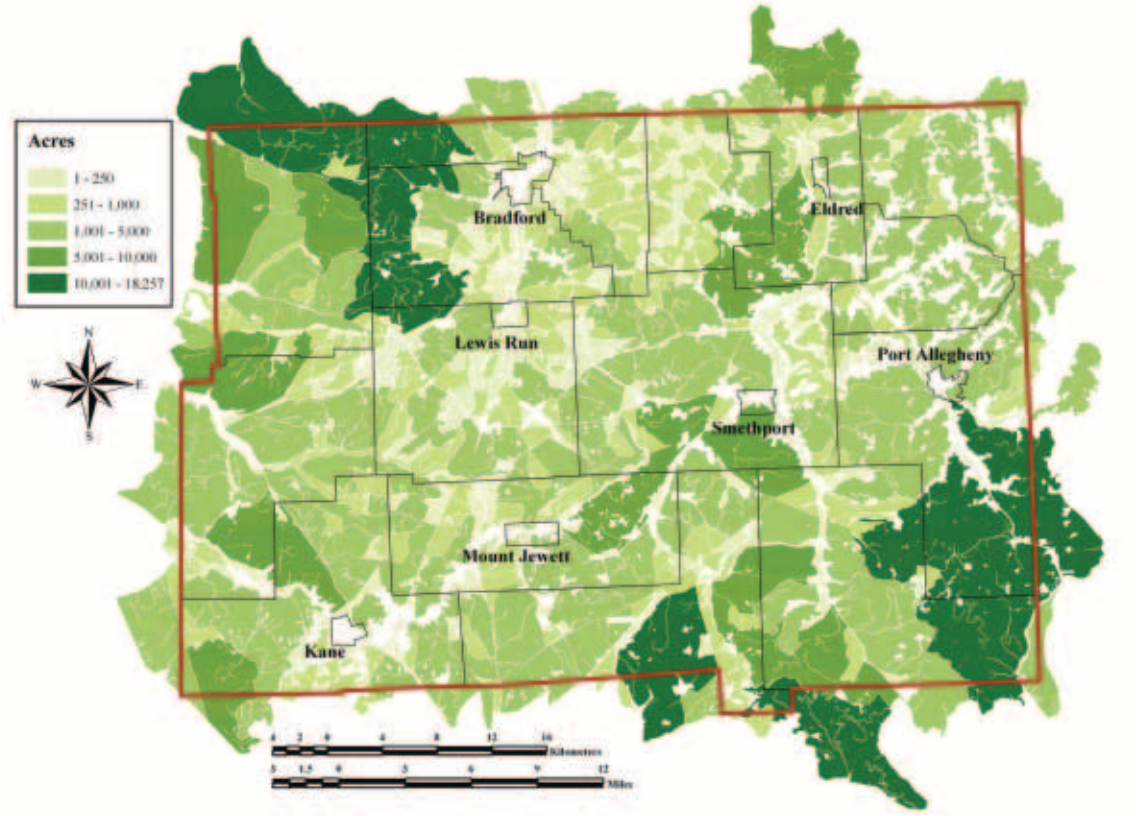


Figure 11. Forest and wetland areas of Pennsylvania shown at varying scales of fragmentation due to human-created linear landscape features. **A**. Forest and wetland areas in Pennsylvania derived from the National Land Cover Data Set for Pennsylvania (USGS 2001). **B**. Forest and wetland areas greater than one acre, fragmented by interstate, US, and state highways. Roads of this magnitude function as a barrier to all animals. The forest and wetland blocks shown here represent potential contiguous habitat for megafauna relatively insensitive to smaller-scale fragmenting features, such as black bear and white-tailed deer. **C**. Forest and wetland areas greater than one acre, fragmented by interstate, US, and state highways, state and local roads, public forest roads, and active railroads. The habitat blocks shown in this figure represent potential contiguous habitat for animals sensitive to all scales of fragmenting features, such as interior forest birds and amphibians.

The macroinvertebrate fauna found in 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, Trombulak and Frissell 2000). Unpaved road edges often have exposed areas of mineral soil and suitable light and moisture conditions that allow exotic seeds to become established (Parendes and Jones 2000, Trombulak and Frissell 2000).

Figure 12. Areas of contiguous forest and wetland habitat in McKean County, Pennsylvania.



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 & Alexander 1998, Trombulak and Frissell 2000). Heavy metals, which include lead, aluminum, iron, cadmium, copper, and manganese, contaminate soils, plants, and invertebrates up to 200 m from roads, as well as vertebrate fauna foraging within the affected zone (Trombulak and Frissell 2000). One study found elevated lead concentrations in tissue of several small mammal species in a narrow zone by roads (Getz et al. 1977, cited in Forman and Alexander 1998). Deicing salts contribute ions to the soil, altering pH and soil chemical composition, which effects plant growth (Forman and Alexander 1998**,** Trombulak and Frissell 2000). Airborne sodium chloride from snowplowing may cause leaf injury to trees (e.g., white pine) up to 120 m from a road, especially downwind and downslope (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). Vehicles produce ozone, which increases the concentration of this gas in the lower atmosphere where it acts as a greenhouse gas (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). Herbicides are often applied to roadsides and utility right-of-ways to control woody plant growth. Forest edge and interior plant species can be damaged or destroyed by drifting or misapplied herbicide (Williams 1995**,** Forman and Deblinger 2000).

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.

Landscape Analysis

Based on the National Land Cover Data Set for Pennsylvania (USGS 2001), forests and wetlands cover roughly 556,570 acres, or 88 percent of McKean County. Of that, 63 percent is interior forest habitat - defined as being over 100 m from either a fragmenting feature or forest edge (Goodrich et al. 2003). Hardwood forest accounts for 74 percent of the county's forest. The remainder is comprised of coniferous forest (0.4%), mixed conifer-hardwood forest (12%), shrub/scrub - areas dominated by true shrubs, forest in an early successional stage, or trees stunted from environmental conditions (0.7%), and wetlands (0.2%).

The results of the landscape analysis to identify contiguous areas of forest and wetland habitat in McKean County are shown in Figure 12, page 39. The vast majority of contiguous forest occurs in blocks of less than 250 acres (see Figure 13); of the 653 blocks that comprise the 1 to 250 acre size class, only 36 cover an area greater than 100 acres, and of those 36 forest blocks, only eight are larger than 200 acres. Roughly ten percent of the identified forest blocks are larger than 1,000 acres.

The forest blocks greater than 1,000 acres represent potential habitat for area-sensitive species. Robbins et al. (1989) found the minimum preserve size for forest birds to be 988 acres. This is not to say, however, that area-sensitive species will not be found in forested areas less than that which they require, but their reproductive success may be significantly reduced, resulting in population declines (Goodrich et al. 2003). During nesting season, the home range of a pair of Northern Goshawk may encompass an area ranging from 1,400 acres to 8,600 acres (Squires & Reynolds 1997). Bobcat territories can extend up to 1,700 acres (Cizek 2002). Black bear males establish ranges large enough to secure mates as well as food. A male range averages 20,000 acres and typically encompasses 7-15 female territories (Rogers 1999). Anderson and Vickery (in press) suggest that a minimum forest area of 25,000 acres is required to both absorb damage from large-scale disturbances such as tornados and to sustain resident populations of area-sensitive species.

Landscape-scale Conservation Area Results

This report focuses primarily on rare, threatened, and endangered species and natural communities at the scale of local occurrences; such occurrences are addressed in the Results by Municipality section. This section considers the county from a landscape-scale perspective, and approaches conservation and forest management at this scale.

Figure 13. Distribution of forest blocks across size classes.

Landscape Conservation Areas

Landscape Conservation Areas (LCAs) represent large areas of the landscape that are of higher ecological quality than other areas of similar size. They may include large blocks of contiguous forest, extensive wetland complexes, landscape features linking rare element occurrences recognized within Conservation Areas, and otherwise comparatively (relative to an individual county) undisturbed, intact portions of the landscape.

Nine Landscape Conservations Areas have been designated within McKean County. One LCA encompasses a large wetland complex in the floodplain of the Allegheny River. Two LCAs encompass large, intact, high quality riparian systems. The remaining six encompass large blocks of contiguous or potentially contiguous forest which support forest interior species.

Allegheny Wetland Complex LCA

The Allegheny Wetland Complex Landscape Conservation Area takes in 6,132 acres of wetlands that lay along the Allegheny River between Turtlepoint and the New York border, as well as wetlands along Potato Creek from Farmers Valley downstream to the confluence with the Allegheny River. Wetland complexes of this size are scarce on the Unglaciated Allegheny Plateau and this wetland complex may well be the largest.

Threats and Stresses

Because of its proximity to roads and population centers, this wetland likely faces a number of stresses. Hydrologic alterations to the wetland due to drainage, dredging, stream channelization, ditching, levees, deposition of fill material, stream diversion, ground water withdrawal, and impoundment can lead to significant alterations in water temperature and chemistry, soil chemistry, and nutrient cycling as well as increased sedimentation (US EPA 1993a, cited in Osmond et al. 1995). Sedimentation reduces wetland water storage capacity, smothers vegetation, reduces light penetration, reduces oxygen content and affects the entire ecosystem richness, diversity, and productivity. Toxic substances, adhering to sediments, may accumulate in impoundments as a result of decreased water circulation and bioaccumulation of contaminants by wetland biota may occur (Osmond et al. 1995). Paradoxically, impervious surfaces such as roads, buildings, and parking lots can cause both an increase in surface runoff by preventing rainfall from percolating into the soil, and a decrease in ground water recharge within a watershed, leading to a reduction of water flow into wetlands (Osmond et al. 1995). Wastewater treatment plant effluent and urban stormwater are a source of pollutants that continue to degrade wetlands (US EPA 1994b, cited in Osmond et al. 1995). The "aging" of wetlands can occur when wetlands filter organic matter. "Aging" is the saturation of the ecosystem by nutrients and heavy metals over time that results in the reduced effectiveness and degradation of the wetland (Mitsch and Gosselink 1986, cited in Osmond et al. 1995). Wastewater and stormwater can alter the ecology of a wetland ecosystem if high nutrient levels cause extended eutrophication and metals cause plant and aquatic organism toxicity (Ewel 1990, cited in Osmond et al. 1995). As a result of disturbance and habitat degradation, wetlands can be invaded by aggressive, highly tolerant, non-native vegetation, such as purple

Wetland Functions

(*The following is from the introduction of* Forested Wetlands: Functions, Benefits, and the Use of Best Management Practices [Welsh et al. 1995])

Wetlands are complex and fascinating ecosystems that perform a variety of functions of vital importance to the environment and to the society whose very existence depends on the quality of the environment. Wetlands regulate water flow by detaining storm flows for short periods thus reducing flood peaks. Wetlands improve water quality by retaining or transforming excess nutrients and by trapping sediment and heavy metals. Wetlands provide many wildlife habitat components such as breeding grounds, nesting sites and other critical habitat for a variety of fish and wildlife species as well as the unique habitat requirements of many threatened and endangered plants and animals. Wetlands also provide a bounty of plant and animal products such as blueberries, cranberries, timber, fiber, finfish, shellfish, waterfowl, furbearers, and game animals. Although wetlands are generally beneficial, they can, at times, adversely affect water quality. Waters leaving [some] wetlands have shown elevated bacterial coliform counts, reduced oxygen content and color values that exceed the standard for drinking water.

loosestrife *(Lythrum salicaria)*, water hyacinth (*Eichhornia crassipes*), and salvinia *(Salvinia molesta*), or can be dominated by a monoculture of cattails *(Typha spp.)* or common reed *(Phragmites spp.)* (McColligan and Kraus 1988; Weller 1981; Mitsch and Gosselink 1993; cited in Osmond et al. 1995).

Conservation Recommendations

In general, any development or landuse changes in the wetland complex should be avoided. Best Management Practices (BMPs) have been developed for a wide range of human activities that pose potential threats to aquatic environments, including Stormwater BMPs, Agricultural BMPs, Forestry BMPs, and Urban Small Sites BMPs. Landowners and anyone involved in planning for projects in the landscape surrounding this wetland complex that fall within these categories should incorporate relevant BMPs.

Potato Creek LCA

The Potato Creek LCA includes the East and West Branches of Potato Creek, the main stem of Potato Creek downstream to Farmers Valley, and the tributaries flowing into these sections of Potato Creek, excluding Havens Run. A. E. Ortmann, writing in 1909 on the destruction of the fresh-water fauna in western Pennsylvania, noted that Potato Creek was polluted by chemical factories, and was in very bad condition at its confluence with the Allegheny River. Today, the streams within this Landscape Conservation Area support three fish species of conservation concern, as well as numerous other more common species.

Upper Allegheny River LCA

The Upper Allegheny River LCA encompasses the main stem of the Allegheny River from the vicinity of Turtlepoint to Burtville, and Allegheny Portage Creek from it mouth at Port Alleghany to its headwaters near Keating Summit, as well as the tributaries flowing into these streams. In the first decade of the twentieth century, when pollution from wood-pulp mills, tanneries, chemical factories, and coal mines widespread across the Unglaciated Allegheny Plateau, Ortmann (1909) found "the headwaters of the Allegheny in McKean and Potter Counties [to be] generally good," in spite of some polluted tributaries, such as Potter Creek. Currently, 25 species of fish inhabit the waters within this landscape conservation area – five of which are considered species of special concern in Pennsylvania.

The boundaries of these stream-based LCAs capture the slopes that drain directly into the primary streams, as well as the riparian zones of their tributaries extending at least five kilometers upstream from the main stems. Each LCA functions as supporting landscape for the multiple Conservation Areas that lie within their boundaries.

Threats and Stresses

Maintaining suitable stream habitat is key to protecting all the rare aquatic species occurring within these stream-based Landscape Conservation Areas. Their continued success depends upon high water quality, the regulation of water temperature provided by forest cover, and the input of detritus and other organic material from the surrounding forest. Loss of forest cover along riparian corridors would likely result in physical degradation of the stream channels, erosion and sediment pollution in the river, higher water temperatures, and disruption of natural nutrient cycling linked to the river and its tributaries. If forest cover is substantially reduced within the watershed, water quality is likely to decline from increased sediment loads. Removal of forest cover on steep slopes is 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, road construction, and oil and gas 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 watershed is not as closely linked to the stream ecosystem 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.

The Importance of Riparian Forest

Riparian zones occur at the interface of terrestrial and aquatic ecosystems, and are among the most dynamic, diverse, and productive of ecological systems (Gregory et al. 1991; Naiman et al. 1993**,** cited in Williams 1996). Such riparian areas are particularly important in supporting the health of the aquatic community, and when forested, provide important habitat to terrestrial species as well. Forested riparian buffers function to stabilize stream hydrology, maintain the physical integrity of the stream channel, and intercept sediments and chemicals before they enter the stream. Riparian buffers are also critical in maintaining a natural cycle of nutrient input and uptake in the stream, providing a source of organic matter while filtering nutrients contained in runoff. In addition, a forested riparian buffer supports habitat conditions necessary for a diverse assemblage of native species in the stream; it regulates air and water temperatures, and provides food and cover for fish, amphibians, invertebrates, and other wildlife (Harding et al. 1998; Maryland DNR 1999). Forested riparian corridors also represent complex gradients that can include variation in elevation, frequency of flooding and duration, substrate conditions, nutrients, and light that produces a mosaic of plant communities extending from the stream into the forest (Williams 1996). Indeed, in Allegheny Plateau landscapes, the more frequently inundated areas of headwater riparian forests represent important centers of vascular plant diversity compared to mesic floodplains and adjacent hill-slopes (Williams 1996).

Elk River LCA
Keating Summit LCA
Lookout Mountain LCA
State Line LCA
Stickney LCA
Tracy Ridge LCA

These Landscape Conservation Areas have been designated around extensive areas of contiguous forest. They contain blocks of forest ranging from 5,300 acres to more than 36,000 acres and represent some of the most ecologically significant regions in the county.

Elk River LCA contains over 36,000 acres of near contiguous forest. This LCA contains the headwaters for many important streams that feed Potato Creek and support numerous species of special concern, excellent fisheries, and exceptionally scenic waterways. Lying in both Elk and McKean Counties, the greatest majority of this LCA is in private holding (85%).

Keating Summit LCA encompasses 19,656 acres of forest, making it the second largest block of contiguous forest in the county. Approximately 77 percent of this LCA is interior forest. While this LCA represents a large block of forest, it has a large perimeter-to-area ratio and thus is the forest-based LCA most impacted by edge effects.

Lookout Mountain LCA is 13,300 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. The LCA lies between two waterways – the Allegheny River and the 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.

Table 6. Ownership of lands within Landscape Conservation Areas.

Landscape Conservation Area	Total Area (acres)	Private Ownership		Public Ownership (acres)			
		acres	% of total	National Forest	State Game Land	State Forest	State Park
Allegheny Wetland Complex	6,132	4,852	79%	0	1,280	0	0
Elk River	36,016	30,625	85%	0	4,831	560	0
Keating Summit	19,656	17,016	87%	0	670	1,970	0
Lookout Mountain	13,300	9.463	71%	0	0	3837	0
Potato Creek	36,737	35,637	97%	0	1,100	0	0
State Line	12,652	385	3%	2,982	0	0	9,285*
Stickney	5,804	100	2%	5,704	0	0	0
Tracy Ridge	10,073	239	2%	9,834	0	0	0
Upper Allegheny River	23,627	20,728	88%	0	2,768	131	0

*Alleghany State Park, New York

State Line LCA has been designated around 12,652 acres of largely contiguous forest – of which 11,192 acres is interior forest. The forest block contained in this LCA ranks second behind the Tracy Ridge LCA in terms of its perimeter-to-area ratio. Much of this LCA is located in New York's Alleghany State Park.

Stickney LCA, located almost entirely in the Allegheny National Forest, encompasses 5,804 acres of contiguous forest. This LCA, approximately 83 percent of which is interior forest, has the third smallest perimeter-to-area ratio among all the forest blocks that fall within McKean County.

Tracy Ridge LCA has been designated around a 10,073-acre forest block – of which 91 percent is interior forest. This LCA has the smallest perimeter-to-area ratio of all the forest blocks within the county, or, in other words, is least impacted by edge effects. Virtually all of this LCA lies within the Allegheny National Forest, and has retained its designation as a National Recreation Area in the 2007 Forest Management Plan.

Seventy percent of the interior forest remaining in Pennsylvania is found in patches of 5,000 acres or less (Goodrich et al. 2003). Given that context, it is hard to place too much emphasis on the importance the interior forest within these LCAs. Not only does it provide potential habitat for a number of area-sensitive species, but the interior forest is 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 stream flow within watersheds and sequester large amounts of carbon as biomass (a potential economic benefit in the future).

Threats and Stresses

Activities such as development, road building, and large-scale timber harvesting that result in forest fragmentation will reduce the contiguity that makes these LCAs ecologically significant. Landscape features that fragment the landscape range from all-terrain vehicle trails to state highways and their effects depend largely on a specific plant or animal 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. Over-browsing by white-tailed deer has eliminated the tree seedling, sapling, and shrub layers, and greatly reduced herbaceous species diversity in large areas of forest in Pennsylvania. The longer over-browsing occurs, the more difficult it becomes to restore the original vegetation, in part because seeds and other propagules supplies have been greatly reduced or eliminated (Latham et al. 2005).

Conservation Recommendations

A significant portion of the land encompassed by these LCAs is located in the Allegheny National Forest (see Table 6, pg. 43), which presents land managers with the opportunity to coordinate sustainable management and biodiversity conservation. The U.S. Forest Service recognizes sustainability as one of the management goals in the National Forest.

A number of resources, listed in Appendix V (pg. 171), 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 envisioned goals for their land. 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 (DMAP).

Forest fragmentation can be minimized by utilizing existing disturbed areas for new projects 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. The impact of individual features such as oil and gas wells, roads, right-of-ways and other clearings can also be minimized by the use of ecologically informed best management practices in construction and maintenance.

Results by Municipality

Detailed maps and descriptions of McKean County's Conservation Areas (CAs) follow, organized by township. For each township, a summary table, map, and full report are provided. Townships are arranged alphabetically. Boroughs are treated together with an adjacent or surround township due to their small size.

Conservation Areas, Landscape Conservation Areas, and Public Lands are labeled on the township maps. Plant and animal species nomenclature follows that adopted by the Pennsylvania Biological Survey. Natural community descriptions follow Fike (1999).

Summary Table Conventions

A summary table of sites precedes each map and lists identified Conservation Areas and Geologic Features.

- A categorical designation of a site's relative significance is listed after the site name. Table 1 (page ix) summarizes sites by significance category. Definitions of the significance categories are outlined in Table 4 (page 33)**.**
- 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 IV (pg. 166) for a list of Natural Communities recognized in Pennsylvania.
    - Some species perceived to be highly vulnerable to intentional disturbance are referred to as "sensitive species of concern" rather than by their species name. In addition, each of these species are assigned a unique number for the report.
    - The Pennsylvania Natural Diversity Inventory (PNDI) ranks, and current legal status (detailed in Appendix III, pg. 163), 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.

Particular species names, common and scientific, are provided in coordination with the appropriate jurisdictional agency. Plants and terrestrial invertebrates are under the jurisdiction of the PA Department of Conservation and Natural Resources (DCNR). Mammals and birds are under the jurisdiction of the PA Game Commission (PGC). Aquatic animals, reptiles, and amphibians are under the jurisdiction of the PA Fish and Boat Commission (PFBC). Some species governed by the PGC and the PFBC are especially vulnerable to disturbance or unauthorized collection and are therefore not identified in the text of this report, at the request of the agencies, in order to provide some measure of protection.

ANNIN TOWNSHIP

	PNDI Rank*		State Legal Status*	Last Observed	Quality*
	Global	State			
NATURAL HERITAGE AREAS:					
Allegheny River at Turtlepoint Conservation Area	*Exceptional Significance*				
American brook lamprey (*Lampetra appendix*)	G4	S3	PC	2003	E
Elktoe mussel (*Alasmidonta marginata*)	G4	S4	N	1992	E
Round pigtoe mussel (*Pleurobema sintoxia*)	G4	S2	PE	1992	E
Sensitive species of concern 2	-	-	-	2002	E
Sensitive species of concern 3	-	-	-	2005	E
Sensitive species of concern 5	-	-	-	2005	E

*Please refer to Appendix III (pg. 163) for an explanation of Element Ranks, Legal Status, and Quality Ranks.

McKean County
Natural Heritage Inventory

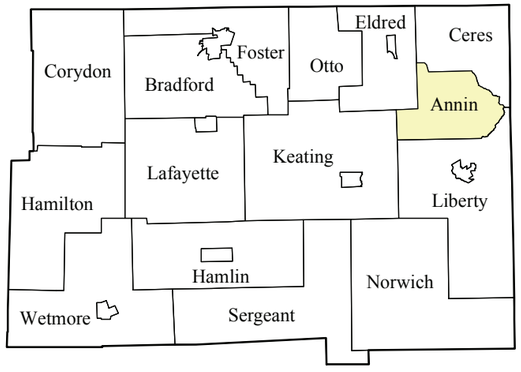
Annin Township

Conservation Areas:
Allegheny River at Turtlepoint

Landscape Conservation Areas:
Allegheny Wetland Complex
Upper Allegheny River

Public Lands:
State Game Lands 59

County Overview



Conservation Area (CA)
- Core Habitat
- Supporting Landscape

Other Areas
- Landscape Conservation Area (LCA)
- Allegheny National Forest
- State Lands
- 40 ft. Contour Interval

Pennsylvania Natural Heritage Program

Scale 1:44,000
0 0.5 1 2 Kilometers
0 0.25 0.5 1 1.5 Miles

ANNIN TOWNSHIP

Annin Township, located in the northeastern region of the county, lies entirely within the watershed of the Allegheny River. Newell Creek, Rock Run, Annin Creek, and Twomile Creek are the major tributaries within the township, flowing southwestward through relatively broad valleys before entering the Allegheny. Approximately 65 percent of the township is forested, with 64 percent of that being interior forest.

Allegheny River at Turtlepoint CA

This site is designated around aquatic habitat that supports several Pennsylvania-threatened species. Because of collection pressure or sensitivity to disturbance some species present at this site remain unnamed in this report at the request of the jurisdictional agencies.

The Allegheny River at Turtlepoint Conservation Area encompasses a section of the Allegheny River that provides habitat for six species of concern: **sensitive species of concern 2**, **sensitive species of concern 3, sensitive species of concern 5, American brook lamprey** (*Lampetra appendix*), **elktoe mussel** (*Alasmidonta marginata*), and **round pigtoe mussel** (*Pleurobema sintoxia*).

Allegheny River at Turtlepoint
Photo source: Western Pennsylvania Conservancy

Within Pennsylvania, sensitive species of concern 2 occurs only within the upper reaches of the Allegheny River and Lake Erie. This species prefers the deep, cool water of lakes and large rivers, where it typically hides among bottom structures during the day and emerges to feed at night. Immature individuals favor gravelly substrate where they feed on macroinvertebrates, while adults tend to remain in deep water and prey on fish. Sensitive species of concern 2 is one of only a few species in Pennsylvania to reproduce in the winter.

Sensitive species of concern 3 occurs primarily in the Ohio River basin, extending into the lower Great Lakes basin and upper St. Lawrence drainages. It also occurs in southeastern Kansas, southwestern Missouri, eastern Oklahoma, Arkansas, and northern Louisiana. Although the range of sensitive species of concern 3 is large, this species often occurs in isolated populations. In Pennsylvania, it is known from Lake Erie and larger tributaries, and the upper part of the Allegheny River drainage. This species inhabits large clean streams and rivers with moderate current and bottoms consisting of large rocks, fine gravel, and sand. Breeding occurs in spring to mid-summer. Males select and establish small territories downstream from large stones scattered over a clean sand-small gravel bottom. Females move into these territories, burrow into the gravel behind each stone, and spawn here with various males. Small numbers of eggs are deposited and fertilized with each spawning, until up to 400 eggs are laid. This species feeds on small aquatic insect larvae, as well as algae and organic detritus.

Sensitive species of concern 5 occurs along the western side of the Appalachian Mountains in the Ohio, Tennessee, and Allegheny River drainages, from southwestern New York down to North Carolina and Tennessee. In Pennsylvania, this species is known only from scattered sites in the Allegheny River and French Creek headwaters. The preferred habitat of sensitive species of concern 5 is moderate to large-sized streams with swift currents and bottoms of gravel and boulders. Little is known about the life history of this species, but it is believed that it reproduces between March and May. Adults feed on small crayfish and larger insect larvae.

The stream sections support a population of American brook lamprey (*Lampetra appendix*), a species currently under consideration for listing as rare by the Pennsylvania Biological Survey. Additionally, elktoe mussel (*Alasmidonta marginata*), and round pigtoe mussel (*Pleurobema sintoxia*) are found in this reach.

The American brook lamprey requires cool, clear water and inhabits large creeks and small to medium rivers where adults can be found in riffles with a gravel or sand substrate, while juveniles inhabit sandy or silty pools (Page and Burr 1991). This species has a complex life cycle that includes an extended larval stage before transformation into an adult stage. Eggs 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. The adult does not feed, and immediately begins spawning, with death following shortly thereafter (NatureServe 2007).

round pigtoe mussel (*Pleurobema sintoxia*)
Photo source: Western Pennsylvania Conservancy

Freshwater mussels, primarily found in streams, are filter feeders that spend their adult lives in the substrate of stream or lake bottoms. Movement is accomplished either by means of a muscular foot or flood currents. A mussel filters oxygen and particulate matter from the water column by continuously siphoning water through its body. They feed on suspended organic matter, including detritus and plankton. Mussels have a rather complex life cycle involving four stages. The cycle begins when males release sperm into the water column. As the sperm passively drifts with the current, it may enter females when they are siphoning and consequently fertilize their eggs. During the second stage, the fertilized eggs develop into larvae called glochidia. The glochidia are microscopic and are held in the female's gills for future release into the water column. They must attach to the gills or fins of a suitable host fish in order to survive once the female releases them. Once a glochidium attaches to a host, it remains for a period of days or months, depending upon the species, as it transforms into a juvenile mussel. Following the transformation the juvenile releases from the host and sinks to the stream bottom. If the juvenile is lucky, it lands in suitable substrate where it feeds and grows into an adult (Cordeiro and Bowers-Altman [no date]). Because mussels are dependent upon good water quality and physical habitat conditions and an environment that will support populations of host fish, they are considered good indicators of the health of aquatic ecosystems. See page 63 for additional information on freshwater mussel conservation.

The supporting landscape extends upstream for five kilometers from the boundary of the core habitat, and captures the viewshed of the core habitat and the riparian zone of the main stem of the creek, plus tributaries and their riparian zones.

Threats and Stresses

All the rare species occurring within this Conservation Area are dependent upon high-quality stream habitat for their continued success; each of these species are particularly vulnerable to siltation within riffle and run habitats. Runoff from dirt and gravel roads in close proximity to streams can contribute to physical degradation of stream channels, erosion, and pollution of in the streams. Loss of forest cover within riparian zones may also result in increased water temperatures and disruption of natural nutrient cycling linked to streams. 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 (see page 43 for a discussion of how riparian buffers function to protect water quality). Timbering, road construction, and gas and oil 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 (http://pubs.cas.psu.edu/FreePubs/pdfs/uh090.pdf) or through Penn State, for guidelines aimed at minimizing impacts due to timber harvesting.

Allegheny River at Turtlepoint

Photo source: Ken Anderson, PA Fish and Boat Commission

BRADFORD TOWNSHIP & BRADFORD CITY

	PNDI Rank*		State Legal Status*	Last Observed	Quality*
	Global	State			
NATURAL HERITAGE AREAS:					
Brown Valley Conservation Area			*High Significance*		
Swainson's thrush (*Catharus ustulatus*)	G5	S2S3B	CR	1994	E
Cobb Hollow Upland Conservation Area			*High Significance*		
Swainson's thrush (*Catharus ustulatus*)	G5	S2S3B	CR	2005	E
Sugar Run Conservation Area			*High Significance*		
Northern water shrew (*Sorex palustris albibarbis*)	G5T5	S3	CR	2005	E
West Branch Tunungwant Creek Conservation Area			*High Significance*		
American brook lamprey (*Lampetra appendix*)	G4	S3	PC	2005	E

*Please refer to Appendix III (pg. 163) for an explanation of Element Ranks, Legal Status, and Quality Ranks.

McKean County
Natural Heritage Inventory

Bradford Township
&
Bradford City

Conservation Areas:

Brown Valley
Cobb Hollow Upland
Sugar Run
West Branch Tunungwant Creek

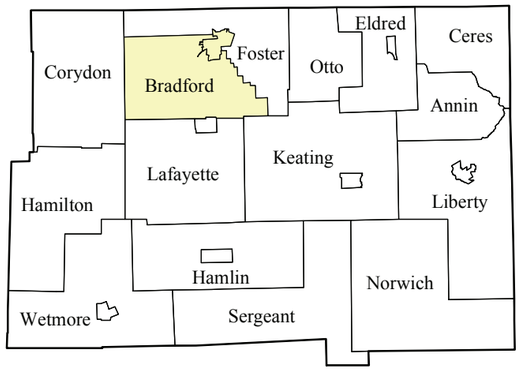
Landscape Conservation Areas:

none

Public Lands:

Allegheny National Forest

County Overview



Conservation Area (CA)

Core Habitat
Supporting Landscape

Other Areas

Landscape Conservation Area (LCA)
Allegheny National Forest
State Lands
40 ft. Contour Interval

PNHP
Pennsylvania Natural Heritage Program

Scale 1:60,000
0 0.5 1 2 3 Kilometers
0 0.5 1 2 Miles

BRADFORD TOWNSHIP & BRADFORD CITY

Bradford Township is located in the northwestern portion of the county. Forest covers roughly 83 percent of the township, 61 percent of which is interior forest. The East and West Branches of Tunungwant Creek are the primary streams flowing through the township. Oil and gas development within Bradford Township is concentrated along these streams.

The city of Bradford straddles the border between Bradford and Foster Townships, where the East and West Branches of Tunungwant Creek join to form the main stem of the stream. As McKean County's only city, Bradford is the largest population center in the county and home to a number of industries. An important issue related to the ecological health of the surrounding areas is appropriate management of stormwater and sewage to minimize impacts to Tunungwant Creek.

Brown Valley CA

This Conservation Area, encompassing mixed hemlock – hardwood riparian forest along an unnamed tributary of Marilla Brook, supports a breeding pair of **Swainson's thrush** (*Catharus ustulatus*). The Swainson's thrush is a neo-tropical migratory bird species that is associated with coniferous forests. It breeds in eastern and central North America from Canada south to the Allegheny High Plateau of northern Pennsylvania, and over-winters in mature tropical forests of Central and South America. In Pennsylvania, this species is considered to be an imperiled species and is a rare nester in several northern counties at the edge of the species' breeding range (Brauning 1992).

Swainson's Thrush (*Catharus ustulatus*) nest
Photo source: Beth Brokaw, PNHP

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 this decline are unclear. Swainson's thrush is prone to collisions with tall buildings and towers during migration and is sensitive to human activity near nesting sites. This species is also considered to be 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, one study 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 (Holmes and Sherry 1988).

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 hemlock woolly adelgid has been documented in 49 counties in Pennsylvania, and while known from Elk County has not yet reached McKean County. 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 CA 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 post-logging (Evans Mack and Yong 2000).

Conservation Recommendations

A large portion of this site is located on the property of the Bradford City Water Authority, who manages their land with the goal of protecting water quality. A key component of this type of management is preserving forest

within riparian zones. Private landowners with property within this site should consider adopting similar management goals, if they have not already done so. 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 the core habitat of this site during the breeding season—May through the end of July—of Swainson's thrush. Only silvicultural treatments that maintain at least a partial canopy and enhance structure in the understory should be practiced at the site.

Cobb Hollow Upland CA

This Conservation Area is discussed under Foster Township (page 83). It is designated around an area of mixed hemlock – hardwood forest that supports at least one breeding pair of **Swainson's thrush** (*Catharus ustulatus*), a neo-tropical migratory bird species of conservation concern in Pennsylvania. No timbering should be conducted within the core habitat of this site during the breeding season—May through the end of July—of Swainson's thrush.

Sugar Run CA

This site, located within the Allegheny National Forest, has been designated around sections of headwater stream and adjacent riparian forest habitat that supports populations of 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 and more information on this site can be found on page 70.

West Branch Tunungwant Creek CA

The stream sections within the core habitat of the West Branch Tunungwant Creek Conservation Area supports a population of **American brook lamprey** (*Lampetra appendix*), a species currently under consideration for listing as rare by the Pennsylvania Biological Survey. Other fish species observed within this site include blacknose dace (*Rhinichthys atratulus*), creek chub (*Semotilus atromaculatus*), white sucker (*Catostomus commersoni*), mottled sculpin (*Cottus bairdi*), and four species of darter (*Etheostoma* spp.) – indicator species for a coolwater stream community within the Ohio-Great Lakes Basins in Pennsylvania (Walsh et al. 2007b). This community type occurs in small to medium-sized streams at moderate to high elevations, and typically has a neutral pH (~7.0; Walsh et al. 2007b). Fish occurring within the coolwater stream community are habitat generalists and somewhat pollution tolerant.

The supporting landscape extends upstream for five kilometers from the boundary of the core habitat, and captures the viewshed of the core habitat and the riparian zone of the main stem of the creek, plus tributaries and their riparian zones.

American brook lamprey (*Lampetra appendix*)
Photo source: Western Pennsylvania Conservancy

The American brook lamprey requires cool, clear water and inhabits large creeks and small to medium rivers where adults can be found in riffles with a gravel or sand substrate, while juveniles inhabit sandy or silty pools (Page and Burr 1991). This species has a complex life cycle that includes an extended larval stage before transformation into an adult stage. Eggs 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. The adult does not feed, and immediately begins spawning, with death following shortly thereafter (NatureServe 2007).

Threats and Stresses

As with all aquatic species, maintaining suitable stream habitat is key to the continued success of American brook lamprey. Runoff from roads in close proximity to streams can contribute to physical degradation of stream channels, erosion, and sediment pollution in streams. Loss of forest cover within the riparian zone will likely result in physical degradation of the stream channels, erosion, and sediment pollution in the streams, higher water temperatures, and disruption of natural nutrient cycling linked to the streams. If forest cover is substantially reduced within the watershed, water quality is likely to decline from increased sediment loads, potentially to the loss of these species. 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, road construction, and oil and gas 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 watershed is not as closely linked to the stream ecosystem 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 ecosystem. Landowners engaged in timber harvesting within the watershed can refer to *Best Management Practices for Pennsylvania Forests*, a brochure available online (http://pubs.cas.psu.edu/FreePubs/pdfs/uh090.pdf) or through Penn State, for guidelines aimed at minimizing impacts due to timber harvesting.

CERES TOWNSHIP

	PNDI Rank*		State Legal Status*	Last Observed	Quality*
	Global	State			
NATURAL HERITAGE AREAS:					
Oswayo Creek Conservation Area	*Exceptional Significance*				
Elktoe mussel (*Alasmidonta marginata*)	G4	S4	N	1992	E
Ohio lamprey (*Ichthyomyzon bdellium*)	G3G4	S2S3	PC	2005	E
Round pigtoe mussel (*Pleurobema sintoxia*)	G4	S2	PE	1992	E
Wavy-rayed lampmussel (*Lampsilis fasciola*)	G4	S4	N	1992	E

*Please refer to Appendix III (pg. 163) for an explanation of Element Ranks, Legal Status, and Quality Ranks.

McKean County
Natural Heritage Inventory

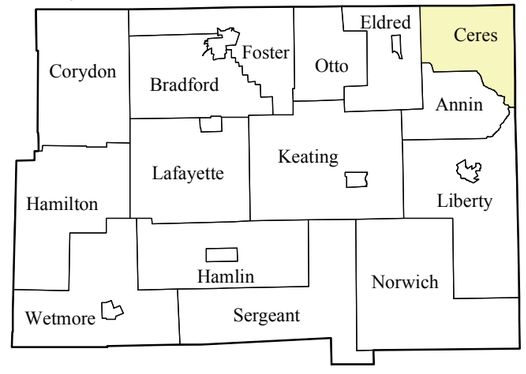
Ceres Township

Conservation Areas:
Oswayo Creek

Landscape Conservation Areas:
none

Public Lands:
State Game Lands 59

County Overview



Conservation Area (CA)
- Core Habitat
- Supporting Landscape

PNHP
Pennsylvania Natural Heritage Program

Other Areas
- Landscape Conservation Area (LCA)
- Allegheny National Forest
- State Lands
- 40 ft. Contour Interval

Scale 1:50,000
0 0.5 1 2 Kilometers
0 0.25 0.5 1 1.5 Miles

CERES TOWNSHIP

Ceres Township forms the northeast corner of McKean County, bordering Potter County to the east and New York State to the north. Located entirely within the watershed of the Allegheny River, the township is primarily drained by Oswayo Creek, Bell Run, and King Run. Oswayo Creek marks the glacial boundary within McKean County; approximately 20,000 years ago, the small corner of McKean County north of Oswayo Creek was covered by the Wisconsin glaciation. During that time, the Allegheny River was blocked by ice and many of the valleys in Ceres Township were partly filled with outwash from the surrounding slopes (Churchill 1987).

Oswayo Creek CA

This Conservation Area is delineated around a section of Oswayo Creek that supports populations of **round pigtoe mussel** (*Pleurobema sintoxia*), **wavy-rayed lampmussel** (*Lampsilis fasciola*), **elktoe mussel** (*Alasmidonta marginata*), and **Ohio lamprey** (*Ichthyomyzon bdellium*). Round pigtoe is a Pennsylvania-endangered freshwater mussel 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 (NatureServe 2007). The wavy-rayed lampmussel and elktoe mussel are not currently listed, but populations are tracked in the state. The Ohio lamprey, a fish species under consideration by the Pennsylvania Biological Survey to be listed as rare in the state, is found in the Ohio River basin from southwestern New York to Indiana and Alabama.

Oswayo Creek
photo source: Western Pennsylvania Conservancy

The main channel of Oswayo Creek is about 15-20 meters wide with pools up to two meters or more in depth. 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*).

Other fish species observed within this site include greenside darter (*Etheostoma blennioides*), river chub (*Nocomis micropogon*), bluntnose minnow (*Pimephales notatus*), rosyface shiner (*Notropis rubellus*), and five other species of darter (*Etheostoma* spp., *Percina maculata*) – indicators species for a warmwater stream community within the Ohio-Great Lakes Basins in Pennsylvania (Walsh et al. 2007b). This community type occurs in medium to large watersheds. On the Allegheny Plateau, this community type can be found in streams at relatively high elevations and with intermediate alkalinity (79 mg/l) and conductivity (375 µS/cm) values and slightly basic pH values (~ 7.4) relative to the waters that other communities inhabit (Walsh et al. 2007b). Warm water temperatures are also characteristic of this community group. Fish occurring within the warmwater stream community are habitat generalists and have higher thermal tolerances than those fish found in cold and coolwater communities (Walsh et al. 2007b).

The supporting landscape extends upstream for five kilometers from the boundary of the core habitat, and captures the viewshed of the core habitat and the riparian zone of the main stem of the creek, plus tributaries and their riparian zones

Freshwater mussels, primarily found in streams, are filter feeders that spend their adult lives in the substrate of stream or lake bottoms. Movement is accomplished either by means of a muscular foot or flood currents. A mussel filters oxygen and particulate matter from the water column by continuously siphoning water through its body. They feed on suspended organic matter, including detritus and plankton. Mussels have a rather complex life cycle involving four stages. The cycle begins when males release sperm into the water column. As the sperm passively drifts with the current, it may enter females when they are siphoning and consequently fertilize their eggs. During the second stage, the fertilized eggs develop into larvae called glochidia. The glochidia are microscopic and are held in the female's gills for future release into the water column. They must attach to the gills or fins of a suitable host fish in order to survive once the female releases them. Once a glochidium attaches to a host, it remains for a period of days or months, depending upon the species, as it transforms into a juvenile mussel. Following the transformation, the juvenile releases from the host and sinks to the stream bottom. If the juvenile is lucky, it lands in suitable substrate where it feeds and grows into an adult (Cordeiro and Bowers-Altman [no date]). Because mussels are dependent upon good water quality and physical habitat conditions and an environment that will support populations of host fish, they are considered good indicators of the health of aquatic ecosystems.

wavy-rayed lampmussel (*Lampsilis fasciola*)
photo source: Western Pennsylvania Conservancy

The Ohio lamprey is a fish that primarily inhabits clean, moderate to large streams of the Upper Allegheny River system. They have a complex life cycle that includes an extended larval stage before transformation into an adult stage. Eggs are laid in depressions among gravel and rocks. Once the larvae hatch, they burrow into beds of mixed sand and organic debris in pools and backwaters, where they feed on particulate plant and animal matter. The larval stage may last from five to seven years. During the transformation to adult stage, the larvae develop a complete digestive tract and a toothed mouth disc. The young, still immature lamprey then disperse downstream into larger waters, where they attach themselves to suckers, bass, walleye and other fishes. After feeding and growing for another year, the fully-grown, sexually mature adults then return upstream to spawning sites (PA DCNR no date [c]).

Threats and Stresses

As with all aquatic species, 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 stream channels, erosion, and sediment pollution in streams. Loss of forest cover within the core areas would likely result in physical degradation of the stream channels, erosion, and sediment pollution in the streams, higher 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 and may lead to species loss. 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 (see page 43 for a discussion of how riparian buffers function to protect water quality). Timbering, road construction, and oil and gas 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 *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.

Freshwater Mussel Conservation

(*Source: Walsh et al. 2007b)*

Freshwater mussels are generally indicative of habitat types that are rare in the Commonwealth. Mussel species are typically found in watersheds at least 75 km^2 (29 mi^2) in size that are drained by medium or large sized streams. Mussel richness generally increases with increasing watershed size (Strayer and Jirka 1997), so the largest rivers in Pennsylvania, like the Ohio, Allegheny, Susquehanna, and Delaware Rivers tend to have the most species-rich mussel communities. Large streams and rivers of good quality without major habitat alterations are becoming increasingly rare.

Water quality threats to mussels include toxic and organic compounds released from industrial and municipal point sources. In recent decades, regulations of gross point source discharges have sufficiently improved water quality and allowed mussels to re-colonize some streams and rivers (Strayer and Jirka 1997). Non-point source pollution contributed from large areas, like farms and cities, can also threaten water quality for mussels. Agricultural practices can vary greatly, as can their influences on mussel communities. In many instances, mussels are seemingly undisturbed, compared to other aquatic organisms, by agricultural pollution. But excessive sedimentation and habitat alteration from agricultural practices can also be detrimental to mussel communities. Runoff from urban and suburban developments appears to be more damaging to mussels, most likely due to combined effects of altered hydrology, excess sediment and nutrients, and warm water temperatures (Strayer and Jirka 1997).

Dams impact mussel communities through hydrologic alteration, disrupted connectivity, habitat alteration, and changes in thermal properties. Dams restrict the movement of host fish and thus glochidia (larval mussels) carried by their hosts are similarly restricted in distribution. Alterations in the stream channel above and below the dam may potentially alter available habitat for mussel communities. Water quality and temperature can be largely altered in a reservoir. Impoundment management and drawdown plans can be important for maintaining mussel communities.

Mussel habitat requirements are not well known. Protecting habitats where mussels are currently occurring is a first step to ensuring the long-term mussel resource. Protection from major channel alteration by bridges, dams, dredging is important for maintaining habitat. Preventing excessive amounts of sediments, nutrients, and toxins in streams and rivers will maintain good water quality to support healthy mussel communities. Adopting zoning, stormwater detention ordinances, and natural resource protection ordinances will help protect mussel resources. Reducing the effects of urbanization through control of quantity and quality of stormwater will also help protect these habitats.

Many experts believe that effective aquatic conservation will result only from the protection of ecological and evolutionary contexts, which they equate with biological organization above the level of individual species (e.g. Angermeier and Schlosser 1995). Targeting biological communities is a proactive approach to biodiversity conservation because it protects whole assemblages of species before any single species declines into imperilment. All species are protected: the common, the rare, and those not yet known (Higgins et al. 1998). Pennsylvania is fortunate to harbor many inland freshwater mussel taxa that are globally rare. By conserving the processes that support these species, we are better able to conserve the species. Thus, it is important to protect examples of each mussel community and protect watersheds that contain rich mussel populations to effectively protect the biodiversity of the state, and the nation.

CORYDON TOWNSHIP

	PNDI Rank*		State Legal Status*	Last Observed	Quality*
	Global	State			
NATURAL HERITAGE AREAS:					
Coffey Run Conservation Area			*High Significance*		
Swainson's thrush (*Catharus ustulatus*)	G5	S2S3B	CR	1994	E
Klondike Upland Conservation Area			*High Significance*		
Sensitive species of concern 6	-	-	-	2001	E
Sugar Bay Conservation Area			*High Significance*		
Osprey (*Pandion haliaetus*)	G5	S2B	PT	2005	E
Sugar Run Conservation Area			*High Significance*		
Northern water shrew (*Sorex palustris albibarbis*)	G5T5	S3	CR	2005	E
Sugar Run Mouth Conservation Area			*High Significance*		
Ski-tailed emerald dragonfly (*Somatochlora elongate*)	G5	S2	-	1994	E
Superb jewelwing damselfly (*Calopteryx amata*)	G4	S2S3	-	1994	E
Whitney Run Conservation Area			*High Significance*		
Northern water shrew (*Sorex palustris albibarbis*)	G5T5	S3	CR	2005	E
Willow Bay Conservation Area			*High Significance*		
Osprey (*Pandion haliaetus*)	G5	S2B	PT	2005	E

*Please refer to Appendix III (pg. 163) for an explanation of Element Ranks, Legal Status, and Quality Ranks.

McKean County
Natural Heritage Inventory

Corydon Township

Conservation Areas:

- Coffey Run
- Klondike Upland
- Sugar Bay
- Sugar Run
- Sugar Run Mouth
- Whitney Run
- Willow Bay

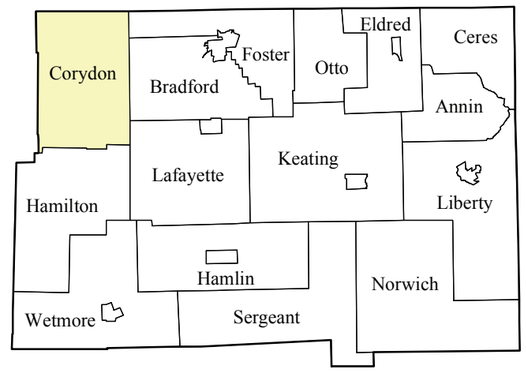
Landscape Conservation Areas:

- State Line
- Stickney
- Tracy Ridge

Public Lands:

- Allegheny National Forest

County Overview



Conservation Area (CA)

- Core Habitat
- Supporting Landscape

Other Areas

- Landscape Conservation Area (LCA)
- Allegheny National Forest
- State Lands
- 40 ft. Contour Interval

Pennsylvania Natural Heritage Program

Scale 1:60,000
0 0.5 1 2 3 Kilometers
0 0.5 1 2 Miles

CORYDON TOWNSHIP

Corydon Township forms the northwestern corner of McKean County, where it lies along the boundary between Pennsylvania and New York, and borders Warren County to the west. It lies entirely within the proclamation boundary of the Allegheny National Forest, with private landholdings accounting for only 11 percent of the land ownership in the township. Roughly 93 percent of Corydon Township is forested, making it the most heavily forested township in the county.

Coffey Run CA

This Conservation Area, encompassing hemlock-dominated riparian forest along Coffey Run, supports a breeding pair of **Swainson's thrush** (*Catharus ustulatus*), a species of conservation concern in Pennsylvania. The Swainson's thrush is a neo-tropical migratory bird species that is associated with coniferous forests. It breeds in eastern and central North America from Canada south to the Allegheny High Plateau of northern Pennsylvania, and over-winters in mature tropical forests of Central and South America. In Pennsylvania, this species is considered to be an imperiled species and is a rare nester in several northern counties at the edge of the species' breeding range (Brauning 1992).

Coffey Run, Corydon Township
Photo source: Jim Clark

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 this decline are unclear. Swainson's thrush is prone to collisions with tall buildings and towers during migration and is sensitive to human activity near nesting sites. This species is also considered to be 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, one study 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 (Holmes and Sherry 1988).

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 hemlock woolly adelgid has been documented in 49 counties in Pennsylvania, and while known to be in Elk County it has not yet reached McKean County. 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 CA 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 post-logging (Evans Mack and Yong 2000).

Conservation Recommendations

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 the core habitat of this site during the breeding season—May through the end of July—of Swainson's thrush. Only silvicultural treatments that maintain at least a partial canopy and enhance structure in the understory should be undertaken within this site.

Klondike Upland CA

The mature northern hardwood forest within this site provides habitat for **sensitive species of concern 6**, a species of conservation concern in Pennsylvania. In general, sensitive species of concern 6 prefers coniferous and mixed forest, but will also utilize deciduous woods and riparian woods. Optimal habitat has been reported to be the cool, moist, mature forest of higher elevations. Such areas usually possess a well-developed canopy, substantial ground cover, quantities of wet, dead, and downed wood, and often organic substrates. These conditions favor an abundance of snags, cavities, witches brooms, trees festooned with lichens and moss, and a diverse array of buds, berries, seeds, and fungi. This species is often most abundant near swamps or streams. It utilizes mature trees for many stages in its life-cycle. The diet of this species is somewhat unusual in that it consists largely of fungi and lichens, which this species can subsist on for extended periods. Insects, nuts, buds, seeds, fruit are also an import supplement to its diet (NatureServe 2007).

Threats and Stresses

The major threats faced by sensitive species of concern 6 result from human activities such as timber harvesting and any type of development that destroys extensive tracts of habitat. The size and condition of forest habitat is critical to the success of this species. Successional and regenerating forest communities require considerable time to develop into habitats of sufficient quality to support this species. This species is also vulnerable to impacts from habitat fragmentation by roads, power lines, and pipelines. A two-lane road in North Carolina has been documented as acting as an effective barrier to the movement of this species. Additionally, roads can serve as hunting patrol routes for predators such as bobcats, coyotes, foxes, hawks, and owls, resulting in increased mortality of prey species such as sensitive species of concern 6.

Within this site, oil and gas development, with its accompanying canopy removal and road development, poses a direct threat to the species of concern.

Conservation Recommendations

The core of this site is located within the Allegheny National Forest, in a Management Area designated for even-age timber management. Timber harvesting should be avoided completely within the core habitat area and harvesting within the supporting landscape should take into account potential impacts to sensitive species of concern 6. Oil and gas development should not encroach on the core habitat area.

osprey
Photo source: US Fish and Wildlife Service

Sugar Bay CA

Willow Bay CA

These Conservation Areas, located within the Allegheny Reservoir, support several nesting pairs of **osprey** (*Pandion haliaetus*), a state threatened species. The Allegheny Reservoir, also known as Kinzua Lake, is a 12,000-acre impoundment that spans the border between Pennsylvania and New York. In Pennsylvania, the reservoir is completely surrounded by the Allegheny National Forest; and in New York State by Allegany State Park and the Allegany Indian Reservation of the Seneca Nation. The landscape surrounding the reservoir is entirely forested.

The osprey is a Neotropical migrant bird species with a range that is widespread and increasing. Its main breeding range extends from northern Canada south to the Great Lakes states and along Atlantic and Gulf Coasts to Florida. More scattered populations breed along inland rivers and lakes. The species is considered imperiled within the state, although its population may be increasing due in part to active management by the Pennsylvania Game Commission. Habitat requirements for osprey vary between sites, but must include an adequate supply of accessible live fish within commuting distance of nest (10–20 km); shallow waters (0.5–2 meters deep) which generally provide the most accessible fish; and open nest sites free from predators (Poole et al. 2002). Reservoirs

that provide ample expanses of shallow, clear water have ideal conditions for hunting. Like other fish-eating birds, osprey generally defend only nest sites, not feeding territories. See the osprey fact sheet on page 180 for more information on this species.

Threats and Stresses

Any factor that would decrease water quality of the lake would impact the nesting ospreys. Non-point source pollution from agricultural development upslope from the lake and timber harvesting within forested areas along the lake are the greatest threats to water quality. Acid precipitation may affect fauna residing in the lake.

At the national level, osprey are recovering in many areas following severe declines resulting from organochlorine biocide (e.g. DDT) use. However, organochlorines and other contaminants are still contributing to eggshell thinning and low hatching success in some populations (Steidl et al. 1991). General threats to osprey include death by gunshot, steel traps, impact with, or electrocution by, high-tension wires, and being caught or drowned in nets (Wiemeyer et al. 1980, cited in Henny and Anthony 1989).

Conservation Recommendations

Forest cover in the immediate watershed surrounding the lake should be left intact because alterations in light levels and temperature along the perimeter of the lake could alter the hydrology of the site. Fishing is the primary recreational activity at Allegheny Reservoir and boats with motors are permitted. Human disturbance near the nest platform should be kept to a minimum during the nesting period (months of June and July) when Ospreys are most sensitive to intrusions. Tolerance levels of human activity near nests are too variable for guidelines to be broadly applied. Biologists with the Allegheny National Forest are aware of the Osprey nests and monitor them annually.

Sugar Run Mouth CA

The section of Sugar Run within this Conservation Area serves as habitat for at least two species of rare, river-breeding odonates: **ski-tailed emerald** (*Somatochlora elongata*) and **superb jewelwing** (*Calopteryx amata*). Within the core of this site, which begins approximately 0.5 kilometers upstream of the slack-water of Allegheny Reservoir, Sugar Run is a small, medium to high gradient, cold water stream with an average width of eight meters. The stream habitat consists of riffles and runs with occasional pools. The substrate is a mixture of sand, medium to coarse gravel, cobbles, and scattered boulders.

Ski-tailed Emerald Dragonfly
Photo source: Jerry McWilliams

The supporting landscape extends for five kilometers from the upstream boundary of the core of the site, and captures the forested slopes that drain into the main stem of the creek within the core habitat, plus tributaries and their riparian zones.

Dragonflies, as with other members of the order Odonata, have three stages in their life cycle: egg, nymph, and adult. Odonates oviposit their eggs in or near water. The species occurring within this Conservation Area are river-breeding odonates that utilize clear, rapid, rocky streams and rivers with silt-bottomed pools. After the eggs hatch, the nymphs remain in the water through several instars (stages between successive molts of the exoskeleton), feeding on small aquatic organisms until they eventually emerge from the water as terrestrial adults.

Threats and Stresses

As with all aquatic species, 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 stream

channels and erosion and sediment pollution in streams. Loss of forest cover within the core areas would likely result in physical degradation of the stream channels, erosion and sediment pollution in the streams, higher 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, road construction, and oil and gas 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.

Sugar Run CA

Whitney Run CA

These sites, both located within the Allegheny National Forest, have been designated around sections of headwater stream and adjacent riparian forest habitat that supports populations of 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 rosebay (*Rhododendron maximum*; Merritt 1987). This species requires high quality water and abundant cover such as rocks, logs, or overhanging stream banks. Water shrews, voracious predators primarily of aquatic macroinvertebrates, have an extremely high metabolic rate and must feed frequently.

The section of Sugar Run that lies within the Conservation Area is a moderately small, forested stream that flows over rock and cobblestone. Eastern hemlock (*Tsuga canadensis*), yellow birch (*Betula alleghaniensis*), black cherry (*Prunus serotina*), and red maple (*Acer rubrum*) make up the canopy of the riparian forest within the core of this site. Rosebay (*Rhododendron maxima*) dominates the shrub layer. Plants found in the herbaceous layer of the riparian forest include partridgeberry (*Mitchella repens*), hay-scented fern (*Dennstaedtia punctilobula*), evergreen wood fern (*Dryopteris intermedia*), and various grasses sedges. A notable feature of the forest along the stream is the relatively large quantity of downed wood. Other small mammal species captured along the stream include deer mouse (*Peromyscus maniculatus*), rock vole (*Microtus chrotorrhinus*), woodland vole (*Microtus pinetorum*), southern red-backed vole (*Clethrionomys gapperi*), and woodland jumping mouse (*Napaeozapus insignis*).

Typical habitat bordering Sugar Run with abundant dead wood
Photo source: Western Pennsylvania Conservancy

Whitney Run, in the section where the northern water shrew was captured, is a small headwater stream flowing through hemlock – northern hardwood forest with a canopy comprised of American beech (*Fagus grandifolia*), red and sugar maples (*Acer rubrum* and *A. saccharum*), yellow and black birches (*Betula alleghaniensis* and *B. lenta*), and hemlock.

northern water shrew (*Sorex palustris albibarbis*)
photo source: PNHP

The shrub layer and sub-canopy are made up of American beech, witch-hazel (*Hamamelis virginiana*), and serviceberry (*Amelanchier* sp.). The herbaceous layer in made up of evergreen wood fern, New York fern (*Thelypteris noveboracensis*), trillium (*Trillium* sp.), foamflower (*Tiarella cordifolia*), partridgeberry, and several species of violet (*Viola* spp.). In addition to northern water shrew, eight other species of small mammals were captured along Whitney Run, including: pygmy shrew (*Sorex hoyi*); smoky shrew (*Sorex fumeus*); northern short-tailed shrew (*Blarina brevicauda*); deer mouse; white-footed mouse (*Peromyscus leucopus*); southern red-backed vole; and southern bog lemming (*Synaptomys cooperi*).

The core habitat areas of the sites include the portion of stream where the presence of the northern water shrew was documented, plus a 150-meter buffer designed to capture critical streamside habitat. The supporting landscape provides an additional 350-meter buffer of contiguous forest needed to protect the water quality of the stream.

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 hemlock woolly adelgid has been documented in 49 counties in Pennsylvania, is beginning to invade the High Allegheny Plateau (such as Elk and Cameron Counties). This insect pest can result in high levels of mortality of hemlock trees, which are an important component of the northern water shrew's habitat.

Conservation Recommendations

Land managers are aware of the presence of the northern water shrew along both Sugar Run and Whitney Run. In addition, the Allegheny National Forest Management Plan calls for protection of riparian zones. Periodic monitoring for 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.

ELDRED TOWNSHIP & ELDRED BOROUGH

	PNDI Rank*		State Legal Status*	Last Observed	Quality*
	Global	State			
NATURAL HERITAGE AREAS:					
Allegheny River at Larabee Conservation Area			*High Significance*		
Blue-tipped dancer damselfly (*Argia tibialis*)	G5	S1	-	2003	E
Elktoe mussel (*Alasmidonta marginata*)	G4	S4	N	1992	E
Long dash butterfly (*Polites mystic*)	G5	S3	-	2003	E
Bullis Mills Conservation Area			*High Significance*		
Sensitive species of concern 7	-	-	-	2005	E
Wilson's snipe (*Gallinago delicata*)	G5	S3B	CR	2005	E
Coryville Railroad Grade Conservation Area			*High Significance*		
Stalked bulrush (*Scirpus pedicellatus*)	G4	S1	PT	2006	BC
Indian Crossing Swamp Conservation Area			*Exceptional Significance*		
Black ash – balsam fir swamp natural community	GNR	S1	-	2007	E
Downy willow-herb (*Epilobium strictum*)	G5?	S3	PE	2002	C
Sensitive species of concern 8	-	-	-	2007	E
Stalked bulrush (*Scirpus pedicellatus*)	G4	S1	PT	2002	B
Wilson's snipe (*Gallinago delicata*)	G5	S3B	CR	2005	E
Lower Knapp Creek Conservation Area			*High Significance*		
American brook lamprey (*Lampetra appendix*)	G4	S3	CP	2007	E
Leonard's skipper butterfly (*Hesperia leonardus*)	G4	S3S4	PE	2005	E

*Please refer to Appendix III (pg. 163) for an explanation of Element Ranks, Legal Status, and Quality Ranks.

McKean County
Natural Heritage Inventory

Eldred Township
&
Eldred Borough

Conservation Areas:

Allegheny River at Larabee
Bullis Mills
Coryville Railroad Grade
Indian Crossing Swamp
Lower Knapp Creek

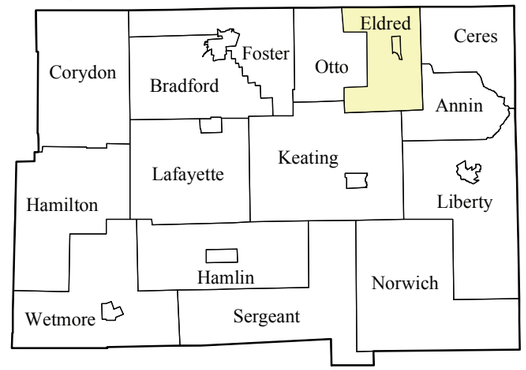
Landscape Conservation Areas:

Allegheny Wetland Complex
Upper Allegheny River

Public Lands:

State Game Land 301

County Overview



Conservation Area (CA)

Core Habitat
Supporting Landscape

PNHP
Pennsylvania Natural Heritage Program

Other Areas

Landscape Conservation Area (LCA)
Allegheny National Forest
State Lands
40 ft. Contour Interval

ELDRED TOWNSHIP & ELDRED BOROUGH

Eldred Township is located in the northeast region of McKean County, where it lies along the boundary between Pennsylvania and New York, bordering Ceres and Annin Townships to the east and Foster Township to the west. The Allegheny River flows through the center of the township, bisecting it along a north-south axis. Approximately 80 percent of Eldred Township is forest and wetland, with 64 percent of that being interior habitat. Slightly over 17 percent of the township lies within the large wetland complex along the Allegheny River.

Eldred Borough, located along the Allegheny River just upstream of its confluence with Knapp Creek, lies within the boundaries of Eldred Township. No Conservation Areas were delineated within Eldred Borough, but it does partially lie within the Allegheny Wetland Complex Landscape Conservation Area. An important issue related to the ecological health of the lands within the borough is appropriate management of storm-water and sewage to minimize impacts to area waterways.

elktoe mussel (*Alasmidonta marginata*)
photo source: Western Pennsylvania Conservancy

Allegheny River at Larabee CA

This site is designated around aquatic habitat that supports a mussel, **elktoe mussel** (*Alasmidonta marginata*), a damselfly, **blue-tipped dancer** (*Argia tibialis*), and a butterfly, **long dash** (*Polites mystic*).

Freshwater mussels, such as the elktoe, are filter feeders that spend their adult lives in the substrate of stream or lake bottoms. They feed on suspended organic matter, including detritus and plankton. Because mussels are dependent upon good water quality and physical habitat conditions and an environment that will support populations of host fish, they are considered good indicators of the health of aquatic ecosystems. See page 63 for additional information on freshwater mussel conservation.

The blue-tipped dancer and long dash are dependent on the intact riparian wetlands present in at this site. These wetlands, in turn, are dependent upon the free-flowing high-quality river at this site to provide them with clean water and on occasion renew the ecological succession process and open new areas to colonization.

Threats and Stresses

Two of these species are dependent upon high-quality stream habitat for their continued success and are particularly vulnerable to siltation within riffle and run habitats. The third species is dependent on the riparian habitat supported by the high-quality stream. Runoff from dirt and gravel roads in close proximity to streams can contribute to physical degradation of stream channels, erosion, and pollution of in the streams. Loss of forest cover within riparian zones may also result in increased water temperatures and disruption of natural nutrient cycling linked to streams. Removal of forest cover on steep slopes is especially problematic because of the potential for increased runoff and erosion following storm events.

blue-tipped dancer (*Argia tibialis*)
photo source: Jerry McWilliams

Conservation Recommendations

Preserving forested stream corridors is key to maintaining high water quality (see page 43 for a discussion of how riparian buffers function to protect water quality). Timbering, road construction, and oil and gas 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 (http://pubs.cas.psu.edu/FreePubs/pdfs/uh090.pdf) or through Penn State, for guidelines aimed at minimizing impacts due to timber harvesting.

Bullis Mills CA

The core of this Conservation Area is delineated around an area of forest, scrub-shrub, and graminoid-dominated marsh within the large wetland complex adjacent to the Allegheny River that provides habitat for **sensitive species of concern 7** and **Wilson's snipe** (*Gallinago delicata*), an animal species of conservation concern in Pennsylvania.

Wilson's Snipe
Photo Source: David Ward, USFWS

Sensitive species of concern 7 needs tall trees or cliffs near large bodies of water, and the same site may be used year after year or the species may alternate between two sites in successive years. This species feeds opportunistically on fishes, injured waterfowl and seabirds, various mammals, and carrion (NatureServe 2007).

Wilson's snipe are rare, generally irregular breeding birds in a variety of wetland habitats across Pennsylvania (McWilliams and Brauning 2000). The species breeds in sedge bogs, fens, willow (*Salix* spp.) and alder (*Alnus* spp.) swamps, and marshy edges of ponds, rivers, and brooks. It requires soft organic soil rich in food organisms just below surface, with clumps of vegetation offering both cover and a good view of approaching predators. It avoids marshes with tall, dense vegetation (cattails [*Typha*], reeds [*Phragmites*], etc.; Tuck 1972, cited in Mueller 1999). To forage for food, the snipe probes in soil with its long bill, and swallows small prey without withdrawing its bill from the soil (Mueller 1999). The Wilson's snipe builds its nest on the ground, concealing it in grass, sedge, or sphagnum moss. The female typically lays four eggs and incubates the eggs without assistance from the male. The chicks leave the nest soon after hatching – the first two hatchlings leave with the male adult and the female takes the final two hatchlings. No more contact occurs between the adults past this point (Mueller 1999).

Threats and Stresses

Major threats to sensitive species of concern 7 include disturbance by humans, pesticide contamination, habitat loss, decreasing food supply, and illegal shooting. This species is susceptible to the concentration of toxic chemicals from lower trophic level and is vulnerable to accumulated toxins. This vulnerability was demonstrated by the dramatic decline in its numbers following the widespread use of the pesticide DDT, an organochlorine, after World War II. Human intrusion, particularly during the period between breeding and the maturing of the young, can have a negative impact. This species generally shows a high degree of adaptability and tolerance if the human activity is not directed toward them. However, chronic disturbance results in the disuse of areas by sensitive species of concern 7 (NatureServe 2007).

Conservation Recommendations

Human intrusion and disturbance should be avoided in both the core habitat and supporting landscape between 1 January to 31 August, and timber harvesting, road building, and other habitat-altering activities should not take place in the core habitat area during any time of the year.

Coryville Railroad Grade CA

This Conservation Area is discussed in detail under Keating Township (page 102). It is designated around a portion of the large wetland complex along the Allegheny River that provides habitat for **stalked bulrush** (*Scirpus pedicellatus*), a plant species of concern. Any alterations to the hydrology of the river or the wetland should be avoided within this region of the county.

Indian Crossing Swamp CA

This site, covering 71 acres adjacent to the Lower Knapp Creek Conservation Area, is part of an extensive wetland complex, fed in part by springs and seeps, that drains into Knapp Creek and the Allegheny River. A portion of the wetland complex within this site is a mosaic of **black ask – balsam fir swamp**, with scattered shrub- and graminoid-dominated openings and ponded water that provides habitat for two plant species of special concern: **downy willow-herb** (*Epilobium strictum*) and **stalked bulrush** (*Scirpus pedicellatus*), **Wilson's snipe** (*Gallinago delicata*), an animal species of concern, and **sensitive species of concern 8**.

Graminoid-dominated opening in the black ash – balsam fir swamp.

Photo source: Nick Champlin

The black ask – balsam fir swamp is a unique natural community both within Pennsylvania and within North America. Aside from this site, the black ask – balsam fir swamp community type is only known to occur within a single high-elevation headwater basin in Tucker County, West Virginia (NatureServe 2007). The soils within the site are likely derived from glacial outwash, thus this rich swamp provides rare habitat for shade-tolerant calciphile wetland species. The canopy varies from open to closed and is dominated by stunted, inundation-stressed black ash (*Fraxinus nigra*), balsam fir (*Abies balsamea*), and eastern hemlock (*Tsuga canadensis*). Speckled alder (*Alnus incana*) with locally abundant winterberry holly (*Ilex verticillata*) and silky dogwood (*Cornus amomum*) dominate the shrub layer. A small population of downy willow-herb occurs within a saturated opening dominated by cattail (*Typha latifolia*), rice cutgrass (*Leersia oryzoides*), and wood reedgrass (*Cinna arundinacea*). Stalked bulrush was found growing in herbaceous openings along with cattail, spreading goldenrod (*Solidago patula*), spotted joe-pye-weed (*Eupatorium maculatum*), boneset (*Eupatorium perfoliatum*), whitegrass (*Leersia virginica*), southern arrow-wood (*Viburnum dentatum*), and winterberry holly. Sensitive species of concern 8 was found under fairly dense canopy in a mucky transition zone between slightly elevated, drier hemlock forest and a hemlock - black ash dominated portion of the swamp.

Stalked bulrush, a member of the large Cyperaceae (Sedge) family, is a grass-like plant usually found growing in lowland marshes in stream valleys, edges of bogs, boggy meadows, and wet sandy shorelines (FNA 2003). Its range extends from Newfoundland south to Kentucky and west to Missouri (NatureServe 2006). In Pennsylvania, this species has been documented in the northwestern counties of Forest, McKean, Potter, Venango, and Warren (NatureServe 2007). *Scirpus pedicellatus* is very similar in appearance to one of its most common congeners, woolgrass (*Scirpus cyperinus*), a species it can hybridize with (FNA 2003).

Threats and Stresses

The westward migration of the hemlock wooly adelgid (*Adelges tsugae*), currently documented in 49 counties in the eastern two-thirds of Pennsylvania including Elk and Cameron (PA Bureau of Forestry 2006), poses a potential threat to the hemlock trees in the region. The hemlock wooly 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 exposing the forest floor to full sunlight.

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 all the plant species of concern within the site, as they are best adapted to cooler, more northern climates. Any changes in the environment that raise or lower the water table may adversely affect the plant species within the site.

Over-browsing by white-tailed deer has eliminated the tree seedling, sapling, shrub layers, and greatly reduced herbaceous species diversity in large areas of forest in Pennsylvania. Excessive deer herbivory 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). The longer over-browsing occurs, the more difficult it becomes to restore the original vegetation, in part because seeds and other propagules supplies have been greatly reduced or eliminated (Latham et al. 2005). Sparse tree regeneration within this site suggests that over-browsing has occurred up until recently.

Black ash-dominated area of the black ash – balsam fir swamp.
Photo source: Western Pennsylvania Conservancy

Conservation Recommendations

The rare plants and natural community occurring in this Conservation Area face no imminent threats. Much of the site is located within State Game Land 301, and the land manager is fully aware of the uniqueness of the forest community. Deer numbers are currently being brought back into balance with the habitat through management implemented by the PGC.

Activities such as road development and timber harvesting should be avoided in the vicinity of the wetland. However, if such activities cannot be eliminated, the use of Best Management Practices (BMPs) can prevent or minimize the impact of these activities on the wetland habitat. Periodic monitoring for hemlock wooly adelgid is recommended, as well as further surveys to document amphibian and insect species utilizing the swamp.

Lower Knapp Creek CA

This Conservation Area encompasses a section of Knapp Creek and its associated riparian forest provides habitat for two animal species of concern: **American brook lamprey** (*Lampetra appendix*) and **Leonard's skipper butterfly** (*Hesperia leonardus*).

The American brook lamprey requires cool, clear water and inhabits large creeks and small to medium rivers. It has a complex life cycle that includes an extended larval stage before transformation into an adult stage. Eggs are laid in nests in riffles and runs with a gravel/sand substrate and a strong current. Once the larvae hatch, they burrow into sand and silt, often 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. The adult does not feed, and immediately begins spawning, with death following shortly thereafter (NatureServe 2007).

Butterflies undergo four stages in their life cycle: egg, caterpillar, pupa, and adult. Once an adult female has mated, she seeks out the species of host plant appropriate for her species on which to lay her fertilized eggs. Most species lay their eggs on a plant that the newly hatched caterpillar will eat. When an egg hatches, a small caterpillar emerges and spends all its time eating and growing. As a caterpillar grows, it sheds its exoskeleton – usually three or four times – over the course of two to three weeks. During the caterpillar stage, the animal is

highly vulnerable to predation by wasps and birds, parasitization by wasps or flies, or infection by fungal or viral pathogens; most caterpillars do not survive to the next stage of development. Once a caterpillar has reached full size, it attaches itself to a support and encases itself in a hard outer shell (chrysalis), and becomes a pupa. While in the pupa stage, the butterfly transforms into an adult. When the adult inside the chrysalis is fully formed, the chrysalis splits and the adult butterfly emerges (Glassberg 1999).

Leonard's Skipper ranges from Nova Scotia and Maine west through southern Ontario and the Great Lakes region to Minnesota, south to North Carolina, Louisiana, and Missouri. Habitat for this species is open grassy areas including native prairies, fields, barrens, and meadows. The caterpillars feed on leaves and live in shelters of tied leaves. The first-stage caterpillar overwinters within its shelter. Various perennial grasses, including little bluestem (*Andropogon scoparius*), blue grama (*Bouteloua gracilis*), and bent grass (*Agrostis* spp.), serve as the caterpillar's host plants. The adults feed from flowers, especially from blazing star (*Liatris punctata*), but also thistles, asters, teasel, and others (Opler et al. 2006).

Leonard's skipper (*Hesperia leonardus*)
Photo: Jerry Williams

Threats and Stresses

The Leonard's skipper faces no apparent threats within this site. The American brook lamprey is dependent on the quality of the habitat, thus any alterations to the water quality or sediment load could potentially impact its continued success here. Runoff from dirt and gravel roads in close proximity to streams can contribute to physical degradation of stream channels, erosion, and pollution of the streams. Loss of forest cover within riparian zones may also result in increased water temperatures and disruption of natural nutrient cycling linked to streams (see page 43 for a discussion of how riparian buffers function to protect water quality).

Conservation Recommendations

Best Management Practices (BMPs) have been developed for a wide range of human activities that pose potential threats to aquatic environments, including Stormwater BMPs, Agricultural BMPs, Forestry BMPs, and Urban Small Sites BMPs. Anyone involved in planning for projects in the Knapp Creek watershed that fall within these categories should incorporate relevant BMPs.

FOSTER TOWNSHIP

	PNDI Rank*		State Legal Status*	Last Observed	Quality*
	Global	State			
NATURAL HERITAGE AREAS:					
Cobb Hollow Upland Conservation Area			*High Significance*		
Swainson's thrush (*Catharus ustulatus*)	G5	S2S3B	CR	2005	E

*Please refer to Appendix III (pg. 163) for an explanation of Element Ranks, Legal Status, and Quality Ranks.

McKean County
Natural Heritage Inventory

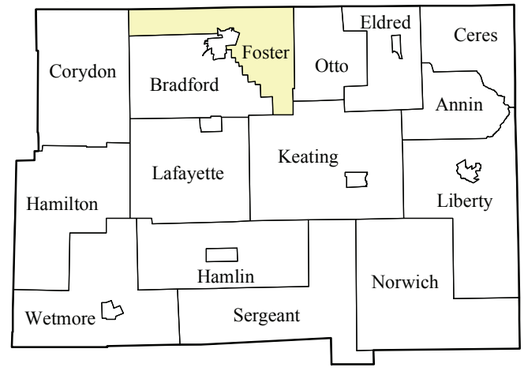
Foster Township

Conservation Areas:
Cobb Hollow Upland

Landscape Conservation Areas:
Potato Creek

Public Lands:
Allegheny National Forest

County Overview



Conservation Area (CA)
- Core Habitat
- Supporting Landscape

Other Areas
- Landscape Conservation Area (LCA)
- Allegheny National Forest
- State Lands
- 40 ft. Contour Interval

Pennsylvania Natural Heritage Program

Scale 1:67,000
0 0.5 1 2 3 Kilometers
0 0.5 1 2 Miles

FOSTER TOWNSHIP

Foster Township lies along the boundary between Pennsylvania and New York and borders Otto Township to the east and Corydon Township to the west. The township is located almost entirely within the Tunungwant Creek watershed. Tunungwant Creek, which flows north, crosses into New York near the town of Limestone. Approximately 85 percent of the township is forested, with 65 percent of that being interior forest.

Cobb Hollow Upland CA

This Conservation Area is designated around an area of mixed hemlock – hardwood forest that supports at least one breeding pair of **Swainson's thrush**, a bird species of special concern in Pennsylvania. The Swainson's thrush is a neo-tropical migratory bird species that is associated with coniferous forests. It breeds in eastern and central North America from Canada south to the Allegheny High Plateau of northern Pennsylvania, and over-winters in mature tropical forests of Central and South America. In Pennsylvania, this species is considered to be an imperiled species and is a rare nester in several northern counties at the edge of the species' 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 this decline are unclear. Swainson's thrush is prone to collisions with tall buildings and towers during migration and is sensitive to human activity near nesting sites. This species is also considered to be 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, one study 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 (Holmes and Sherry 1988).

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 hemlock woolly adelgid has been documented in 49 counties in Pennsylvania, and while known from Elk County it has yet to be found in McKean County. 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 CA 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 post-logging (Evans Mack and Yong 2000).

Hemlock Woolly Adelgid infestation along a hemlock branch.
photo source: Connecticut Agricultural Experiment Station Archive

Conservation Recommendations

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 the core habitat of this site during the breeding season—May through the end of July - Swainson's thrush. Only silvicultural treatments that maintain at least a partial canopy and enhance structure in the understory should be undertaken within this site.

HAMILTON TOWNSHIP

	PNDI Rank*		State Legal Status*	Last Observed	Quality*
	Global	State			
NATURAL HERITAGE AREAS:					
Briggs Run Conservation Area			*Notable Significance*		
Great-spurred violet (*Viola selkirkii*)	G5?	S1	TU	2007	E
Chappel Bay Conservation Area			*High Significance*		
Thread rush (*Juncus filiformis*)	G5	S3	PR	2005	E
Kiasutha Campground Conservation Area			*High Significance*		
Sensitive species of concern 7	-	-	-	2005	E
Kinzua Creek Conservation Area			*Exceptional Significance*		
American brook lamprey (*Lampetra appendix*)	G4	S3	PC	1999	AB
Northern pygmy clubtail dragonfly (*Lanthus parvulus*)	G4	S3S4	-	1994	E
Harpoon clubtail dragonfly (*Gomphus descriptus*)	G4	S1S2	-	1994	E
Maine snaketail dragonfly (*Ophiogomphus mainensis*)	G4	S3	-	1994	E
Ocellated darner dragonfly (*Boyeria grafiana*)	G5	S3	-	2004	E
Superb jewelwing damselfly (*Calopteryx amata*)	G4	S2S3	-	1994	E
Zebra clubtail dragonfly (*Stylurus scudderi*)	G4	S1	-	1994	E
Kinzua Creek below Westline Conservation Area			*Notable Significance*		
Ocellated darner dragonfly (*Boyeria grafiana*)	G5	S3	-	2004	E
Klondike Upland Conservation Area			*High Significance*		
Sensitive species of concern 6	-	-	-	2001	E
Red Bridge Conservation Area			*High Significance*		
Osprey (*Pandion haliaetus*)	G5	S2B	PT	2006	E
Thread rush (*Juncus filiformis*)	G5	S3	PR	2005	E
Swede Hill Conservation Area			*Exceptional Significance*		
Northern pygmy clubtail dragonfly (*Lanthus parvulus*)	G4	S3S4	-	1994	E
Ocellated darner dragonfly (*Boyeria grafiana*)	G5	S3	-	2004	E
Superb jewelwing damselfly (*Calopteryx amata*)	G4	S2S3	-	1994	E

*Please refer to Appendix III (pg. 163) for an explanation of Element Ranks, Legal Status, and Quality Ranks.

McKean County
Natural Heritage Inventory

Hamilton Township

Conservation Areas:

Briggs Run
Chappel Bay
Kiasutha Campground
Kinzua Creek
Kinzua Creek below Westline
Klondike Upland
Red Bridge
Swede Hill

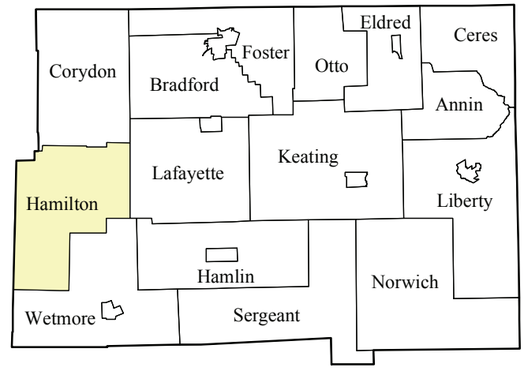
Landscape Conservation Areas:

none

Public Lands:

Allegheny National Forest

County Overview



Conservation Area (CA)

Core Habitat
Supporting Landscape

PNHP
Pennsylvania Natural Heritage Program

Other Areas

Landscape Conservation Area (LCA)
Allegheny National Forest
State Lands
40 ft. Contour Interval

Scale 1:60,000
0 0.5 1 2 Kilometers
0 0.25 0.5 1 1.5 Miles

HAMILTON TOWNSHIP

Hamilton Township, which borders Warren County, encompasses almost 74 square miles of a predominantly forested landscape. The township lies entirely within the proclamation boundary of the Allegheny National Forest, with private landholdings accounting for 38 percent of the land ownership in the township. Oil and gas development is extensive, and is most concentrated in the eastern half of the township.

Briggs Run CA

This Conservation Area above the Chappel Fork supports a population of **great-spurred violet** (*Viola selkirkii*). This species is primarily found on the limestone ledges in the undisturbed forested area of this run.

great-spurred violet (*Viola selkirkii*)
photo source: PNHP

Threats and Stresses

Populations of great-spurred violet are generally small and localized because of the species narrow habitat requirements. Any changes in the environment that expose the limestone ledges or remove the forest cover would be expected to have negative impact on this population. Non-point source pollution from oil and gas exploration or other development upslope would have a negative affect on this population.

Conservation Recommendations

Forest cover in the immediate watershed surrounding the ledges should be left intact because alterations in light levels and local microclimate could diminish the suitability of the site.

Chappel Bay CA
Red Bridge CA

Both of these Conservation Areas include portions of the shore of the Allegheny Reservoir, where the lakeside habitat experiences fluctuating water levels, with conditions ranging from complete inundation to aridness during periods of drought.

The Red Bridge Conservation Area takes in a portion of Kinzua Creek, where it transitions into the Kinzua Bay of the Allegheny Reservoir, that supports a nesting pair of **osprey** (*Pandion haliaetus*), as well as the seasonally flooded banks of the bay that provide habitat for **thread rush** (*Juncus filiformis*), a state-rare plant. The Chappel Bay Conservation Area, located along a portion of shoreline in Chappel Bay where Hemlock Run enters the reservoir, supports a small population of thread rush. Within both of these sites, thread rush marks the transition zone between a sparse, low-growing plant community that occurs along the shore below the normal waterline and the more lush wetland plant community that begins at the high water line.

The osprey is a Neotropical migrant bird species with a range that is widespread and increasing. Its main breeding range extends from northern Canada south to the Great Lakes states and along Atlantic and Gulf Coasts to Florida. More scattered populations breed along inland rivers and lakes. The species is considered imperiled within the state, although its population may be increasing due in part to active management by the Pennsylvania Game Commission. Habitat requirements for osprey vary between sites, but must include an adequate supply of accessible live fish within commuting distance of nest (10–20 km); shallow waters (0.5–2 meters deep) which generally provide most accessible fish; and open nest sites free from predators (Poole et al. 2002). Reservoirs that provide ample expanses of shallow, clear water have ideal conditions for hunting. Like other fish-eating birds,

osprey generally defend only nest sites, not feeding territories. See the Osprey fact sheet on page 180 for more information on this species.

Threats and Stresses

Populations of thread rush are generally small and localized, only rarely occurring across extensive areas of suitable habitat. This species appears to have broad hydrologic requirements being found in a wide variety of wetland or riparian habitats. Any changes in the environment that raise or lower water levels would be expected to have negative impact on some existing plants. However, it appears the species is capable of dispersing to other suitable sites during such times. Thus it appears there are both positive and negative responses by this species to periodic hydrological changes (Hays 2001a). Any factor that would decrease water quality of the lake would impact the nesting ospreys. Non-point source pollution from agricultural development upslope from the lake and timber harvesting within forested areas along the lake are the greatest threats to water quality. Acid precipitation may affect fauna residing in the lake.

Thread rush growing at Red Bridge. The patches of thread rush roughly mark the normal water line of the reservoir. This photo was taken during a period of drought.
Photo source: WPC

At the national level, osprey are recovering in many areas following severe declines resulting from organochlorine biocide use. However, organochlorines and other contaminants are still contributing to eggshell thinning and low hatching success in some populations (Steidl et al. 1991). General threats to osprey include death by gunshot, steel traps, impact with, or electrocution by, high-tension wires, and being caught or drowned in nets (Wiemeyer et al. 1980, cited in Henny and Anthony 1989).

Conservation Recommendations

Forest cover in the immediate watershed surrounding the lake should be left intact because alterations in light levels and temperature along the perimeter of the lake could alter the hydrology of the sites. Fishing is the primary recreational activity at Allegheny Reservoir and boats with motors are permitted. Human disturbance near the osprey nest platform should be kept to a minimum during the nesting period (months of June and July) when ospreys are most sensitive to intrusions. Tolerance levels of human activity near nests are too variable for guidelines to be broadly applied. Biologists with the Allegheny National Forest are aware of the thread rush occurrences and the osprey nest, and monitor the nest annually.

Kiasutha Campground CA

This Conservation Area is delineated around an area of upland hardwood forest adjacent to the Allegheny Reservoir that provides habitat for **sensitive species of concern 7,** a species of conservation concern in Pennsylvania.

Sensitive species of concern 7 needs tall trees or cliffs near large bodies of water, and the same site may be used year after year or the species may alternate between two sites in successive years. This species feeds opportunistically on fishes, injured waterfowl and seabirds, various mammals, and even carrion (NatureServe 2007).

Threats and Stresses

Major threats to sensitive species of concern 7 include disturbance by humans, pesticide contamination, habitat loss, decreasing food supply, and illegal shooting. This species is susceptible to the concentration of toxic chemicals from lower trophic level and is vulnerable to accumulated toxins. This vulnerability was demonstrated by the dramatic decline in its numbers following the widespread use of the pesticide DDT (an organochlorine) after World War II. Human intrusion, particularly during the period between breeding and the maturing of the young, can have a negative impact. This species generally shows a high degree of adaptability and tolerance if the human activity is not directed toward them. However, chronic disturbance results in the disuse of areas by sensitive species of concern 7 (NatureServe 2007).

Maine Snaketail (*Ophiogomphus mainensis*)
Photo Source: Tom Murray

Conservation Recommendations

Human intrusion and disturbance should be avoided in both the core habitat and supporting landscape between January 1st to August 31st, and timber harvesting, road building, and other habitat-altering activities should not take place in the core habitat area during any time of the year.

Klondike Upland CA

This Conservation Area is discussed under Corydon Township (page 68). It is designated around an area of mature northern hardwood forest within this site provides habitat for **sensitive species of concern 6**, a species of conservation concern in Pennsylvania. Timber harvesting should be avoided completely within the core habitat area and harvesting within the supporting landscape should take into account potential impacts to the species of concern.

Kinzua Creek CA

This site includes approximately three km (1.9 mi) of Kinzua Creek, as well as extending 1.5 km (0.9 mi) up Meade Run from its confluence with Kinzua Creek. The portion of Kinzua Creek encompassed within this Conservation Area is a medium to high gradient stream characterized by shallow riffles and runs. The substrate is dominated by coarse gravel and cobbles, with scattered small boulders; occasional sand-bars are also present (Bier et al. 1997). This section of Kinzua Creek, along with a wetland complex near the mouth of Meade Run, supports at least 33 species of odonates; of these, six are presently considered species of special concern: **northern pygmy clubtail** (*Lanthus parvulus*), **harpoon clubtail** (*Gomphus descriptus*), **Maine snaketail** (*Ophiogomphus mainensis*), **ocellated darner** (*Boyeria grafiana*), **superb jewelwing** (*Calopteryx amata*), and **zebra clubtail** (*Stylurus scudderi*). Additionally, the flowing waters of this Conservation Area support a population of **American brook lamprey** (*Lampetra appendix*), a species currently under consideration for listing as rare by the Pennsylvania Biological Survey. Please refer to the preceding summary table for a complete list of dragonfly species found at this site.

Other fish species observed within this site include blacknose dace (*Rhinichthys atratulus*), creek chub (*Semotilus atromaculatus*), white sucker (*Catostomus commersoni*), mottled sculpin (*Cottus bairdi*), and three species of darter (*Etheostoma* spp.) – indicator species for a coolwater stream community within the Ohio-Great Lakes Basins in Pennsylvania (Walsh et al. 2007b). This community type occurs in small to medium-sized streams at moderate to high elevations, and typically has a neutral pH (~7.0; Walsh et al. 2007b). Fish occurring within the coolwater stream community are habitat generalists and generally pollution tolerant.

The supporting landscape extends upstream for five kilometers from the boundary of the core habitat, and captures the viewshed of the core habitat and the riparian zone of the main stem of the creek, plus tributaries and their riparian zones.

Dragonflies, as with other members of the order Odonata, have three stages in their life cycle: egg, nymph, and adult. Dragonflies oviposit their eggs in or near water. The species occurring within these Conservation Areas are river-breeding odonates that utilize clear, rapid, rocky streams and rivers with silt-bottomed pools. After the eggs hatch, the nymphs remain in the water through several instars (stages between molting of the exoskeleton), feeding on small aquatic organisms until they eventually emerge from the water as terrestrial adults.

The American brook lamprey requires cool, clear water and inhabits large creeks and small to medium rivers where adults can be found in riffles with a gravel or sand substrate, while juveniles inhabit sandy or silty pools (Page and Burr 1991). This species has a complex life cycle that includes an extended larval stage before transformation into an adult stage. Eggs 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. The adult does not feed, and immediately begins spawning, with death following shortly thereafter (NatureServe 2007).

ocellated darner dragonfly (*Boyeria grafiana*)
Photo source: Rick Koval

Threats and Stresses

All the rare species occurring within this Conservation Area are dependent upon high-quality stream habitat for their continued success; each of these species are particularly vulnerable to siltation within riffle and run habitats. Runoff from roads in close proximity to streams can contribute to physical degradation of stream channels and erosion and sediment pollution in streams. Loss of forest cover within the riparian zone will likely result in physical degradation of the stream channels, erosion and sediment pollution in the streams, higher water temperatures, and disruption of natural nutrient cycling linked to the streams. If forest cover is substantially reduced within the watershed, 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, road construction, and oil and gas development or other construction activities should be kept well away from riparian corridors in order to avoid degrading important aquatic and streamside habitat.

Kinzua Creek below Westline CA

This section of Kinzua Creek encompasses areas of medium to high gradient stream characterized by shallow riffles and runs and supports **ocellated darner dragonfly** (*Boyeria grafiana*), a species of special concern.. The substrate is dominated by coarse gravel and cobbles, with scattered small boulders; occasional sand-bars are also present.

Threats and Stresses

This species depends upon high-quality stream habitat for its continued success and is particularly vulnerable to siltation within riffle and run habitats. Runoff from roads in close proximity to streams can contribute to physical degradation of stream channels and erosion and sediment pollution in streams. Loss of forest cover within the riparian zone will likely result in physical degradation of the stream channels, erosion and sediment pollution in the streams, higher water temperatures, and disruption of natural nutrient cycling linked to the streams. If forest cover is substantially reduced within the watershed, 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, road construction, and oil and gas development or other construction activities should be kept well away from riparian corridors in order to avoid degrading important aquatic and streamside habitat.

Swede Hill CA

This Conservation Area is discussed under Wetmore Township (page 143). It is designated around a section of South Branch Kinzua Creek that provides habitat for **northern pygmy clubtail dragonfly** (*Lanthus parvulus*), **ocellated darner dragonfly** (*Boyeria grafiana*), and **superb jewelwing damselfly** (*Calopteryx amata*), three odonate species of conservation concern in Pennsylvania. Forest riparian buffers should be maintained within and upstream of this site to protect stream habitat quality.

Small yellow lady's-slipper (*Cypripedium calceolus var. parviflorum*)
Photo source: Western Pennsylvania Conservancy

HAMLIN TOWNSHIP & MOUNT JEWETT BOROUGH

	PNDI Rank*		State Legal Status*	Last Observed	Quality*
	Global	State			
NATURAL HERITAGE AREAS:					
Cathrine Swamp Conservation Area	*Exceptional Significance*				
American emerald dragonfly (*Cordulia shurtleffii*)	G5	S3S4	-	2006	E
Creeping snowberry (*Gaultheria hispidula*)	G5	S3	PR	2007	AB
Comet darner dragonfly (*Anax longipes*)	G5	S1S2	-	2005	E
Crimson-ringed whiteface dragonfly (*Leucorrhinia glacialis*)	G5	S3S4	-	2006	E
Harpoon clubtail dragonfly (*Gomphus descriptus*)	G4	S1S2	-	2006	E
Red-waisted whiteface dragonfly (*Leucorrhinia proxima*)	G5	S2	-	2006	AB
Silver-bordered fritillary butterfly (*Boloria selene myrina*)	G5	S1S3	-	2006	E
Ski-tailed emerald dragonfly (*Somatochlora elongata*)	G5	S2	-	2005	E
Wiegand's sedge (*Carex wiegandii*)	G3	S1	PT	2007	A
Kasson Railroad Grade Conservation Area	*High Significance*				
Case's ladies'-tresses (*Spiranthes casei*)	G4	S1	PE	2003	C
Kinzua Gorge Conservation Area	*Local Significance*				
Kinzua Gorge (Erosional Remnant)	-	-	-	-	-

*Please refer to Appendix III (pg. 163) for an explanation of Element Ranks, Legal Status, and Quality Ranks.

McKean County
Natural Heritage Inventory

Hamlin Township
&
Mount Jewett Borough

Conservation Areas:

Cathrine Swamp
Kasson Railroad Grade
Kinzua Gorge

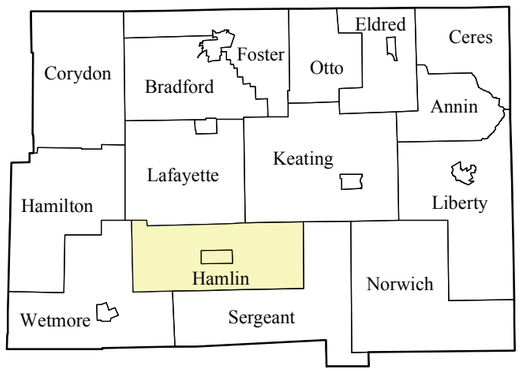
Landscape Conservation Areas:

none

Public Lands:

Allegheny National Forest
Kinzua Bridge State Park
State Game Lands 62

County Overview



Conservation Area (CA)

Core Habitat
Supporting Landscape

Other Areas

Landscape Conservation Area (LCA)
Allegheny National Forest
State Lands
40 ft. Contour Interval

Pennsylvania Natural Heritage Program

Scale 1:70,000
0 0.5 1 2 3 Kilometers
0 0.5 1 2 Miles

HAMLIN TOWNSHIP & MOUNT JEWETT BOROUGH

Hamlin Township, located in the central region of McKean County, falls within the watersheds of Kinzua Creek, Clarion River, and Potato Creek. Approximately 81 percent of Hamlin Township is forested, with 63 percent of that being interior habitat. Thirty-two percent of the township lies within public lands. Kinzua Gorge, both a feature of geologic interest and the focal feature of Kinzua State Park, is an erosional remnant carved by Kinzua Creek that straddles the boundary between Hamlin and Keating Townships.

Mount Jewett Borough, located at the divide between the Kinzua Creek, Clarion River, and Potato Creek watersheds, lies within the boundaries of Hamlin Township. No Conservation Areas were delineated within Mount Jewett.

Cathrine Swamp CA

This Conservation Area is discussed under Sergeant Township (page 135). It is designated around a wetland complex that provides habitat for six dragonfly species, **American emerald** (*Cordulia shurtleffii*), **comet darner** (*Anax longipes*), **crimson-ringed whiteface** (*Leucorrhinia glacialis*), **harpoon clubtail** (*Gomphus descriptus*), **red-waisted whiteface** (*Leucorrhinia proxima*) and **ski-tailed emerald** (*Somatochlora elongata*), on butterfly, **Silver-bordered fritillary** (*Boloria selene myrina*), and two plant species **creeping snowberry** (*Gaultheria hispidula*) and **Wiegand's sedge** (*Carex wiegandii*). A forested buffer should be maintained around the wetland in order to preserve the hydrologic conditions supporting the wetland and the rare species it supports.

green-striped darner (*Aeshna verticalis*)
Photo source Steve Nanz: http://stevenanz.com

round-leaved sundew (*Drosera rotundifolia*) in Cathrine Swamp
photo source: PNHP

Kasson Railroad Grade CA

These sites are designated around populations of **Case's ladies'-tresses** (*Spiranthes casei*), a plant species of concern in Pennsylvania. This species occurs in Nova Scotia, and in the United States from Maine to northern Pennsylvania west to Michigan and Wisconsin (Gleason and Cronquist 1991). *Spiranthes casei* is considered globally apparently secure, but is listed as critically imperiled in Pennsylvania and Vermont. In Pennsylvania, this species is currently known to occur only in McKean County (NatureServe 2007).

Case's ladies'-tresses, a member of the orchid family, was only recognized as a separate species in 1974 (Catling and Cruise 1974). It is a colonizer of disturbed sites, where it grows in dry, open, sandy soil (Rhoads and Klein 1993, Rhoads and Block 2000). In McKean County, this species is most often found growing along railroad grades where the herbaceous layer is relatively sparse.

Threats and Stresses

Threats to this species are poorly known. Succession of the occupied habitat from a disturbed, sparsely vegetated to a more densely vegetated state would likely result in the disappearance of Case's ladies-tresses from these sites.

Conservation Recommendations

The current conditions within the sites are compatible with maintaining these populations. The landowners should be apprised of the presence of Case's ladies-tresses on their lands, if they are not already aware of it, and encouraged to consider possible impacts to the species when planning any changes in how they're managing the occupied habitat.

Kinzua Gorge CA

This site is created around an erosional remnant; a geologic feature associated with ice-age flood events and continued downcutting by Kinzua Creek. This area features a narrow, deep gorge with steep walls and picturesque views up and down the curving valley. The upper rim of the gorge is formed be a hard, weathering resistant cap of Pottsville sandstone. This cap covers softer stone composed of layers of sandstone, siltstone, and shale that have eroded more quickly allowing the deep, narrow gorge to form. Downcutting at Kinzua Gorge began approximately 1.6 million years ago and continues today. Despite the steepness of the valley, there is no evidence of glaciation within the gorge.

From: *Outstanding Scenic Geologic Features of Pennsylvania*

> A spectacular gorge and scenic view of the High Plateau; site of the famous Kinzua Viaduct, the second highest bridge of this type on the North American continent, 301 feet high and 2,110 feet long. The steel structure was built in 1900 as a replacement for the original iron viaduct of the same dimensions constructed in 1882. The iron viaduct was the highest railroad bridge in the world at that time (1882). The Kinzua Viaduct is in the *National Register of Historical Places.*

Kinzua Gorge State Park

Photo source: Pennsylvania DCNR

Today, however, most of the Kinzua Viaduct is lying in pieces on the bottom of the Kinzua Gorge. On July 21, 2003 the Kinzua Viaduct sustained a direct hit from a tornado causing the middle of the structure to collapse. Efforts to restore and preserve the structure were underway at the time of the collapse and today efforts to repair the remaining structure and assess the feasibility of rebuilding the entire structure are ongoing. Despite this event, the scenic beauty of the park and substantial recreational opportunities still remain.

Threats and Stresses

The portion of this site containing the viaduct is a state park. However, the majority of the site, including most of the viewshed, is in private ownership. Logging, suburban development, or oil and gas exploration in this area would greatly diminish the scenic quality of the site.

Conservation Recommendations

Work to preserve the scenic quality of this site in order to maintain both it biological value and the scenic beauty that make it a popular tourist destination.

KEATING TOWNSHIP & SMETHORT BOROUGH

	PNDI Rank*		State Legal Status*	Last Observed	Quality*
	Global	State			
NATURAL HERITAGE AREAS:					
Bingham Conservation Area		*Exceptional Significance*			
Case's ladies'-tresses *(Spiranthes casei*)	G4	S1	PE	2006	E
Creeping snowberry (*Gaultheria hispidula*)	G5	S3	PR	2006	B
Oblong-fruited serviceberry (*Amelanchier bartramiana*)	G5	S1	PE	2006	B
Coryville Railroad Grade Conservation Area		*High Significance*			
Stalked bulrush (*Scirpus pedicellatus*)	G4	S1	PT	2006	BC
Kasson Railroad Grade Conservation Area		*High Significance*			
Case's ladies'-tresses (*Spiranthes casei*)	G4	S1	PE	2003	C
Kinzua Gorge Conservation Area		*Local Significance*			
Kinzua Gorge (Erosional Remnant)	-	-	-	-	-
Ormsby Swamp Conservation Area		*Exceptional Significance*			
American emerald dragonfly (*Cordulia shurtleffii*)	G5	S3S4	-	2005	E
Aphrodite fritillary butterfly (*Speyeria aphrodite*)	G5	S3S4	-	2005	E
Atlantic fritillary butterfly (*Speyeria atlantis*)	G5	SU	-	2005	E
Black-tipped darner dragonfly (*Aeshna tuberculifera*)	G4	S2S3	-	2005	E
Brush-tipped emerald dragonfly (*Somatochlora walshii*)	G5	S2	-	2004	E
Creeping snowberry (*Gaultheria hispidula*)	G5	S3	PR	2006	AB
Eyed brown butterfly (*Satyrodes eurydice*)	G4	S1S3	-	2004	E
Forcipate emerald dragonfly (*Somatochlora forcipata*)	G5	S2	-	2007	E
Green-striped darner dragonfly (*Aeshna verticalis*)	G5	S3S4	-	2005	E
Long dash butterfly (*Polites mystic*)	G5	S3	-	2005	E
Northern pearly-eye butterfly (*Enodia anthedon*)	G5	S3S4	-	2005	E
Oblong-fruited serviceberry (*Amelanchier bartramiana*)	G5	S1	PE	2006	E
Silver-bordered fritillary butterfly (*Boloria selene myrina*)	G5T5	S1S3	-	2005	E
Ski-tailed emerald dragonfly (*Somatochlora elongata*)	G5	S2	-	2005	E
Sensitive species of concern 11	-	-	-	1996	E
White-faced meadowhawk dragonfly (*Sympetrum obtrusum*)	G5	S3S4	-	2005	E
Potato Creek Conservation Area		*Exceptional Significance*			
American brook lamprey (*Lampetra appendix*)	G4	S3	PC	2005	E
Ohio lamprey (*Ichthyomyzon bdellium*)	G3G4	S2S3	PC	1993	B
Sensitive species of concern 2	-	-	-	2002	E
Sensitive species of concern 3	-	-	-	1985	BC
Potato Creek – Cole Creek Conservation Area		*Exceptional Significance*			
American brook lamprey (*Lampetra appendix*)	G4	S3	PC	2005	E
Creek heelsplitter mussel (*Lasmigona compressa*)	G5	S2S3	CR	1992	E
Elktoe mussel (*Alasmidonta marginata*)	G4	S4	N	1992	E
Round pigtoe mussel (*Pleurobema sintoxia*)	G4	S2	-	1992	E
Sensitive species of concern 2	-	-	-	2005	E
Sensitive species of concern 3	-	-	-	2005	B
Sensitive species of concern 5	-	-	-	2005	E
Route 59 Roadside Conservation Area		*High Significance*			
Case's ladies'-tresses (*Spiranthes casei*)	G4	S1	PE	1996	E
Smethport Upland Conservation Area		*High Significance*			
Sensitive species of concern 4	-	-	-	1989	E

GEOLOGIC FEATURES: *Devils Den (Erosional Remnant)*
The Nipple (Erosional Remnant)

*Please refer to Appendix III (pg. 163) for an explanation of Element Ranks

McKean County
Natural Heritage Inventory

Keating Township
&
Smethport Borough

Conservation Areas:

Bingham
Coryville Railroad Grade
Kasson Railroad Grade
Kinzua Gorge
Ormsby Swamp
Potato Creek
Potato Creek - Cole Creek
Route 59 Roadside
Smethport Upland

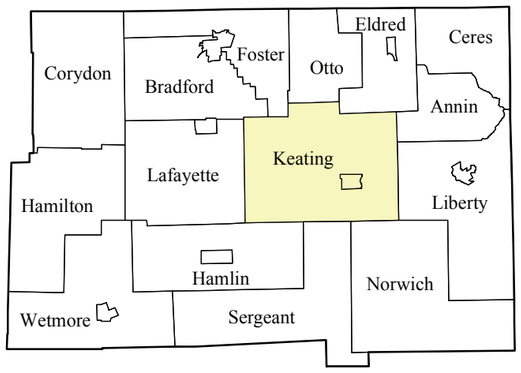
Landscape Conservation Areas:

Allegheny Wetland Complex
Potato Creek

Public Lands:

Kinzua Bridge State Park
State Game Lands 301

County Overview



Conservation Area (CA)

Core Habitat
Supporting Landscape

PNHP
Pennsylvania Natural Heritage Program

Other Areas

Landscape Conservation Area (LCA)
Allegheny National Forest
State Lands
40 ft. Contour Interval

Scale 1:65,000
0 0.5 1 2 3 Kilometers
0 0.5 1 2 Miles

KEATING TOWNSHIP & SMETHORT BOROUGH

Keating Township is the largest township in McKean County, covering almost 100 square miles. Approximately 79 percent of Keating Township is forested, with 65 percent of that being interior habitat. Potato Creek and two of its large tributaries, Cole Creek and Marvin Creek, are the primary streams flowing through the township.

Kinzua Gorge, both a feature of geologic interest and the focal feature of Kinzua State Park, is an erosional remnant carved by Kinzua Creek that straddles the boundary between Hamlin and Keating Townships. Two other erosional remnants can be found in the township: Devils Den, 1.7 km south of Smethport; and The Nipple, 2.7 km east of Smethport.

The borough of Smethport, located at the confluence of Marvin Creek and Potato Creek, lies within the boundaries of Keating Township and contains part of the Potato Creek – Cole Creek CA. An important issue related to the administration of population centers is the appropriate management of storm-water and sewage to minimize impacts to area streams.

Bingham CA

This Conservation Area is discussed under Lafayette Township (page 111). It encompasses a section of railroad grade that supports a population of **Case's ladies'-tresses** (*Spiranthes casei*), and a small adjacent wetland that provides habitat for **creeping snowberry** (*Gaultheria hispidula*) and **oblong-fruited serviceberry** (*Amelanchier bartramiana*).

Kinzua Gorge CA

This Conservation Area is discussed under Hamlin Township (page 96). It encompasses a section of Kinzua Creek and contains the Kinzua Viaduct, which is on the National Register of Historic Places

Kasson Railroad Grade CA
Route 59 Roadside CA

These sites are designated around populations of **Case's ladies'-tresses** (*Spiranthes casei*), a plant species of concern in Pennsylvania. This species occurs in Nova Scotia, and in the United States from Maine to northern Pennsylvania west to Michigan and Wisconsin (Gleason and Cronquist 1991). *Spiranthes casei* is considered globally apparently secure, but is listed as critically imperiled in Pennsylvania and Vermont. In Pennsylvania, this species is currently known to occur only in McKean County (NatureServe 2007).

Case's ladies'-tresses, a member of the orchid family, was only recognized as a separate species in 1974 (Catling and Cruise 1974). It is a colonizer of disturbed sites, where it grows in dry, open, sandy soil (Rhoads and Klein 1993, Rhoads and Block 2000). In McKean County, this species is most often found growing along railroad grades where the herbaceous layer is relatively sparse.

Case's ladies'-tresses
(*Spiranthes casei*)
Photo: Jeff Hapeman, WISFLORA

Threats and Stresses

Threats to this species are poorly known. Succession of the occupied habitat from a disturbed, sparsely vegetated to a more densely vegetated state would likely result in the disappearance of Case's ladies-tresses from these sites.

Conservation Recommendations

The current conditions within the sites are compatible with maintaining these populations. The landowners should be apprised of the presence of Case's ladies-tresses on their lands, if they are not already aware of it, and

creek heelsplitter (*Lasmigona compressa*)
Photo source: Western Pennsylvania Conservancy

encouraged to consider possible impacts to the species when planning any changes in how they're managing the occupied habitat.

Coryville Railroad Grade CA

This Conservation Area is located along a section of railroad right-of-way within the large wetland complex along the Allegheny River that provides habitat for **stalked bulrush** (*Scirpus pedicellatus*), a plant species considered critically imperiled in Pennsylvania. Within this site, scattered clumps of stalked bulrush are growing in open, swampy depressions along the elevated railroad grade, along with woolgrass (*Scirpus cyperinus*), tearthumb (*Polygonum sagittatum*), and rice cutgrass (*Leersia oryzoides*).

Stalked bulrush, a member of the large Cyperaceae (Sedge) family, is a grass-like plant usually found growing in lowland marshes in stream valleys, edges of bogs, boggy meadows, and wet sandy shorelines (FNA 2003). Its range extends from Newfoundland south to Kentucky and west to Missouri (NatureServe 2006). In Pennsylvania, this species has been documented in the northwestern counties of Forest, McKean, Potter, Venango, and Warren (NatureServe 2007). *Scirpus pedicellatus* is very similar in appearance to one of its most common congeners, woolgrass, a species it can hybridize with (FNA 2003).

Freshwater Mussels – the river's filters

The Allegheny River and its tributaries provide habitat for a diverse community of freshwater mussels, a group of animals considered the most imperiled in North America. Almost half of the species of freshwater mussels in Pennsylvania are extirpated or considered rare, threatened, or endangered, due to more than a century of modification and destruction of aquatic habitats by dams, dredging, and pollution (Williams and Neves 1995). Mussels play important ecological roles, filtering algae, plankton, and silts from the water; and serving as a food source for otters, raccoons, herons, and some fish. The reproductive cycle of freshwater mussels involves a fish host, often a single fish species specific to each species of mussel. The presence of diverse and healthy mussel populations can serve as an indicator of a healthy aquatic system, including fish, waterfowl habitat, and water quality.

Conservation and recovery of freshwater mussels in the Alleghany River and elsewhere is not only dependent on maintenance of water quality and flows in the river, but also on conservation practices in terrestrial habitats (Williams and Neves 1995). Freshwater areas are indirectly affected by erosion and chemical runoff in the surrounding uplands of the watershed. Siltation and removal of riparian vegetation can destabilize the river substrates and eliminate habitat for bottom-dwelling organisms such as mussels. Populations of rare mussels are generally dependent on conservation practices that will improve and maintain water quality and restore natural flows to the river. Reduction of erosion and chemical runoff, restoration and maintenance of riparian forested buffers, and restoration of natural flows will all improve habitat for freshwater mussels and associated aquatic organisms. Any individual area of mussel habitat is affected by the entire upstream area, and therefore mussel conservation should focus on watershed level protection.

Threats and Stresses

Stalked bulrush is considered an obligate wetland species, and therefore dependent on the hydrological conditions currently found within this site. However, the land management practices (or lack of) within this Conservation Area are compatible with the continued success this species, and thus it appears to be under no imminent threat.

Conservation Recommendations

Any activities that might alter the hydrology, such as ditching or deposition of fill material, should be avoided within this site.

Potato Creek CA

This Conservation Areas is delineated around aquatic habitat within Potato Creek and several of its tributaries. The Potato Creek Landscape Conservation Area (LCA) functions as supporting landscape for aquatic-based Conservation Areas within its boundaries (see page 40 for further discussion of the LCA). Because all of the sites where species of concern are found are linked by flowing water, each of the rare species within this site may well be a member of a single population extending throughout the Potato Creek system within Norwich and Keating Townships. A complete description of this site may be found on page 125.

Potato Creek – Cole Creek CA

This Conservation Area encompasses sections of Potato Creek and two of its large tributaries, Cole Creek and Marvin Creek. The Potato Creek Landscape Conservation Area (LCA) functions as supporting landscape for each of the aquatic-based Conservation Areas within its boundaries (see page 40 for further discussion of the LCA). Because of collection pressure or sensitivity to disturbance some species present at this site remain unnamed in this report at the request of the jurisdictional agencies.

Potato Creek, McKean County
Photo source: Western Pennsylvania Conservancy

The stream habitat within the Potato Creek – Cole Creek CA supports **round pigtoe** (*Pleurobema sintoxia*), **creek heelsplitter** (*Lasmigona compressa*), and **elktoe** (*Alasmidonta marginata*) all mussel species of conservation concern within Pennsylvania.

Freshwater mussels, primarily found in streams, are filter feeders that spend their adult lives in the substrate of stream or lake bottoms. Movement is accomplished either by means of a muscular foot or flood currents. A mussel filters oxygen and particulate matter from the water column by continuously siphoning water through its body. They feed on suspended organic matter, including detritus and plankton. Mussels have a rather complex life cycle involving four stages. The cycle begins when males release sperm into the water column. As the sperm passively drifts with the current, it may enter females when they are siphoning and consequently fertilize their eggs. During the second stage, the fertilized eggs develop into larvae called glochidia. The glochidia are microscopic and are held in the female's gills for future release into the water column. They must attach to the gills or fins of a suitable host fish in order to survive once the female releases them. Once a glochidium attaches to a host, it remains for a period of days or months, depending upon the species, as it transforms into a juvenile mussel. Following the transformation, the juvenile releases from the host and sinks to the stream bottom. If the juvenile is lucky, it lands in suitable substrate where it feeds and grows into an adult (Cordeiro and Bowers-Altman [no date]). Because mussels are dependent upon good water quality and physical habitat conditions and an environment that will support populations of host fish, they are considered good indicators of the health of aquatic ecosystems. (See page 63 for further discussion of mussel conservation.)

Potato Creek – Cole Creek CA also supports **sensitive species of concern 2, sensitive species of concern 3**, and **sensitive species of concern 5**. The creek provides additional habitat occupied by **American brook lamprey** (*Lampetra appendix*), a species currently under consideration for listing as rare by the Pennsylvania Biological Survey.

American brook lamprey requires cool, clear water and inhabits large creeks and small to medium rivers where adults can be found in riffles with a gravel or sand substrate, while juveniles inhabit sandy or silty pools (Page and Burr 1991). This species has a complex life cycle that includes an extended larval stage before transformation into an adult stage. Eggs 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. The adult does not feed, and immediately begins spawning, with death following shortly thereafter (NatureServe 2007).
Within Pennsylvania, sensitive species of concern 2 occurs only within the upper reaches of the Allegheny River and Lake Erie. This species prefers the deep, cool water of lakes and large rivers, where it typically hides among bottom structures during the day and emerges to feed at night. Immature individuals favor gravelly substrate where they feed on macroinvertebrates, while adults tend to remain in deep water and prey on other fish. Sensitive species of concern 2 is one of the few species in Pennsylvania to reproduce during winter.

Sensitive species of concern 3 occurs primarily in the Ohio River basin, extending into the lower Great Lakes basin and upper St. Lawrence drainages. It also occurs in southeastern Kansas, southwestern Missouri, eastern Oklahoma, Arkansas, and northern Louisiana. Although the range of sensitive species of concern 3 is large, this species often occurs in isolated populations. In Pennsylvania, it is known from Lake Erie and its larger tributaries, and the upper part of the Allegheny River drainage. This species inhabits large clean streams and rivers with moderate current and bottoms consisting of large rocks, fine gravel, and sand. Reproduction takes place from spring to mid-summer. Males select and establish small territories downstream from large stones scattered over a clean sand-small gravel bottom. Females move into these territories, burrow into the gravel behind each stone, and spawn here with various males. Small numbers of eggs are deposited and fertilized with each spawning, until up to 400 eggs are laid. This species feeds on small aquatic insect larvae, as well as algae and organic detritus.

Sensitive species of concern 5 occurs along the western side of the Appalachian Mountains in the Ohio, Tennessee, and Allegheny River drainages, from southwestern New York down to North Carolina and Tennessee. In Pennsylvania, this species is known only from scattered sites in the Allegheny River and French Creek headwaters. The preferred habitat of sensitive species of concern 5 is moderate to large-sized clear streams with swift currents and bottoms of gravel and boulders. Little is known about the life history of this species, but it is believed that it reproduces between March and May. Adults feed on small crayfish and larger insect larvae.

Threats and Stresses

All the rare species occurring within this Conservation Area are dependent upon high-quality stream habitat for their continued success; each of these species are particularly vulnerable to siltation within riffle and run habitats. Runoff from dirt and gravel roads in close proximity to streams can contribute to physical degradation of stream channels and erosion and pollution of in the streams. Loss of forest cover within riparian zones may also result in increased water temperatures and disruption of natural nutrient cycling linked to streams (see page 43 for a discussion of how riparian buffers function to protect water quality). 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, road construction, and oil and gas 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 (http://pubs.cas.psu.edu/FreePubs/pdfs/uh090.pdf) or through Penn State, for guidelines aimed at minimizing impacts due to timber harvesting.

Ormsby Swamp CA

The core of this site is a large wetland complex, covering approximately 132 acres, drained by an unnamed tributary of Kinzua Creek. The supporting landscape extends to the boundary of the immediate watershed supporting the wetland.

The wetland complex is comprised of shrub thickets, open sphagnous boggy areas, and several small ponds, and is roughly bisected by an old roadbed. In addition, a network of small, brownwater rivulets meander through the wetland. The variety of habitat types supports a wealth of rare species, including two plant, four butterfly, and six dragonfly species of conservation concern in Pennsylvania. Please refer to the preceding summary table for a complete list of the rare species documented at this site.

Creeping snowberry (*Gaultheria hispidula*)
Photo source: PNHP

Sphagnum and *Polytrichum* mosses are prevalent throughout the wetland; most of the area contains a typical suite of acid-loving wetland species, with small clumps of cinnamon fern (*Osmunda cinnamomea*) and low shrubs occupying hummocks. Shrub species include: black chokecherry (*Aronia sp.*), sweet low blueberry (*Vaccinium angustifolium*), inkberry (*Nemopanthus mucronatus*), northern arrow-wood (*Viburnum recognitum*), and steeplebush (*Spiraea tomentosa*). The open canopy is comprised of scattered eastern hemlock (*Tsuga canadensis*), white pine (*Pinus strobus*), and red maple (*Acer rubrum*). Herbaceous species include: cranberry (*Vaccinium macrocarpon*), soft rush (*Juncus effusus*), swamp dewberry (*Rubus hispidus*), cottongrass (*Eriophorum virginicum*), wool-grass (*Scirpus cyperinus*), three-way-sedge (*Dulichium arundinaceum*), and a number of sedges (*Carex gynandra, Carex folliculata, Carex trisperma, Carex lurida, Carex scoparia*). **Creeping snowberry** (*Gaultheria hispidula*) is found in open-canopy sphagnous wetlands with a pit-and-mound microtopography, where it typically grows on hummocks with dead wood present. Within this site, it can be found along the old roadbed and on hummocks throughout the boggy portions of the wetland. **Oblong-fruited serviceberry** (*Amelanchier bartramiana*) also grows along the abandoned roadbed and into the edge of a shrub-dominated portion of the wetland.

black-tipped darner dragonfly (*Aeshna tuberculifera*)
photo source: Jerry McWilliams

Odonates have three stages in their life cycle: egg, nymph, and adult. Dragonflies and damselflies typically lay their eggs in water. The **black-tipped darner** (*Aeshna tuberculifera*), **green-striped darner** (*A. verticalis*), and **white-faced meadowhawk** (*Sympetrum obtrusum*) are pond-breeding odonates that prefer ponds, lakes, marshes, and occasionally slow-flowing streams. The **brush-tipped emerald** (*Somatochlora walshii*), **ski-tailed emerald** (*S. elongata*), **forcipate emerald** (*S. forcipata*), and **American emerald** (*Cordulia shurtleffii*) and typically utilize small, clear, slow-flowing streams draining open bogs, marshes, or swamps. 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).

Butterflies undergo four stages in their life cycle: egg, caterpillar, pupa, and adult. Once an adult female has mated, she seeks out the species of host plant appropriate for her species on which to lay her fertilized eggs. Most species lay their eggs on a plant that the newly hatched caterpillar will eat. When an egg hatches, a small caterpillar emerges and spends all its time eating and growing. As a caterpillar grows, it sheds its exoskeleton – usually three or four times – over the course of two to three weeks. During the caterpillar stage, the animal is highly vulnerable to predation by wasps and birds, parasitization by wasps or flies, or infection by fungal or viral pathogens; most caterpillars do not survive to the next stage of development. Once a caterpillar has reached full size, it attaches itself to a support and

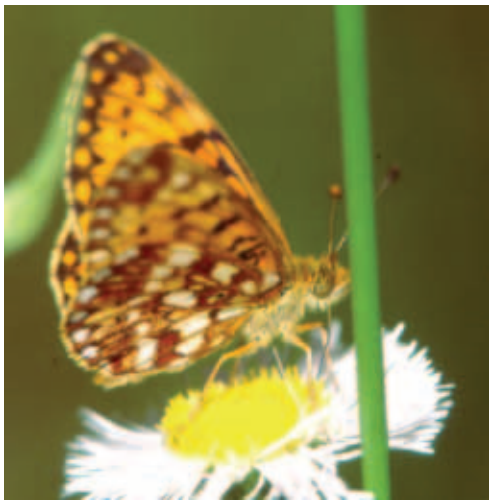
encases itself in a hard outer shell (chrysalis), and becomes a pupa. While in the pupa stage, the butterfly transforms into an adult. When the adult inside the chrysalis is fully formed, the chrysalis splits and the adult butterfly emerges (Glassberg 1999).

Habitat for **Aphrodite fritillary** (*Speyeria aphrodite*), **Atlantic fritillary** (*Speyeria atlantis*), and **sensitive species of concern 11** is open fields and woodland edges; they can be found in both wet and dry habitats (Glassberg 1999). Females Aphrodite and Atlantic fritillary walk about on the ground to lay single eggs near violets. The first-stage caterpillars do not feed, but overwinter until spring, when they eat young leaves of violets. The adults feed from the flowers of milkweed (*Asclepias* spp.) and viper's bugloss (*Echium vulgare*), among others (Opler et al. 2006).

The **eyed brown** (*Satyrodes eurydice*) and **long dash** (*Polites mystic*) inhabit open sedge meadows, freshwater marshes, and slow-moving streams. Adults fly weakly over and within low plant growth and perch frequently. The males patrol in vegetation and occasionally perch to court females. The female eyed brown scatter eggs on a variety of plants. The caterpillars feed on the leaves of various sedges (*Carex stricta*, *C. lupulina*, *C. bromoides*, and *C. trichocarpa*); the third and fourth stages hibernate in the eyed-brown. The adults feed on sap, bird droppings, and occasionally flower nectar (Opler et al. 2006). Long dash caterpillars feed almost exclusively on the common reed (*Phragmites australis*).

Northern pearly-eye (*Enodia anthedon*) can be found in damp deciduous woods, usually near marshes or waterways, as well as in mixed or grassy woodlands. Males perch on tree trunks or vegetation up to 10 feet above ground at edges of clearings to wait for females. Eggs are laid singly on caterpillar host plants, which include white grass (*Leersia virginica*), bearded shorthusk grass (*Brachyelytrum erectum*), plumegrass (*Erianthus* spp.), broadleaf uniola (*Uniola latifolia*), and bottlebrush (*Hystrix patula*). The third- and fourth-stage caterpillars hibernate. Adult food sources include dung, fungi, carrion, and sap from willows, poplars, and birch (Opler et al. 2006).

Silver-bordered fritillary butterfly (*Boloria selene myrina*) inhabit wet meadows, bogs, and marshes. The males patrol wet areas for females, who lay eggs singly near violets (*Viola* spp.). The caterpillars feed on the leaves of violets; third-stage caterpillars hibernate. The adults feed on composite flowers, including goldenrod (*Solidago* spp.) and black-eyed-Susan (*Rudbeckia hirta*; Opler et al 2006).



Silver-bordered fritillary butterfly (*Boloria selene myrina*)
Photo: Jerry McWilliams

The brownwater streams flowing through 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 in acid precipitation), and in some cases they can bind metals and prevent them from having adverse effects on aquatic organisms (Colburn 2004).

Threats and Stresses

The plant, dragonfly, and butterfly species found within this are under no imminent threat. However, the westward migration of the hemlock wooly adelgid (*Adelges tsugae*), currently documented in 49 counties in Pennsylvania (PA Bureau of Forestry 2006), poses a potential threat to the hemlock trees in the region. The hemlock wooly 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 hemlock in the wetland canopy 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 those 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

The current management is compatible with maintaining the populations of the sensitive species present at this site. Periodic monitoring for hemlock wooly adelgid is recommended.

Smethport Upland CA

The upland forest within the core of this Conservation Area supports **sensitive species of concern 4**, a species of conservation concern in Pennsylvania. In Pennsylvania, this species experienced a severe decline during the first half of the twentieth century, but has made a remarkable comeback in recent decades. Acid mine drainage (AMD), which kills fish and other aquatic organisms, may have adversely affected this species. Recent efforts to mitigate the effects of AMD across the state have likely helped restore life to some of these previously disturbed aquatic habitats.

Threats and disturbances

Timber harvesting is a serious potential threat to nesting colonies of sensitive species of concern 4. This species is sensitive to disturbance, including casual visitation that occurs within a few hundred meters from their location. Any human activities that occur frequently or continuously within the CA stands to impact this species. Removal of trees, living or dead, may eliminate valuable habitat essential to this species.

Conservation recommendations

The core habitat within this site should be protected from disturbance by respecting an undisturbed forested buffer of 500 meters around the site. Any logging operations in the vicinity of the site should be scheduled to occur in the fall and early winter and strictly avoid the early spring and summer.

Blacksmith Run above Smethport, Keating Township

Photo source: Dave Kristine

LAFAYETTE TOWNSHIP & LEWIS RUN BOROUGH

	PNDI Rank*		State Legal Status*	Last Observed	Quality*
	Global	State			
NATURAL HERITAGE AREAS:					
Bingham Conservation Area			*Exceptional Significance*		
Case's ladies'-tresses *(Spiranthes casei*)	G4	S1	PE	2006	E
Creeping snowberry (*Gaultheria hispidula*)	G5	S3	PR	2006	B
Oblong-fruited serviceberry (*Amelanchier bartramiana*)	G5	S1	PE	2006	B
Kinzua Creek below Westline Conservation Area			*Notable Significance*		
Ocellated darner dragonfly (*Boyeria grafiana*)	G5	S3	-	2004	E
Mount Alton Roadside Conservation Area			*Notable Significance*		
Queen-of-the-prairie (*Filipendula rubra*)	G4G5	S1S2	TU	2003	C
Mount Alton Wetland Conservation Area			*High Significance*		
American emerald dragonfly (*Cordulia shurtleffii*)	G5	S3S4	-	2006	E
Silver-bordered fritillary butterfly (*Boloria selene myrina*)	G5	S1S3	-	2006	E
Red-waisted whiteface dragonfly (*Leucorrhinia proxima*)	G5	S2	-	2006	AB
Pine Run Roadside Conservation Area			*High Significance*		
American fever-few (*Parthenium integrifolium*)	G5	S1	TU	2006	B
Sugar Run Conservation Area			*High Significance*		
Northern water shrew (*Sorex palustris albibarbis*)	G5T5	S3	CR	2005	E

*Please refer to Appendix III (pg. 163) for an explanation of Element Ranks

McKean County
Natural Heritage Inventory

Lafayette Township
&
Lewis Run Borough

Conservation Areas:

Bingham
Kinzua Creek below Westline
Mount Alton Roadside
Mount Alton Wetland
Pine Run Roadside
Sugar Run

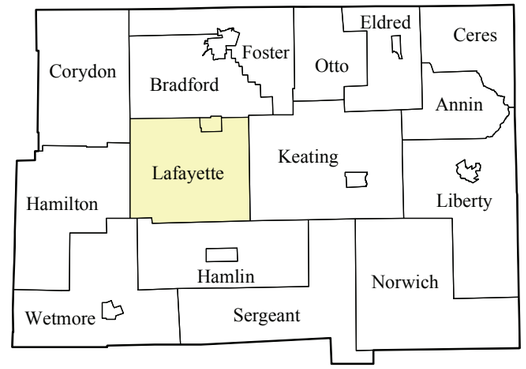
Landscape Conservation Areas:

none

Public Lands:

Allegheny National Forest
State Game Land 62

County Overview



Conservation Area (CA)

Core Habitat
Supporting Landscape

Pennsylvania Natural Heritage Program

Other Areas

Landscape Conservation Area (LCA)
Allegheny National Forest
State Lands
40 ft. Contour Interval

Scale 1:55,000
0 0.5 1 2 Kilometers
0 0.25 0.5 1 1.5 Miles

LAFAYETTE TOWNSHIP & LEWIS RUN BOROUGH

Lafayette Township encompasses slightly more that 72 square miles in the central region of McKean County. Roughly 83 percent of the township is forested, however the pattern of forest cover is highly fragmented due to widespread oil and gas development. Public lands make up 43 percent of the landholdings in the township.

The borough of Lewis Run lies along the northern boundary of Lafayette Township, where Lewis Run flows into Tunungwant Creek. An important issue related to the administration of population centers is the appropriate management of storm-water and sewage to minimize impacts to area streams.

Bingham CA

This Conservation Area is delineated around the disturbed habitat of a tank farm and a section of railroad grade, and an adjacent small depression wetland. The disturbed habitats, characterized by their openness and sparse herbaceous layers, support a population of **Case's ladies'-tresses** (*Spiranthes casei*).

The range of Case's ladies'-tresses extends from Nova Scotia and Maine, south to northern Pennsylvania, and west to Michigan and Wisconsin (Gleason and Cronquist 1991). This species is considered globally apparently secure, but is listed as critically imperiled in Pennsylvania and Vermont. In Pennsylvania, it is currently known to occur only in McKean County (NatureServe 2007). *Spiranthes casei*, a member of the orchid family, was only recognized as a separate species in 1974 (Catling and Cruise 1974). It is a colonizer of disturbed sites, where it grows in dry, open, sandy soil (Rhoads and Klein 1993, Rhoads and Block 2000). In McKean County, this species is most often found growing along railroad grades where the herbaceous layer is relatively sparse.

The small seepage wetland, bounded by drier hemlock forest, contains a dense shrub layer dominated by black chokeberry (*Aronia melanocarpa*) and northern arrow-wood (*Viburnum recognitum*), with **oblong-fruited serviceberry** (*Amelanchier bartramiana*) scattered throughout. A single small clump of **creeping snowberry** (*Gaultheria hispidula*) was found growing on a hummock formed around a decaying hemlock stump, typical habitat for this plant. (See the fact sheet on page 193 for further discussion of this species.)

serviceberry (*Amelanchier* sp.)
Photo source: Jim Stasz, USDA

Oblong-fruited serviceberry can be found growing from Labrador to Minnesota and south to Pennsylvania. In Pennsylvania, this species is only known to occur in McKean, Monroe, and Sullivan Counties (NatureServe 2007). *Amelanchier bartramiana* is a perennial shrub that favors the acid soils of swamps, sphagnum bogs, and peaty thickets (Rhoads and Klein 1993).

Threats and Stresses

Threats to Case's ladies'-tresses are poorly known. Succession of the occupied habitat from a disturbed, sparsely vegetated to a more densely vegetated state would likely result in the disappearance of this species from the site.

The westward migration of the hemlock wooly adelgid (*Adelges tsugae*), currently documented in 49 counties in the eastern two-thirds of Pennsylvania (PA Bureau of Forestry 2006), poses a potential threat to the hemlock trees in the region. The hemlock wooly 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.

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 all the plant species of concern within the site, as they are best adapted to cooler, more northern climates. Additionally, creeping snowberry appears to have narrow hydrologic requirements typical of those 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 adversely affect the creeping snowberry (Hays 2001). Given the limited amount of suitable habitat in the wetland, and the very small population size of *G. hispidula*, it is probable that this species will disappear from this site if the habitat is altered in any way.

Conservation Recommendations

The current conditions within the sites are compatible with maintaining these populations. The landowners should be apprised of the presence of the rare plants on their lands, if they are not already aware of it, and encouraged to consider possible impacts to the species when planning any changes to how they're currently managing the occupied habitat.

Kinzua Creek below Westline CA

This site encompasses areas of medium to high gradient stream characterized by shallow riffles and runs. The substrate is dominated by coarse gravel and cobbles, with scattered small boulders; occasional sand-bars are also present. This section of Kinzua Creek supports **ocellated darner dragonfly** (*Boyeria grafiana*), a species of special concern.

Threats and Stresses

This species depends upon high-quality stream habitat for its continued success and is particularly vulnerable to siltation within riffle and run habitats. Runoff from roads in close proximity to streams can contribute to physical degradation of stream channels and erosion and sediment pollution in streams. Loss of forest cover within the riparian zone will likely result in physical degradation of the stream channels, erosion and sediment pollution in the streams, higher water temperatures, and disruption of natural nutrient cycling linked to the streams. If forest cover is substantially reduced within the watershed, 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, road construction, and oil and gas development or other construction activities should be kept well away from riparian corridors in order to avoid degrading important aquatic and streamside habitat.

Mount Alton Roadside CA

Mount Alton Roadside CA encompasses an area of roadside along Route 59 that serves as habitat for a population of **queen-of-the-prairie** (*Filipendula rubra*), a plant considered to be imperiled to critically imperiled in Pennsylvania.

Queen-of-the-prairie, a member of the rose family, is a clonal species that can be found growing in calcareous fens, moist meadows, thickets, and roadsides of the north-central United States (Aspinwall and Christian 1992**,** Rhoads and Klein 1993). This species approaches the eastern extent of its range in Pennsylvania. *Filipendula rubra* reproduces asexually by underground rhizomes and sexually by seed. Individual ramets, or members of a clone

Showy inflorescence of queen-of-the-prairie.
Photo: Robert Bierman, WISFLORA.

(one plant with many individual shoots), grow from one to two meters tall; a single clone may spread over tens of square meters (Aspinwall and Christian 1992). The showy flowers of queen-of-the-prairie make it an attractive garden plant, and a number of nurseries throughout the nation offer it for sale. The population at this site is presumably naturally established but may be an escape from a nearby garden.

Threats and Stresses

In addition to the scarcity of preferred habitat, a principal reason for the rarity of this species is its limited ability to reproduce sexually. *Filipendula rubra* is self-incompatible (Aspinwall and Christian 1992), or in other words, when pollen from one flower of a clone pollinates another flower within the same clone, non-viable seed is most often the result. Because genetically different populations of queen-of-the-prairie tend to be widely separated from one another, cross-pollination does not often occur within this species.

The queen-of-the-prairie at this site could be impacted by activities associated with roadside maintenance such as mowing, herbicide use, or (excessive) use of road salt. Any activities with the potential to alter the hydrology of the immediate area, such as ditching for water control, could also negatively impact the plant.

Conservation Recommendations

Informing road maintenance crews about the presence of queen-of-the-prairie at this site would be a good first step in protecting the plant population. Maintenance activities should be evaluated for their effects on the plants growing near to the road. Upkeep of the roadside should be restricted to mowing. If possible, mowing should not occur until after the plants have flowered and any viable seeds have matured, in order to increase the possibility of a viable seed bank for maintenance or expansion of the population.

Red-waisted whiteface (*Leucorrhinia proxima*)
Photo source: Mike Reese, www.wisconsinbutterflies.org

Mount Alton Wetland CA

This Conservation Area is delineated around a shrub-dominated, beaver-influenced wetland located at the headwaters of an unnamed tributary of Kinzua Creek. The ponded water within the site serves as habitat for **red-waisted whiteface** (*Leucorrhinia proxima*), an imperiled dragonfly species in Pennsylvania, and **American emerald dragonfly** (*Cordulia shurtleffii*), a dragonfly species considered vulnerable in the state. The open sedge meadows and wet grasslands of the wetland support a population of **Silver-bordered fritillary butterfly** (*Boloria selene myrina*).

Odonates have three stages in their life cycle: egg, nymph, and adult. Dragonflies and damselflies typically lay their eggs in water. The red-waisted whiteface and American emerald are pond-breeding odonates that prefer marshy or boggy ponds and lakes. 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).

Threats and Stresses

The rare species at this site appear to be under no imminent threat. However, development, road maintenance, trail expansion or oil and gas exploration could affect the site through siltation or changes in hydrology upslope. The upslope forested areas should also be maintained intact.

Conservation Recommendations

Activities such as road development, timber harvesting, and oil and gas development should be avoided in the vicinity of the wetland. However, if such activities cannot be eliminated, the use of Best Management Practices (BMPs) can prevent or minimize the impact of these activities on the wetland habitat.

Pine Run Roadside CA

This site encompasses roadside habitat occupied by a population of **American feverfew** (*Parthenium integrifolium*). This is the only population that has been documented in Pennsylvania since 1963 (PNDI 2007).

American feverfew is a perennial herb that grows in prairies, rock outcrops, waste places, and roadsides throughout the eastern United States, excepting the extreme north. It has a long history of medicinal use; the Catawba used a poultice of fresh leaves to treat burns and rubbed the ashes of burned leaves on the sore backs of horses (Moerman 1999). The flowering tops were once used to treat intermittent fevers (such as malaria). One study suggests that *P. integrifolium* may stimulate the immune system (Foster and Duke 1990).

Threats and Stresses

This site is located in an area that is primarily residential, and a section of the occupied habitat has been divided into smaller plots for resale. A portion of the American feverfew population extends into a homeowner's lawn and is being mown on a regular basis. In addition, activities associated with roadside maintenance such as mowing, herbicide use, or (excessive) use of road salt may be impacting the population.

American feverfew (*Parthenium integrifolium*).
Photo source: Merel R. Black, WISFLORA.

Conservation Recommendations

Informing the landowners and road maintenance crews about the presence and significance of the American feverfew at this site would be a good first step in protecting the plant population. Maintenance activities should be evaluated for their effects on the plants growing on the road-bank. Upkeep of the roadside should be restricted to mowing. If possible, mowing should not occur until after the plants have flowered and any viable seeds have matured.

Sugar Run CA

This site, located within the Allegheny National Forest, has been designated around sections of headwater stream and adjacent riparian forest habitat that supports populations of 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 and more information on this site can be found on page 70.

LIBERTY TOWNSHIP & PORT ALLEGHANY BOROUGH

	PNDI Rank*		State Legal Status*	Last Observed	Quality*
	Global	State			
NATURAL HERITAGE AREAS:					
Allegheny Portage Creek Conservation Area	*Exceptional Significance*				
American brook lamprey (*Lampetra appendix*)	G4	S3	PC	2005	E
Long-solid mussel (*Fusconaia subrotunda*)	G3	S1	PE	2005	E
Round pigtoe mussel (*Pleurobema sintoxia*)	G4	S2	PE	2005	E
Sensitive species of concern 1	-	-	-	2005	E
Sensitive species of concern 2	-	-	-	2005	E
Sensitive species of concern 3	-	-	-	2005	E

*Please refer to Appendix III (pg. 163) for an explanation of Element Ranks, Legal Status, and Quality Ranks.

McKean County
Natural Heritage Inventory

Liberty Township
&
Port Allegheny Borough

Conservation Areas:

Allegheny Portage Creek

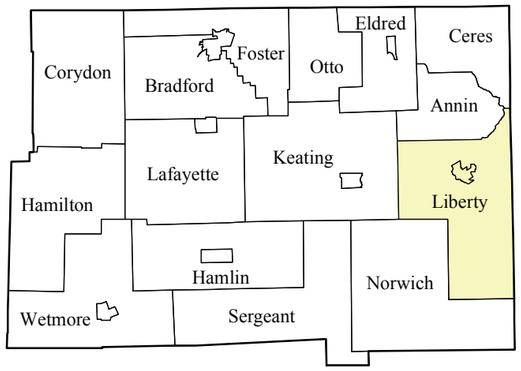
Landscape Conservation Areas:

Keating Summit
Lookout Mountain
Potato Creek
Upper Allegheny River

Public Lands:

State Game Lands 59
State Game Lands 61

County Overview



Conservation Area (CA)

Core Habitat
Supporting Landscape

Other Areas

Landscape Conservation Area (LCA)
Allegheny National Forest
State Lands
40 ft. Contour Interval

Pennsylvania Natural Heritage Program

Scale 1:78,000
0 0.5 1 2 3 Kilometers
0 0.5 1 2 Miles

LIBERTY TOWNSHIP & PORT ALLEGHANY BOROUGH

Liberty Township, one of the larger townships in McKean County, borders Potter County to the east. Located almost entirely within the watershed of the Allegheny River, the township is primarily drained by Allegheny Portage Creek and the Allegheny River. The forests within the Liberty Township are largely contiguous; approximately 79 percent of the township is forested, with 73 percent of that being interior forest.

The borough of Port Alleghany lies within the boundaries of Liberty Township, along the Allegheny River, just downstream of its confluence with Allegheny Portage Creek. Port Alleghany, known as Canoe Place prior to 1840, once served as the launching point for canoe travel down the Allegheny River by travelers coming from the east (Leeson 1890, Stone 1926). As with any population center located along a major waterway, appropriate management of storm-water and sewage to minimize impacts to area streams should be of primary importance to borough administrators.

Allegheny Portage Creek CA

This Conservation Area is delineated around aquatic habitat within Allegheny Portage Creek, the Allegheny River, and several of their tributaries. The Upper Allegheny River Landscape Conservation Area (LCA) functions as supporting landscape for the aquatic-based Conservation Area within its boundaries (see page 40 for further discussion of the LCA). There are numerous individual collection locations for each of the rare species within this site, but they form a single population. Because of collection pressure or sensitivity to disturbance some species present at this site remain unnamed in this report at the request of the jurisdictional agencies.

long-solid mussel (*Fusconaia subrotunda*)
photo source Western Pennsylvania Conservancy

American brook lamprey (*Lampetra appendix*) is a species currently under consideration for listing as rare by the Pennsylvania Biological Survey. The American brook lamprey requires cool, clear water and inhabits large creeks and small to medium rivers where adults can be found in riffles with a gravel or sand substrate, while juveniles inhabit sandy or silty pools (Page and Burr 1991). This species has a complex life cycle that includes an extended larval stage before transformation into an adult stage. Eggs 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. The adult does not feed, and immediately begins spawning, with death following shortly thereafter (NatureServe 2007).

The streams within the CA serve as habitat for **sensitive species of concern 1, sensitive species of concern 2, sensitive species of concern 3**, **round pigtoe mussel** (*Pleurobema sintoxia*), **elktoe mussel** (*Alasmidonta marginata*), and **long-solid mussel** (*Fusconaia subrotunda*), as well as the American brook lamprey mentioned above.

Sensitive species of concern 1 was documented within the site. The range of this species extends from New York and Pennsylvania west through Missouri and Minnesota to Colorado and Wyoming. In Pennsylvania, it occurs only within the upper Allegheny watershed. Habitat for sensitive species of concern 1 includes runs and pools of shallow open headwaters, creeks, and small to medium rivers with substrates predominantly composed of sand, often overlain with silt. This species is primarily an insectivore, but also feeds on plant material and detritus.

Sensitive species of concern 2, occurs throughout the site. Within Pennsylvania, sensitive species of concern 2 occurs only within the upper reaches of the Allegheny River and Lake Erie. This species prefers the deep, cool water of lakes and large rivers, where it typically hides among bottom structures during the day and emerges to feed at night. Immature individuals favor gravelly substrate where they feed on macroinvertebrates, while adults tend to remain in deep water and prey on fish. Sensitive species of concern 2 is one of the few Pennsylvania species that reproduces during the winter.

Sensitive species of concern 3 occurs primarily in the Ohio River basin, extending into the lower Great Lakes basin and upper St. Lawrence drainages. It also occurs in southeastern Kansas, southwestern Missouri, eastern Oklahoma, Arkansas and northern Louisiana. Although the range of sensitive species of concern 3 is large, this species often occurs in isolated populations. In Pennsylvania, it is known from Lake Erie and its larger tributaries, and the upper part of the Allegheny River drainage. This species inhabits large clean streams and rivers with moderate current and bottoms consisting of large rocks, fine gravel, and sand. Reproduction takes place from spring to mid-summer. Males select and establish small territories downstream from large stones scattered over a clean sand-small gravel bottom. Females move into these territories, burrow into the gravel behind each stone, and spawn here with various males. Small numbers of eggs are deposited and fertilized with each spawning, until up to 400 eggs are laid. This species feeds on small aquatic insect larvae, as well as algae and organic detritus.

Round pigtoe, elktoe, and long-solid are Pennsylvania freshwater mussel species of concern that are found in the Upper Mississippi River drainage, from Ontario and New York south to Oklahoma and Alabama. In Pennsylvania, they are found in the Ohio River drainage (NatureServe 2007).

Freshwater mussels like the long-solid, are primarily found in streams and are filter feeders that spend their adult lives in the substrate of stream or lake bottoms. Movement is accomplished either by means of a muscular foot or flood currents. A mussel filters oxygen and particulate matter from the water column by continuously siphoning water through its body. They feed on suspended organic matter, including detritus and plankton. Mussels have a rather complex life cycle involving four stages. The cycle begins when males release sperm into the water column. As the sperm passively drifts with the current, it may enter females when they are siphoning and consequently fertilize their eggs. During the second stage, the fertilized eggs develop into larvae called glochidia. The glochidia are microscopic and are held in the female's gills for future release into the water column. They must attach to the gills or fins of a suitable host fish in order to survive once the female releases them. Once a glochidium attaches to a host, it remains for a period of days or months, depending upon the species, as it transforms into a juvenile mussel. Following the transformation the juvenile releases from the host and sinks to the stream bottom. If the juvenile is lucky, it lands in suitable substrate where it feeds and grows into an adult (Cordeiro and Bowers-Altman [no date]). Because mussels are dependent upon good water quality, physical habitat conditions and an environment that will support populations of host fish, they are considered good indicators of the health of aquatic ecosystems. (Please refer to page 63 for a further discussion of freshwater mussel conservation.)

Mussel displaying to attract host fish. Note the fish-like lure.
Photo source: Tam Smith (WPC)

Threats and Stresses

All the rare species occurring within this Conservation Area are dependent upon high-quality stream habitat for their continued success; each of these species are particularly vulnerable to siltation within riffle and run habitats. Runoff from dirt and gravel roads in close proximity to streams can contribute to physical degradation of stream channels and erosion and pollution of in the streams. Loss of forest cover within riparian zones may also result in increased water temperatures and disruption of natural nutrient cycling linked to streams (see page 43 for a discussion of how riparian buffers function to protect water quality). 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, road construction, and oil and gas 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 (http://pubs.cas.psu.edu/FreePubs/pdfs/uh090.pdf) or through Penn State, for guidelines aimed at minimizing impacts due to timber harvesting.

NORWICH TOWNSHIP

	PNDI Rank*		State Legal Status*	Last Observed	Quality*
	Global	State			
NATURAL HERITAGE AREAS:					
Havens Run Conservation Area			*High Significance*		
American brook lamprey (*Lampetra appendix*)	G4	S3	PC	2002	E
Keating Summit Conservation Area			*Notable Significance*		
Sensitive species of concern 10	-	-	-	2006	E
Potato Creek Conservation Area			*Exceptional Significance*		
American brook lamprey (*Lampetra appendix*)	G4	S3	PC	2005	E
Ohio lamprey (*Ichthyomyzon bdellium*)	G3G4	S2S3	PC	1993	B
Sensitive species of concern 2	-	-	-	2002	E
Sensitive species of concern 3	-	-	-	1985	BC

*Please refer to Appendix III (pg. 163) for an explanation of Element Ranks

McKean County
Natural Heritage Inventory

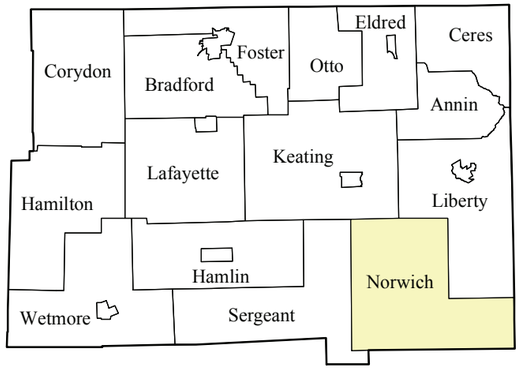
Norwich Township

Conservation Areas:
- Havens Run
- Keating Summit
- Potato Creek

Landscape Conservation Areas:
- Elk River
- Keating Summit
- Potato Creek
- Upper Allegheny River

Public Lands:
- Elk State Forest
- State Game Lane 30
- Susquehannock State Forest

County Overview



Conservation Area (CA)
- Core Habitat
- Supporting Landscape

Other Areas
- Landscape Conservation Area (LCA)
- Allegheny National Forest
- State Lands
- 40 ft. Contour Interval

Pennsylvania Natural Heritage Program

Scale 1:68,000
0 0.5 1 2 3 Kilometers
0 0.5 1 2 Miles

NORWICH TOWNSHIP

Norwich Township forms the southeast corner of McKean County, bordering Potter County to the east and Cameron County to the south. The Eastern Continental Divide passes through the southeastern portion of the township, defining the separation between the Susquehanna River drainage to the east and the Allegheny River drainage to the west. Roughly 89 percent of Norwich Township is forested, making it the second-most heavily forested township in the county.

Havens Run CA

This Conservation Area is delineated around a headwater stream above Potato Creek and supports **American brook lamprey** (*Lampetra appendix*), a species currently under consideration for listing as rare by the Pennsylvania Biological Survey. For further discussion of this species and its habitat requirements along with descriptions of the threats and conservation recommendations for the site please read the Potato Creek CA site description below.

Potato Creek CA

This Conservation Areas is delineated around aquatic habitat within Potato Creek and several of its tributaries. The Potato Creek Landscape Conservation Area (LCA) functions as supporting landscape for the aquatic-based Conservation Area within its boundaries (see page 40 for further discussion of the LCA). Because this site is linked by flowing water, each of the rare species within the site may well be a member of a single population extending throughout the Potato Creek system within Norwich and Keating Townships. Because of collection pressure or sensitivity to disturbance some species present at this site remain unnamed in this report at the request of the jurisdictional agencies.

American brook lamprey (*Lampetra appendix*), a species currently under consideration for listing as rare by the Pennsylvania Biological Survey, has been documented in the Conservations Area.

Potato Creek
Photo source: Western Pennsylvania Conservancy

The American brook lamprey requires cool, clear water and inhabits large creeks and small to medium rivers where adults can be found in riffles with a gravel or sand substrate, while juveniles inhabit sandy or silty pools (Page and Burr 1991). This species has a complex life cycle that includes an extended larval stage before transformation into an adult stage. Eggs 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. The adult does not feed, and immediately begins spawning, with death following shortly thereafter (NatureServe 2007).

Sensitive species of concern 2, a species imperiled in Pennsylvania, occurs within the site. Within Pennsylvania, sensitive species of concern 2 occurs only within the upper reaches of the Allegheny River and Lake Erie. This species prefers the deep, cool water of lakes and large rivers, where it typically hides among bottom structures during the day and emerges to feed at night. Immature individuals favor gravelly substrate where they feed on

macroinvertebrates, while adults tend to remain in deep water and prey on other fish. Sensitive species of concern 2 is one of the few species in Pennsylvania to reproduce during the winter.

Sensitive species of concern 3 occurs primarily in the Ohio River basin, extending into the lower Great Lakes basin and upper St. Lawrence drainages. It also occurs in southeastern Kansas, southwestern Missouri, eastern Oklahoma, Arkansas and northern Louisiana. Although the range of sensitive species of concern 3 is large, this species often occurs in isolated populations. In Pennsylvania, it is known from Lake Erie and larger tributaries, and the upper part of the Allegheny River drainage. This species inhabits large clean streams and rivers with moderate current and bottoms consisting of large rocks, fine gravel, and sand. Reproduction takes place from spring to mid-summer. Males select and establish small territories downstream from large stones scattered over a clean sand-small gravel bottom. Females move into these territories, burrow into the gravel behind each stone, and spawn here with various males. Small numbers of eggs are deposited and fertilized with each spawning, until up to 400 eggs are laid. This species feeds on small aquatic insect larvae, as well as algae and organic detritus.

Ohio lamprey (*Ichthyomyzon bdellium*), a fish species under consideration by the Pennsylvania Biological Survey for listing as rare, has been documented in Potato Creek. The range of this species extends from the Ohio River basin from southwestern New York to Indiana and Alabama. The Ohio lamprey is a fish that primarily inhabits clean, moderate to large streams of the Upper Allegheny River system. They have a complex life cycle that includes an extended larval stage before transformation into an adult stage. Eggs are laid in depressions among gravel and rocks. Once the larvae hatch, they burrow into beds of mixed sand and organic debris in pools and backwaters, where they feed particulate plant and animal matter. The larval stage may last from five to seven years. During the transformation to adult stage, the larvae develop a complete digestive tract and a toothed mouth disc. The young, still immature lamprey then disperse downstream into larger waters, where they attach themselves to suckers, bass, walleye, and other fishes. After feeding and growing for another year, the fully-grown, sexually mature adults then return upstream to spawning sites (PA DCNR no date [c]).

Ohio lamprey (*Ichthyomyzon bdellium*)
Photo source: Steve Grund (PNHP)

Threats and Stresses

The rare species occurring within this Conservation Area are dependent upon high-quality stream habitat for their continued success; all of these species are particularly vulnerable to siltation within riffle and run habitats. Runoff from dirt and gravel roads in close proximity to streams can contribute to physical degradation of stream channels, erosion, and pollution of in the streams. Loss of forest cover within riparian zones may also result in increased water temperatures and disruption of natural nutrient cycling linked to streams (see page 43 for a discussion of how riparian buffers function to protect water quality). 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, road construction, and oil and gas 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 (http://pubs.cas.psu.edu/FreePubs/pdfs/uh090.pdf) or through Penn State, for guidelines aimed at minimizing impacts due to timber harvesting.

Keating Summit CA

This Conservation Areas is delineated around a patch of rocky habitat created by a road cut through a forested landscape that is occupied by sensitive species of concern 10. The forest along this roadcut is deciduous with sugar maple (*Acer saccharum*) and American basswood (*Tilia americana*) as dominate components. Striped maple (*Acer pensylvanicum*) is dominant in the understory and herbs are sparse. The surrounding landscape is extensive forest, both public and private, with a few agricultural fields in the northeast section of the site. Three-quarters of the site is within the Susquehannock State Forest.

The species inhabits steep, rocky, forested slopes of deciduous and mixed forest with a well-developed understory. The species limited range extends from the Allegheny Plateau in western Pennsylvania through the Laurel Highlands to western Maryland and West Virginia. Eighty percent of the subspecies range is within Pennsylvania (PA Game Commission 2005). It is considered a vulnerable species in the Commonwealth.

Threats and Stresses

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

Conservation Recommendations

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

Forested riparian habitat, McKean County
Photo source: Western Pennsylvania Conservancy

OTTO TOWNSHIP

	PNDI Rank*		State Legal Status*	Last Observed	Quality*
	Global	State			
NATURAL HERITAGE AREAS:					
Upper Knapp Creek Conservation Area			*High Significance*		
Sensitive species of concern 2	-	-	-	1998	E

*Please refer to Appendix III (pg. 163) for an explanation of Element Ranks

Upper Knapp Creek, near Prentisvale

Photo source: Jim Clark

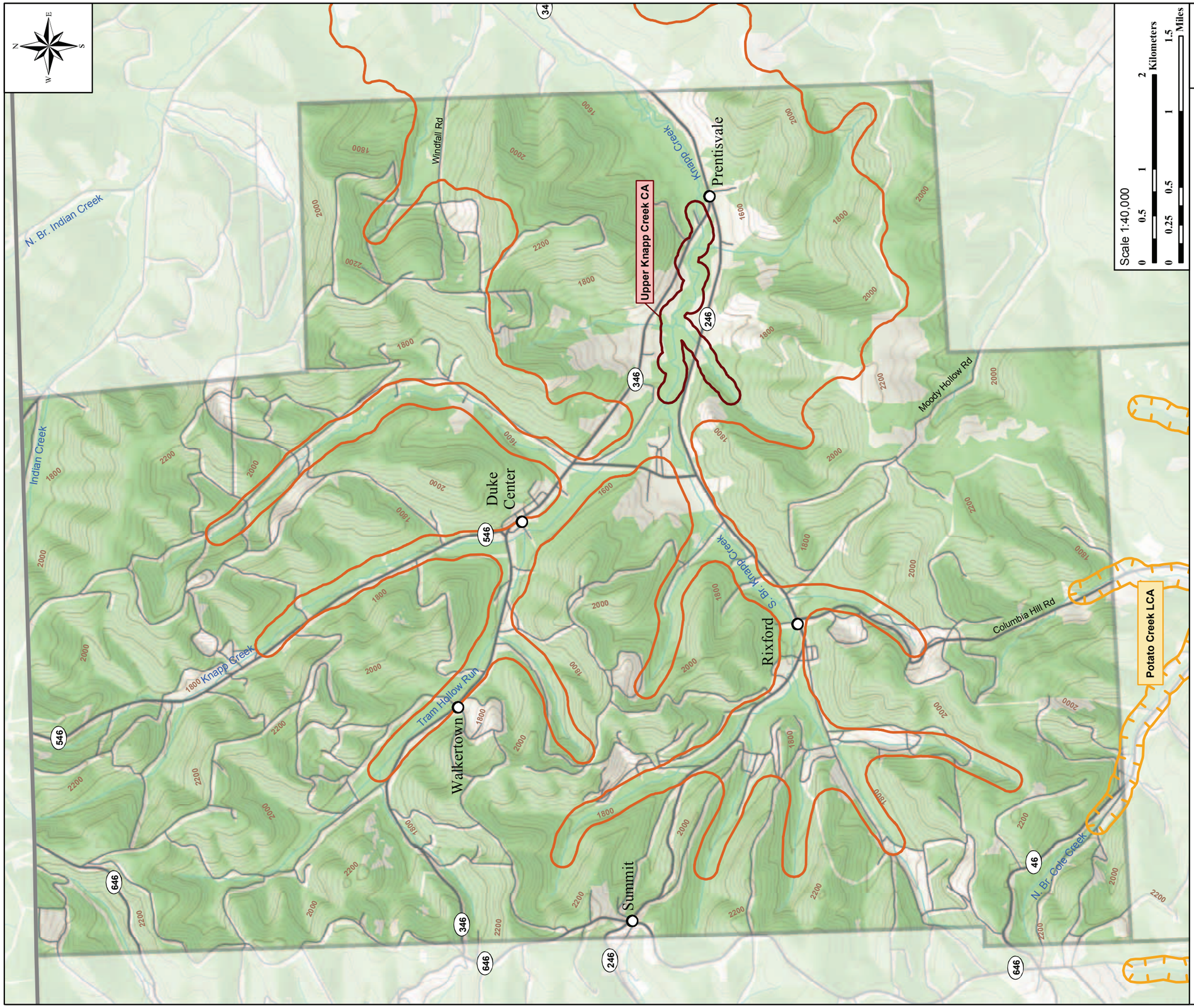
McKean County
Natural Heritage Inventory

Otto Township

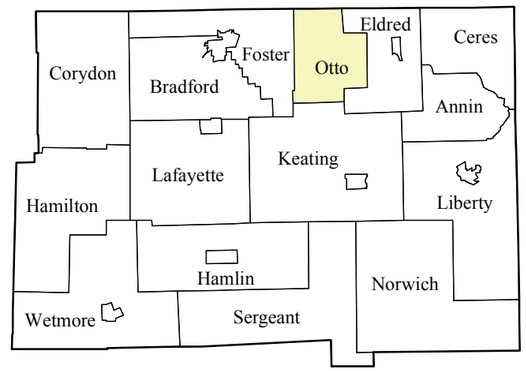
Conservation Areas:
Upper Knapp Creek

Landscape Conservation Areas:
Potato Creek

Public Lands:
none



County Overview



Conservation Area (CA)
- Core Habitat
- Supporting Landscape

Other Areas
- Landscape Conservation Area (LCA)
- Allegheny National Forest
- State Lands
- 40 ft. Contour Interval

PNHP
Pennsylvania Natural Heritage Program

OTTO TOWNSHIP

Otto Township, located between Foster and Eldred Townships, lies along the Pennsylvania/New York state line. It falls almost entirely within the Knapp Creek watershed. Approximately 84 percent of the township is forested, with 58 percent of that being interior forest. The largest concentration of oil and gas development within Otto Township is located northwest of the town of Duke Center, along the ridge separating Knapp Creek and Tram Hollow Run.

Upper Knapp Creek CA

This site encompasses a section of Knapp Creek that supports a population of **sensitive species of concern 2**, a species considered imperiled in Pennsylvania. This Conservation Area shares a supporting landscape with the Lower Knapp Creek CA in Eldred Township. The supporting landscape extends upstream for five kilometers from the boundary of the upstream-most core habitat, and captures the viewshed of Knapp Creek within and between the core habitats, as well as the riparian zones of the creek and its tributaries beyond the viewshed.

Other species observed within this site include greenside darter (*Etheostoma blennioides*), northern hog sucker (*Hypentelium nigricans*), river chub (*Nocomis micropogon*), bluntnose minnow (*Pimephales notatus*), rosyface shiner (*Notropis rubellus*), and seven other species of darter (*Etheostoma* spp., *Percina maculata*) – indicators species for a warmwater stream community within the Ohio-Great Lakes Basins in Pennsylvania (Walsh et al. 2007b). This community type occurs in medium to large watersheds. On the Allegheny Plateau, this community type can be found in streams at relatively high elevations and with intermediate alkalinity (79 mg/l) and conductivity (375 µS/cm) values and slightly basic pH values (~ 7.4) relative to the waters that other communities inhabit (Walsh et al. 2007b). Warmwater temperatures are also characteristic of this community group. Fish occurring within the warmwater stream community are habitat generalists and have higher thermal tolerances than those fish found in cold and coolwater communities (Walsh et al. 2007b).

Within Pennsylvania, sensitive species of concern 2 occurs only within the upper reaches of the Allegheny River and Lake Erie. This species prefers the deep, cool water of lakes and large rivers, where it typically hides among bottom structures during the day and emerges to feed at night. Immature individuals favor gravelly substrate where they feed on macroinvertebrates, while adults tend to remain in deep water and prey on fish. Sensitive species of concern 2 is one of the few Pennsylvania species that reproduces during the winter.

Threats and Stresses

As with all aquatic species, maintaining suitable stream habitat is key to the continued success of sensitive species of concern 2 within this site. Runoff from dirt and gravel roads in close proximity to streams can contribute to physical degradation of stream channels and erosion and sediment pollution in streams. Loss of forest cover within the core areas would likely result in physical degradation of the stream channels, erosion and sediment pollution in the streams, higher 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 (see page 43 for a discussion of how riparian buffers function to protect water quality). Timbering, road construction, and oil and gas 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 *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.

SERGEANT TOWNSHIP

	PNDI Rank*		State Legal Status*	Last Observed	Quality*
	Global	State			
NATURAL HERITAGE AREAS:					
Burning Well Conservation Area		*High Significance*			
Balsam poplar (*Populus balsamifera*)	G5	S1	PE	2005	CD
Cathrine Swamp Conservation Area		*Exceptional Significance*			
American emerald dragonfly (*Cordulia shurtleffii*)	G5	S3S4	-	2006	E
Comet darner dragonfly (*Anax longipes*)	G5	S1S2	-	2005	E
Creeping snowberry (*Gaultheria hispidula*)	G5	S3	PR	2007	AB
Crimson-ringed whiteface dragonfly (*Leucorrhinia glacialis*)	G5	S3S4	-	2006	E
Harpoon clubtail dragonfly (*Gomphus descriptus*)	G4	S1S2	-	2006	E
Red-waisted whiteface dragonfly (*Leucorrhinia proxima*)	G5	S2	-	2006	AB
Silver-bordered fritillary butterfly (*Boloria selene myrina*)	G5	S1S3	-	2006	E
Ski-tailed emerald dragonfly (*Somatochlora elongata*)	G5	S2	-	2005	E
Wiegand's sedge (*Carex wiegandii*)	G3	S1	PT	2007	A
Elk State Forest Conservation Area		*High Significance*			
Case's ladies'-tresses (*Spiranthes casei*)	G4	S1	PE	2003	B
Hutchins Conservation Area		*High Significance*			
Sensitive species of concern 4	-	-	-	2006	E
Midmont Swamp Conservation Area		*Exceptional Significance*			
Bog sedge (*Carex paupercula*)	G5	S3	PT	1986	B
Creeping snowberry (*Gaultheria hispidula*)	G5	S3	PR	1986	AB
Hemlock palustrine forest community	-	S3	-	1986	E
Northern harrier (*Circus cyaneus*)	G5	S3B	CA	2005	E
Sensitive species of concern 9	-	-	-	2005	E
Wiegand's sedge (*Carex wiegandii*)	G3	S1	PT	1986	A

*Please refer to Appendix III (pg. 163) for an explanation of Element Ranks

McKean County
Natural Heritage Inventory

Sergeant Township

Conservation Areas:

Burning Well
Cathrine Swamp
Elk State Forest
Hutchins
Midmont Swamp

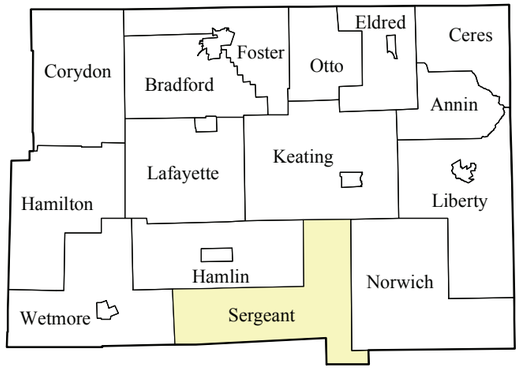
Landscape Conservation Areas:

Elk River
Potato Creek

Public Lands:

Elk State Forest

County Overview



Conservation Area (CA)

Core Habitat
Supporting Landscape

Pennsylvania Natural Heritage Program

Other Areas

Landscape Conservation Area (LCA)
Allegheny National Forest
State Lands
40 ft. Contour Interval

Scale 1:80,000
0 0.5 1 2 3 Kilometers
0 0.5 1 2 Miles

SERGEANT TOWNSHIP

Sergeant Township, located on the southern edge of McKean County, shares a boundary with Elk County. Elk State Forest, totaling 2,813 acres, comprises the only public lands within the township. A large number of the headwater streams in Sergeant Township flow southward through narrow forested valleys before entering the east and west branches of the Clarion River. Approximately 87 percent of the township is forested, with 70 percent of that being interior forest. Oil and gas development is concentrated in the northern arm of the township, in the vicinity of the headwaters of Robbins Brook.

Burning Well CA

This Conservation Area is designated around a small stand of **balsam poplar** (*Populus balsamifera*), a plant species of concern in Pennsylvania. Balsam poplar is a short-lived, fast-growing tree that is most typically found in flood plains. It is the northernmost occurring American hardwood with a range into northern Canada, and approaches the southern limit of its range in Pennsylvania (Burns and Honkula 1990). Other names this species is commonly known by are balm-of-Gilead, cottonwood, and heartleaf balsam poplar. The buds contain a waxy resin with a long history of use as a folk medicine. Native Americans used the resin to treat sore throats, coughs, lung pain, and rheumatism. An ointment known as Balm of Gilead was made from the winter buds to relieve congestion. Bees also collect this resin and use it to seal off intruders, such as mice, which might introduce pathogens and infect the hive (Rook 2002).

Within this site, balsam poplar is growing in a seepy area in an abandoned orchard/old field thicket adjacent to Sicily Run. Tree and shrub species growing along with the balsam poplar include trembling aspen (*Populus tremuloides*), black cherry (*Prunus serotina*), serviceberry (*Amelanchier* sp.), willow (*Salix* sp.), witch-hazel (*Hamamelis virginiana*), American elderberry (*Sambucus canadensis*), and apple (*Malus pumila*). Wrinkle-leaf goldenrod (*Solidago rugosa*) and flat-topped white aster (*Doellingeria umbellata* var. *umbellata*) dominate the herbaceous layer.

Resinous bud of balsam poplar
Photo source: Dave Hanson

Threats and Stresses

The stand of balsam poplar at this site appears to be under no imminent threat.

Conservation Recommendations

Any activities that might alter the hydrology, such as ditching or deposition of fill material, should be avoided within this site.

Cathrine Swamp CA

Cathrine Swamp, an extensive, beaver-influenced wetland complex from which Fivemile Run originates, provides habitat for two plant, six dragonfly, and one butterfly species of special concern. The supporting landscape extends to the boundary of the immediate watershed draining into the wetland.

The wetland is a mosaic of sedge meadow, shrub thickets, *Sphagnum* lawn, open-canopy hemlock – white pine swamp woodland, and ponded water that covers more than 150 acres. Dense thickets of speckled alder (*Alnus incana*), with-red (*Viburnum nudum. var. cassinoides*), northern arrow-wood (*V. recognitum*), and mountain holly (*Nemopanthus mucronatus*) surround much of the wetland and fill much of the central portion of the wetland above a beaver impoundment. Below the impoundment, an open grass-sedge meadow with scattered patches of shrubs dominates the wetland. Decaying stumps indicate that the lower portion of the wetland was logged at some point in the past. Near the center of the wetland complex, along the north and south edges, are *Sphagnum*

lawns with the characteristic pit-and-mound microtopography that support a population of **silver-bordered fritillary** (*Boloria selene myrina*), and robust populations of **Wiegand's sedge** (*Carex wiegandii*) and **creeping snowberry** (*Gaultheria hispidula*—see fact sheet on page 83). Plant species occurring in the open bog include hemlock (*Tsuga canadensis*), cinnamon fern (*Osmunda cinnamomea*), swamp dewberry (*Rubus hispidus*), tawny cotton-grass (*Eriophorum virginicum*), bunchberry (*Cornus canadensis*), round-leaved sundew (*Drosera rotundifolia*), bearded shorthusk grass (*Brachyelytrum erectum*), and northern long sedge (*Carex folliculata*). Lowbush blueberry (*Vaccinium angustifolium*) and the occasional swamp azalea (*Rhododendron viscosum*) are restricted to hummocks. The creeping snowberry is restricted to hummocks with dead wood present.

Bunchberry (*Cornus canadensis*) growing in Cathrine Swamp

Photo source: Madeline Miles

Within this site, Fivemile Run is a small brownwater stream that meanders the length of the wetland. Such brownwater streams 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).

Silver-bordered fritillary (*Boloria selene myrina*) is a butterfly species of wet meadows, bogs, and marshes. The males patrol wet areas for females, who lay eggs singly near violets (*Viola* spp.). The caterpillars feed on the leaves of violets; third-stage caterpillars hibernate. The adults feeds on composite flowers, including goldenrod (*Solidago* spp.) and black-eyed-Susan (*Rudbeckia hirta*; Opler et al 2006).

The stream and the beaver pond it flows through provide habitat for the rare dragonflies occupying the wetland. Odonates have three stages in their life cycle: egg, nymph, and adult. Dragonflies and damselflies typically lay their eggs in water. The **comet darner** (*Anax longipes*), **crimson-ringed whiteface** (*Leucorrhinia glacialis*), and **white-faced meadowhawk** (*Sympetrum obtrusum*) are pond-breeding odonates that prefer ponds, lakes, marshes, and occasionally slow-flowing streams. The **harpoon clubtail** (*Gomphus descriptus*), **ski-tailed emerald** (*S. elongata*), and **American emerald** (*Cordulia shurtleffii*) typically utilizes small, clear, slow-flowing streams draining open bogs, marshes, or swamps.

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).

Wiegand's sedge (*Carex wiegandii*)

Threats and Stresses

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 all the plant species of concern within the site, as they are best adapted to cooler, more northern climates. Additionally, creeping snowberry appears to have narrow hydrologic requirements typical of those 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 adversely affect the creeping snowberry (Hays 2001).

The westward migration of the hemlock wooly adelgid (Adelges tsugae), currently documented in 49 counties in the eastern two-thirds of Pennsylvania (PA Bureau of Forestry 2006), poses a potential threat to the hemlock trees in the region. The hemlock wooly 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.

Conservation Recommendations

Activities such as road development and timber harvesting should be avoided in the core habitat. However, if such activities cannot be eliminated, the use of Best Management Practices (BMPs) can prevent or minimize the impact of these activities on the wetland habitat. Periodic monitoring for hemlock wooly adelgid is recommended.

Elk State Forest CA

This Conservation Area is delineated around a section of abandoned railroad grade in Elk State Forest. The dry, open bank along the old rail bed serves as habitat for a population of **Case's ladies'-tresses** (*Spiranthes casei*), a species of concern in Pennsylvania. This species occurs in Nova Scotia, and in the United States its range extends from Maine to northern Pennsylvania west to Michigan and Wisconsin (Gleason and Cronquist 1991). Globally, *S. casei* is considered apparently secure, but is listed as critically imperiled in Pennsylvania and Vermont. In Pennsylvania, this species is currently only known to occur in McKean County (NatureServe 2007).

Case's ladies'-tresses, a member of the orchid family, was only recognized as a separate species in 1974 (Catling and Cruise 1974). Prior to that, it was identified as *S. cernua*, the more common nodding ladies'-tresses. Case's ladies'-tresses is a colonizer of disturbed sites, where it grows in dry, open, sandy soil (Rhoads and Klein 1993, Rhoads and Block 2000). In McKean County, this species is most often found growing along railroad grades where the herbaceous layer is relatively sparse.

Threats and Stresses

Threats to this species are poorly known. Succession of the occupied habitat from a disturbed, sparsely vegetated to a more densely vegetated state would likely result in the disappearance of Case's ladies-tresses from this site.

Conservation Recommendations

The current conditions within the site are compatible with maintaining this population.

Hutchins CA

The upland forest within the core of this Conservation Area supports a nesting colony of **sensitive species of concern 4**, a species of conservation concern. In Pennsylvania, this species experienced a severe decline during the first half of the twentieth century, but has made a remarkable comeback in recent decades. Acid mine drainage (AMD), which kills fish and other aquatic organisms, may have adversely affected this species in the past. Recent efforts to mitigate the effects of AMD across the state have likely helped restore life to some of these previously disturbed aquatic habitats.

Threats and disturbances

Timber harvesting is a serious potential threat to nesting colonies of sensitive species of concern 4. This species is sensitive to disturbance, including casual visitation that occurs within a few hundred meters from their location. Any human activities that occur frequently or continuously within the CA stands to impact these animals. Removal of trees, living or dead, may eliminate valuable habitat essential to this species.

Conservation recommendations

The core habitat within this site should be protected from disturbance by respecting an undisturbed forested buffer of 500 meters around the nest colony. Any logging or heavy equipment operations in the vicinity of the colony should be scheduled to occur in the fall and early winter to avoid the early spring and summer nesting activities of this species.

Midmont Swamp CA

The core of this Conservation Area is an extensive wetland complex covering approximately 18 hectares (44 acres) previously surveyed by the Western Pennsylvania Conservancy in 1986. The wetland is a mosaic of **hemlock palustrine forest**, with scattered shrub-dominated openings and ponded water that provides habitat for three plant species of special concern: N**orthern Harrier** (*Circus cyaneus*), **sensitive species of concern 9**, **bog sedge** (*Carex paupercula*), **Wiegand's sedge** (*Carex wiegandii*), and **creeping snowberry** (*Gaultheria hispidula*—see fact sheet on page193). The supporting landscape extends to the boundary of the immediate watershed draining into the wetland. The watershed is predominantly forested and lies entirely within private lands.

Bog sedge (Carex paupercula)
Photo source: Svein Astrom

The wetland occurs in the relatively high–elevation basin from which Swamp Creek originates. The underlying and surrounding bedrock is principally sandstone and conglomerate, and thus contributes little mineral enrichment to the soil. Acid mine drainage from nearby reclaimed strip mines may contribute to the acidity of the wetland; the vegetation suggests the wetland is acidic and nutrient-poor. State Route 2001 roughly bisects the wetland, and a pipeline cuts across the wetland south of the road. Beaver activity has created a large pond south of the road. Aerial photos indicate that sometime in the past, portions of the wetland have been ditched in the vicinity of the road, both to the north and the south.

Sphagnum and *Polytrichum* mosses are prevalent throughout the wetland; most of the area contains a typical suite of acid-loving wetland species, with small clumps of cinnamon fern (*Osmunda cinnamomea*) and low shrubs occupying hummocks. Shrub species include: black chokecherry (*Aronia sp.*), sweet low blueberry (*Vaccinium angustifolium*), inkberry (*Nemopanthus mucronatus*), northern arrow-wood (*Viburnum recognitum*), and steeplebush (*Spiraea tomentosa*). The open canopy is dominated by white pine, with hemlock present to a somewhat lesser degree, and red maple occupying a significant portion of the understory. Herbaceous species include: rushes (*Juncus effusus*), swamp dewberry (*Rubus hispidus*), cottongrass (*Eriophorum virginicum*), wool-grass (*Scirpus cyperinus*), three-way-sedge (*Dulichium arundinacea*), and a number of sedges (*Carex gynandra, C. folliculata, C. trisperma, C. lurida, C. scoparia*). A robust population of bog sedge forms a continuous stand on a sphagnum lawn north of the road. Wiegand's sedge occurs within open-canopy seeps and on saturated sphagnum lawns near the northern and southern boundaries of the swamp. Creeping snowberry typically grows on hummocks with dead wood present, in open-canopy sphagnous wetlands with a pit-and-mound microtopography.

The northern harrier and sensitive species of concern 9 are using adjacent grasslands and are likely also present within the wetland. Both species require a combination of open grassland/prairie habitat in association with wetter wet meadow habitat with the northern harrier also using herbaceous wetlands.

Threats and Stresses

The westward migration of the hemlock wooly adelgid (*Adelges tsugae*), currently documented in 42 counties in the eastern two-thirds of Pennsylvania (PA Bureau of Forestry 2006), poses a potential threat to the hemlock trees in the region. The hemlock wooly 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.

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 all the plant species of concern within the site, as they are best adapted to cooler, more northern climates. Additionally, creeping snowberry appears to have narrow hydrologic requirements typical of those 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 adversely affect the creeping snowberry (Hays 2001).

Conservation Recommendations

Activities such as road development and timber harvesting should be avoided in the vicinity of the wetland. However, if such activities cannot be eliminated, the use of Best Management Practices (BMPs) can prevent or minimize the impact of these activities on the wetland habitat. Periodic monitoring for hemlock wooly adelgid is recommended, as well as further surveys to document amphibian and insect species utilizing the wetland.

WETMORE TOWNSHIP & KANE BOROUGH

	PNDI Rank*		State Legal Status*	Last Observed	Quality*
	Global	State			
NATURAL HERITAGE AREAS:					
Crane Run Conservation Area			*High Significance*		
American brook lamprey (*Lampetra appendix*)	G4	S3	PC	2005	E
Ocellated darner dragonfly (*Boyeria grafiana*)	G5	S3	-	2003	B
Kinzua Creek Conservation Area			*Exceptional Significance*		
American brook lamprey (*Lampetra appendix*)	G4	S3	PC	1999	AB
Harpoon clubtail dragonfly (*Gomphus descriptus*)	G4	S1S2	-	1994	E
Maine snaketail dragonfly (*Ophiogomphus mainensis*)	G4	S3	-	1994	E
Northern pygmy clubtail dragonfly (*Lanthus parvulus*)	G4	S3S4	-	1994	E
Ocellated darner dragonfly (*Boyeria grafiana*)	G5	S3	-	2004	E
Superb jewelwing damselfly (*Calopteryx amata*)	G4	S2S3	-	1994	E
Zebra clubtail dragonfly (*Stylurus scudderi*)	G4	S1	-	1994	E
Martin Run Conservation Area			*High Significance*		
American brook lamprey (*Lampetra appendix*)	G4	S3	PC	2005	E
Pigeon Run Headwater Conservation Area			*Notable Significance*		
Northern myotis bat (*Myotis septentrionalis*)	G4	S3B, S3N	CR	2005	E
South Branch Kinzua Creek Conservation Area			*High Significance*		
American brook lamprey (*Lampetra appendix*)	G4	S3	PC	1999	AB
Swede Hill Conservation Area			*Exceptional Significance*		
Northern pygmy clubtail dragonfly (*Lanthus parvulus*)	G4	S3S4	-	1994	E
Ocellated darner dragonfly (*Boyeria grafiana*)	G5	S3	-	2004	E
Superb jewelwing damselfly (*Calopteryx amata*)	G4	S2S3	-	1994	E
Tionesta Natural Areas Conservation Area			*County Significance*		
Hemlock (white pine) – northern hardwood forest	GNR	S5	-	2006	A

*Please refer to Appendix III (pg. 163) for an explanation of Element Ranks

McKean County
Natural Heritage Inventory

Wetmore Township
&
Kane Borough

Conservation Areas:

Crane Run
Kinzua Creek
Martin Run
Pigeon Run Headwater
South Branch Kinzua Creek
Swede Hill
Tionesta Natural Areas

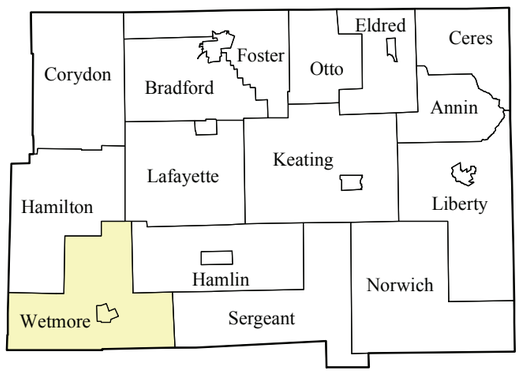
Landscape Conservation Areas:

none

Public Lands:

Allegheny National Forest

County Overview



Conservation Area (CA)

Core Habitat
Supporting Landscape

PNHP
Pennsylvania Natural Heritage Program

Other Areas

Landscape Conservation Area (LCA)
Allegheny National Forest
State Lands
40 ft. Contour Interval

Scale 1:70,000
0 0.5 1 2 3 Kilometers
0 0.5 1 2 Miles

WETMORE TOWNSHIP & KANE BOROUGH

Wetmore Township forms the southwestern corner of McKean County, bordering Warren County to the west and Clarion County to the south. The western two thirds of the township lie within the proclamation boundary of the Allegheny National Forest; public lands comprise 55 percent of the landholdings in the township. Approximately 82 percent of the township is forested, with 65 percent of that being interior forest.

Unlike the other sizable towns within McKean County, Kane is located on a broad plateau rather than along a waterway. Kane is known as the Black Cherry Timber Capital of the World, reflecting the importance of the timber industry to the region.

Kinzua Creek CA

This Conservation Area is discussed under Hamilton Township (page 89). It is designated around a wetland complex that provides habitat for six dragonfly species and one fish species of special concern in Pennsylvania. A forested buffer should be maintained around the wetland in order to preserve the hydrologic conditions supporting the wetland and the rare species it supports.

Crane Run CA
Martin Run CA
South Branch Kinzua Creek CA
Swede Hill CA

The stream sections within the core habitats of the Crane Run CA and South Branch Kinzua Creek CA each support populations of **American brook lamprey** (*Lampetra appendix*), a species currently under consideration for listing as rare by the Pennsylvania Biological Survey.

The core habitat within the Crane Run Conservation Area actually lies within Elk County. The supporting landscape, which extends upstream for five kilometers from the boundary of the core habitat, captures the viewshed of the core habitat and the riparian zone of the main stem of the creek, plus tributaries and their riparian zones, lies partially within Wetmore Township.

The section of South Branch Kinzua Creek within the Swede Hill CA serves as habitat for at least three species of rare, river-breeding odonates: **northern pygmy clubtail** (*Lanthus parvulus*); **ocellated darner** (*Boyeria grafiana*); and **superb jewelwing** (*Calopteryx amata*). Within the core of this site, which begins approximately 0.5 kilometers upstream of the slack-water of Allegheny Reservoir, South Branch Kinzua Creek is a cold, shallow, relatively high gradient creek consisting primarily of stretches of riffles and swift runs, with occasional pools and slower runs. The substrate is a mixture of cobbles and small boulders with small areas of tightly packed gravel. Crane Run CA also supports a population of **ocellated darner** (*Boyeria grafiana*).

South Branch Kinzua Creek CA and Swede Hill CA share a supporting landscape. The supporting landscape extends upstream for five kilometers from the boundary of the upstream-most core habitat, and captures the viewshed of Kinzua Creek within and between the core habitats, as well as the riparian zones of the creek and its tributaries beyond the viewshed.

Dragonflies, as with other members of the order Odonata, have three stages in their life cycle: egg, nymph, and adult. Odonates oviposit their eggs in or near water. The species occurring within this Conservation Area are river-breeding odonates that utilize clear, rapid, rocky streams and rivers with silt-bottomed pools. After the eggs hatch, the nymphs remain in the water through several instars (stages between successive molts of the exoskeleton), feeding on small aquatic organisms until they eventually emerge from the water as terrestrial adults.

American brook lamprey requires cool, clear water and inhabits large creeks and small to medium rivers where adults can be found in riffles with a gravel or sand substrate, while juveniles inhabit sandy or silty pools (Page and

Burr 1991). This species has a complex life cycle that includes an extended larval stage before transformation into an adult stage. Eggs 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. The adult does not feed, and immediately begins spawning, with death following shortly thereafter (NatureServe 2007).

Threats and Stresses

As with all aquatic species, maintaining suitable stream habitat is key to the continued success of the rare species within these sites. Runoff from roads in close proximity to streams can contribute to physical degradation of stream channels, erosion, and sediment pollution in streams. Loss of forest cover within the riparian zone will likely result in physical degradation of the stream channels, erosion and sediment pollution in the streams, higher water temperatures, and disruption of natural nutrient cycling linked to the streams. If forest cover is substantially reduced within the watershed, 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, road construction, and oil and gas 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 watershed 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 ecosystem. Landowners engaged in timber harvesting within the watershed can refer *Best Management Practices for Pennsylvania Forests*, a brochure available online (http://pubs.cas.psu.edu/ FreePubs/pdfs/uh090.pdf) or through Penn State, for guidelines aimed at minimizing impacts due to timber harvesting.

Pigeon Run Headwater CA

This Conservation Area is drawn above Pigeon Run within the Allegheny National Forest around a corridor known to support foraging for **northern myotis bat** (*Myotis septentrionalis*). This bat species spends the winter hibernating in the many caverns of the state. During the summers it frequents wooded streams and trails where it forages, while spending the day roosting in natural cavities and hollow trees. While the relationship of this location to a maternity site or overwintering site is unknown, the multiple individuals captured here show that this population uses the site for foraging.

Threats and Stresses

Potential threats to the site are road creation, oil and gas exploration, and trail expansion. This could disturb both foraging and denning habitat.

Conservation Recommendations

A forest buffer should be maintained where it exists, created where it does not, and monitored for colonization by invasive species. This will maintain “interior” forest around the creek and trails. Additionally, standing deadwood and hollow trees should be left as ideal denning locations.

Tionesta Natural Areas CA

This Conservation Area includes the Tionesta Scenic Area and the Tionesta Research Natural Area within the Allegheny National Forest, which were added to the National Registry of the Natural Landmarks Program in 1973. Combined, these Natural Areas contain a 4,131-acre remnant of old-growth hemlock (white pine) – northern hardwood forest. This is the largest remaining old-growth forest in the mid-Atlantic region.

American beech (*Fagus grandifolia*) and eastern hemlock (*Tsuga canadensis*) are the dominant canopy species within this site. Codominant canopy species include red and sugar maple (*Acer rubrum*, *A. saccharum*), yellow birch (*Betula alleghaniensis*), and black cherry (*Prunus serotina*), and suppressed American beech (*Fagus grandifolia*) and striped maple (*A. pensylvanicum*) make up the understory. Common herbaceous species include northern wood-sorrel (*Oxalis acetosella*), Canada mayflower (*Maianthemum canadense*), jack-in-the-pulpit (*Arisaema triphyllum*), hay-scented fern (*Dennstaedtia punctilobula*), and intermediate wood fern (*Dryopteris intermedia*).

Tionesta Natural Area
Photo source: Rita Hawrot (PNHP)

Old-growth and younger forests typically differ in their age-structure, or the range of tree ages. Due to timber harvesting and subsequent regeneration in any given area, second- and third-growth forests typically have trees that are the same age. In comparison, old-growth forest that has been left in a natural state has trees that span a range of ages. Over time, natural disturbances such as wind, ice storms, insect and disease mortality, and fire result in openings in the canopy where regeneration starts anew, creating a mosaic of different-aged patches and the structural complexity that characterizes old-growth. In 1985, a devastating tornado (based on the Fujito scale) cut a swath nearly a kilometer wide through the northern half of the Tionesta Scenic Area. In 1994, another tornado damaged an area of 3.7 acres in the Tionesta Research Natural Area.

Old-growth forests also serve a number of ecological functions not necessarily filled by second- or third-growth forests. These functions include, but are not limited to: providing habitat for organisms ranging from birds, mammals, amphibians and reptiles, insects, gastropods, plants, fungi, lichens, and microbes; groundwater purification and storage; the formation of optimal forest soils through the accumulation of humus in the upper soil horizons, periodic mixing of horizons by uprooting of trees, and the formation of macropores – linear openings in the soil, having much greater permeability than the surrounding material overlying the bedrock; flood control by means of maximal absorptive capabilities and stream bank stabilization; protecting water quality through prevention of siltation; providing a dependable source of coarse woody debris essential to the functioning of woodland stream ecosystems (Pennsylvania Wildlands Recovery Project 2003).

Threats and Stresses

The westward migration of the hemlock woolly adelgid (*Adelges tsugae*), currently documented in 49 counties in the eastern two-thirds of Pennsylvania including Elk and Cameron (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 drastically altering the species composition of the forest community. As of 2006, the woolly adelgid has been documented in 42 counties in the eastern two-thirds of Pennsylvania (PA Bureau of Forestry 2006).

Eastern hemlock is a long-lived conifer, and its stands form a cool, damp habitat with low light levels in the understory. These dense stands possess a very different microclimate and unique species composition from more

open forests. Hemlock-dominated forests are normally stable and resistant to plant invasions. The loss of *T. canadensis* from such forests can greatly alter the microclimate and soil conditions. Large-scale hemlock die-off affects species diversity, vegetation structure, stand environmental conditions, and ecosystem processes. For example, Ross et al. (2006) suggest that avian biodiversity may be at risk in eastern parks and forests, due to continued expansion of the hemlock woolly adelgid. They found that four insectivorous species, Acadian Flycatcher (*Empidonax virescens*), Blue-headed Vireo (*Vireo solitarius*), Black-throated Green Warbler (*Dendroica virens*), and Blackburnian Warbler (*Dendroica fusca*) are hemlock-associated species at risk from continued hemlock decline in the Delaware River valley and similar forests of the mid-Atlantic east slope. Another study conducted in the Delaware Water Gap looked at the potential long-term impacts of hemlock forest decline on stream benthic macroinvertebrate assemblages. Their results suggest that hemlock decline may result in long-term changes in headwater ecosystems leading to reductions in both within-stream and park-wide benthic community diversity (Snyder et al. 2002). Orwig & Foster (1998) found that light reaching the forest floor through canopy breaks resulting from hemlock mortality led to increased density and average heights of black birch, red maple (*Acer rubrum*), black cherry, and several oak species (*Quercus* spp.). Canopy breaks also facilitated the establishment of invasive species such as Japanese barberry (*Berberis thunbergii*), Asiatic bittersweet (*Celastrus orbiculatus*), tree-of-heaven (*Ailanthus altissima*), and Japanese stilt grass (*Microstegium vimineum*). Hemlock woolly adelgid can disperse easily by wind, birds, mammals, and logging activities (McClure 1990). The rate of hemlock woolly adelgid spread is estimated at 30 km/yr (Orwig and Foster 1998).

Beech bark disease has significantly impacted this site. Beech bark disease refers to a complex that consists of a sap-feeding scale insect and at least two species of Nectria fungi. Beech bark disease begins when American beech becomes infested with beech scale (*Cryptococcus fagisuga* Lind). The tiny scale insects, found on the tree trunk and branches, feed on sap in the inner bark. White wax covers the bodies of the scales, and when trees are heavily infested, they appear to be covered by white wool. Minute wounds and injuries caused by the scale insects eventually enable the Nectria fungus to enter the tree. Nectria kills areas of woody tissue, sometimes creating cankers on the tree stem and large branches. If enough tissue is killed, the tree will be girdled and die. Other trees may linger for several years, eventually succumbing to Nectria or other pathogens. Some infected trees will break off in heavy winds – a condition called "beech snap". Dense thickets of root sprouts are common after trees die or break. Three species of *Nectria* fungi are associated with beech bark disease in North America. *Nectria galligena* is a native pathogen that causes perennial cankers on many hardwood species. It rarely affects beech, however, unless beech scale is present. Another species, *Nectria coccinea var. faginata*, is an exotic pathogen that was introduced from Europe. Often, the native Nectria species is the first to invade trees infested by beech scale, followed by the exotic Nectria species. A third *Nectria* species, *N. ochroleuca*, has been found in association with beech bark disease in Pennsylvania, West Virginia, and Ontario, Canada.

Although high populations of beech scale can weaken a tree, beech bark disease and mortality do not occur until Nectria invades infested trees. This usually happens 3 to 6 years after scales initially infest an area. It can take longer, however, if the area is a long distance from other beeches infected with Nectria, or if the amount of *Nectria* inoculum in the area is low. Once Nectria invasion begins, the largest trees and trees with heavy scale infestations (usually rough-barked trees) are most likely to be killed (McCullough et al. 2000). Shigo (1972, cited in Griffin et al. 2003) described the spread of beech bark disease as occurring in three stages. The “advancing front” consists of rising scale populations and low levels of *Nectria*. The “killing front” follows, characterized by large populations of scale, severe outbreaks of *Nectria* infection, and high beech mortality. Shigo’s final stage, the “aftermath”, consists of evidence of prior mortality, few older trees, and beech thickets made of small trees of sprout origin. The Tionesta Areas are now in the killing front, and have experienced a loss of over 50 percent of mature beech trees over a period of five years.

Conservation Recommendations

Forest managers and researchers are well aware of the impacts of the beech bark disease and the potential impacts of the westward-migrating hemlock wooly adelgid, and are actively monitoring the changes the old-growth forest is undergoing.

CONCLUSION AND GENERAL RECOMMENDATIONS

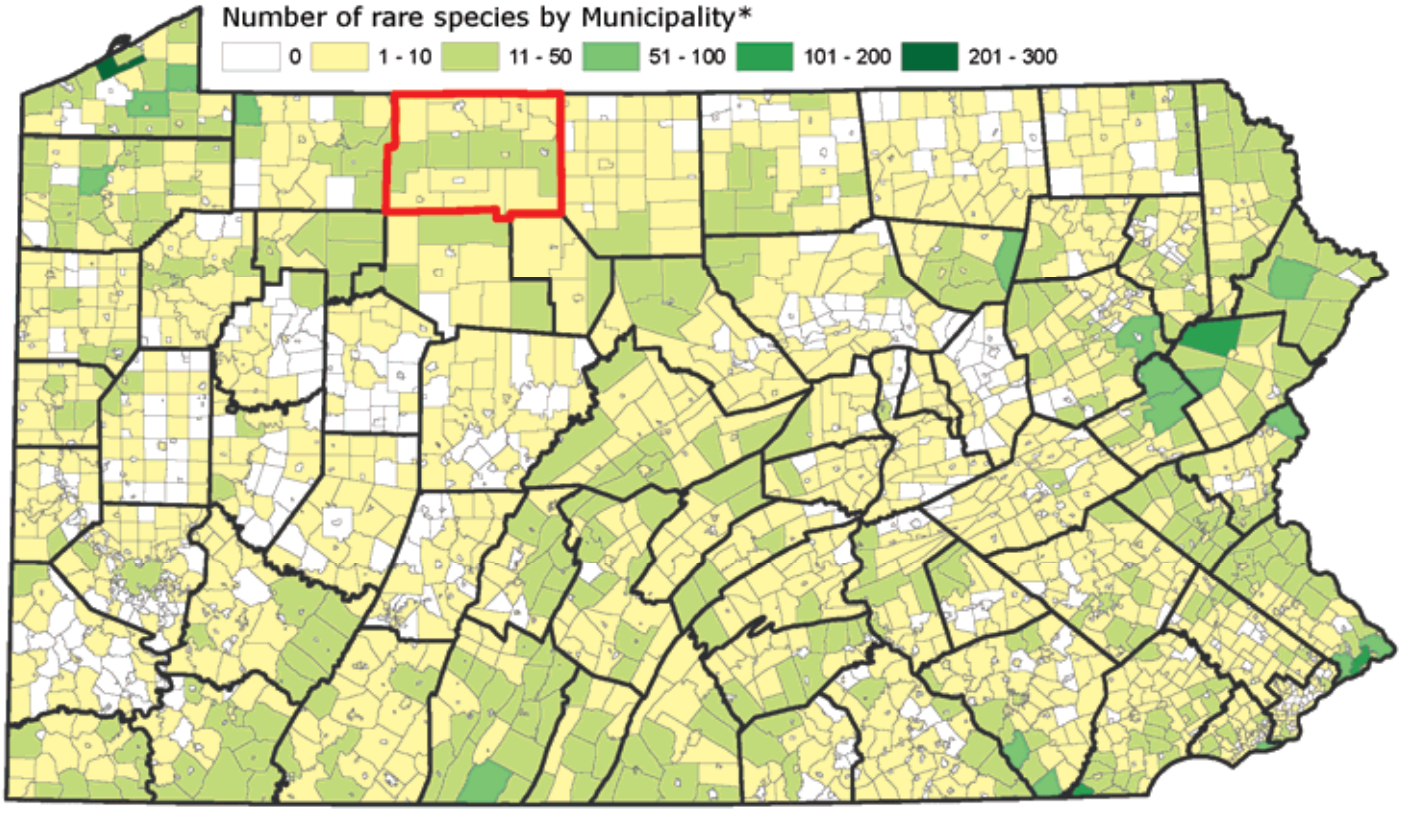
Through the work required to complete the Natural Heritage Inventory (NHI), ecologists, botanists, and zoologists have explored much of the natural areas of McKean County. However, additional explorations of the county will very likely yield additional locations for the species listed in the report as well as species previously unknown to the county. This work represents one of the first organized efforts to inventory the biodiversity present throughout the county. In the surveys conducted through the NHI, we have not only identified rare and endangered plants and animals, but also many common species where no formal record existed in museum and agency records.

McKean County and Regional Biodiversity

An interesting question is '*how does McKean County contribute to the known biodiversity in Pennsylvania?*' McKean County harbors 146 occurrences of endangered, threatened, and rare species of which 18 are historical. Many of these occur within the stream, river, and wetland habitats in the county. Municipal breakdowns of this data are presented in Figure 14.

McKean County contains a number of species that are confined to clean, cool, free-flowing small and mid-sized streams that, once predominating the state, are now exceedingly uncommon. Many of these species are associated with the riparian communities such as American brook lamprey, creek heelsplitter mussel, and northern pygmy clubtail dragonfly. The only known Pennsylvania records of a American feverfew is found in McKean County. Additionally, several globally rare species are found in the unique habitats of McKean County. Two of these species, longhead darter and the long-solid mussel, depend on the county's high quality streams. A breakdown of species by their official state legal status is presented in Table 7.

Figure 14: Distribution of species and communities of species concern by municipality within Pennsylvania.



Future Study and Data Updates

The data presented in this report represents a snapshot of the species and ecological conditions present in the county. Natural systems are constantly changing due to a number of factors including variations in climate as well as impacts from human disturbance. Therefore, this report should be viewed as a snapshot of the current conditions of the county.

Table 7: State status of species of special concern in McKean County

State Status	# of individual occurrences
PA Endangered (PE)	12
PA Threatened (PT)	11
PA Rare (PR)	4
Candidate Species (CP/CR)	8
Tentatively Undetermined (TU)	5
No Legal Status (N)	28

Refer to Appendix III for a description of the state status.

Additionally, lack of access to some sites of interest prevented surveys that may have yielded additional information about the county. A form is presented in Appendix I (pg. 160), which allows people to submit data about potential occurrences of rare species to the Pennsylvania Natural Heritage Program.

Future inventory work in the county could focus on the following areas:

- Little is known about the insects that occur within the county. Additional surveys along riparian corridors, upland forests, wetlands, and other unique habitats may yield additional occurrences and help to fill in data gaps in the distribution of these species.
- Additional surveys for aquatic organisms should be performed on the upper sections of the Allegheny River, Allegheny Portage Creek, and the headwaters of Kinzua Creek.
- The herpetofauna (reptiles and amphibians) present within the county need to have a better, more complete survey.
- The number of bat species present and their prevalence within the county needs to be better examined.

The Pennsylvania Natural Heritage Program can provide the County with formal updates to this report at regular intervals (typically five years). Additionally, PNHP can provide a series of additional biodiversity and conservation planning services to supplement the results of this inventory. Please contact the Pennsylvania Natural Heritage Program for additional information regarding these services.

A Final Note on Protected Rare and Endangered Species

The rare and endangered species in this report are some of the over one-thousand rare species in Pennsylvania that are threatened with extirpation or extinction. There are two strong biological reasons for protecting a species from extinction. The first is that if a species is allowed to go extinct, its ecosystem will have lost a significant element. The second is that endangered species may be indicative of fragile ecosystems that may have become degraded — protection of this species may help monitor the quality of the ecosystem.

Another reason for protecting rare species is for their value as unique genetic resources, with immeasurable scientific and potential economic importance. Every species may provide significant information for future use in genetic research, medical practices, and health care products and industrial processes. Beyond these practical considerations, perhaps the most compelling are the aesthetic and ethical considerations–there is beauty and recreational value inherent in healthy, species-rich ecosystems.

The protection of rare and endangered species depends on several factors including increasing scientific knowledge via concerted efforts by government agencies and private organizations, as well as promoting awareness of the species through public education. The following section outlines several general recommendations as initial steps to protect the species outline in this report.

General 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 sites. 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 a natural heritage area 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 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. This can be a first step to help a landowner decide if they want to pursue more permanent protection methods. Management agreements require landowner and land trust to work together to develop a plan for managing resources such as plant or animal habitat, 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. Pinpoint areas that may be excellent locations for new county or township parks. Sites that can serve more than one purpose such as wildlife habitat, flood and sediment control, water supply, recreation, and environmental education would be particularly ideal. Private lands adjacent to public lands should be examined for acquisition when a 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 are welcomed by land trusts. The donation of land entitles the donor to a charitable deduction for the full market value, as well as a release from the responsibility of managing the land. If the land is donated because of its conservation value, the land will be permanently protected. A donation of land that is not of high biological significance may be sold, with or without restrictions, to a conservation buyer and the funds used to further the land trust's conservation mission.

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

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 recommendations 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 natural community while others may need specific management practices such as canopy thinning, mowing, or burning to maintain their habitat requirements.

Existing parks and conservation lands provide important habitat for plants and animals at both the county level and on a regional scale. For example, these lands may serve as nesting or wintering areas for birds or as stopover areas during migration. Management plans for these areas should emphasize a reduction in activities that fragment habitat. Adjoining landowners should be educated about the importance of their land as it relates to habitat value, especially for species of special concern, and agreements should be worked out to minimize activities that may threaten native flora and fauna.

3. **Protect bodies of water.**
Protection of reservoirs, wetlands, rivers, and creeks is vital for ensuring the health of human communities and natural ecosystems; especially those that protect biodiversity, supply drinking water, and are attractive recreational resources. Many rare species, unique natural communities, or locally significant habitats occur in wetlands and water bodies and are directly dependent on natural hydrological patterns and water quality for their continued existence. Ecosystem processes also provide clean water supplies for human communities and do so at significant cost savings in comparison to water treatment facilities. Hence, protection of high quality watersheds is the only way to ensure the viability of natural habitats and water quality. Scrutinize development proposals for their impact on entire watersheds, not just the immediate project area. Cooperative efforts in land use planning among municipal, county, state, and federal agencies, developers, and residents can lessen the impact of development on watersheds.

4. **Provide for 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 disruption of large pieces of land. County and township officials can encourage landowners to maintain vegetated buffer zones within riparian zones. Vegetated buffers (preferably of PA-native plant species) help reduce erosion and sedimentation and shade/cool the water. This benefits aquatic animal life, provides habitat for other wildlife species, and creates a diversity of habitats along the creek or stream. Staff at the Pennsylvania Natural Heritage Program (PNHP) or natural resources agencies can provide further guidance regarding buffer considerations appropriate for various kinds of natural resources within NHAs, e.g., barren community, wetland, water body, or forest.

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 all portions of the watershed may not be zones of potential impact. As an example, conserving natural areas around municipal water supply watersheds provides an additional protective buffer around the water supply, habitat for wildlife, and may also provide low-impact recreation opportunities.

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. 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. Through careful planning natural environments and plants and animals associated with them can be maintained.

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. 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 (villages, roads, existing ROWs), large

pieces of the landscape can be maintained intact. If possible, networks or corridors of woodlands or greenspace should be preserved linking sensitive natural areas to each other.

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 invasive species 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 (501c3) 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 online 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, as well as 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. **Promote Community education.**
Educating the public about the environment and its protection is key to meeting the recommendations in this section. Without a sense of involvement and investment in environmental programs, public support will be hard to earn. By making educational resources readily available to the public, sponsoring booths and outreach activities during local community events, and promoting public programs and events about the environment, active public application of these recommendations is promoted.

9. **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 can 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, which are good examples of planning efforts that reach beyond county boundaries.

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GIS DATA SOURCES

Note: Many diverse data sources were used in the creation of this report. Every attempt was made to ensure the accuracy of the data. The Pennsylvania Natural Heritage Program should not be held liable for any mapping errors resultant from use of these public data sources.

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Appendices

APPENDIX I: Site Survey Form

PLANT & ANIMAL SPECIES OF SPECIAL CONCERN REPORT

(PLEASE INCLUDE A MAP – SEE MAPPING INSTRUCTIONS)

SPECIES NAME:	**SURVEYOR(S)**:(*Please include your address & phone #)*
DATE OF VISIT:	**TIME SPENT AT SITE:**
USGS QUADRANGLE:	
SITE NAME AND DIRECTIONS TO SITE:	**GPS Coordinates**: Latitude:_____ Longitude:_____ **DATUM** (e.g. NAD27, NAD83)_____

OWNER INFORMATION:

- **Public Land:** give tract name:_____
- **Private Land:** Please fill out landowner info below. **NOTE**: We cannot accept data collected on private land if you didn't have permission!

Landowner Name:	Address:
Phone Number:	City / State / Zip code:

- Landowner aware of the species of special concern? **YES____ NO____**
- Landowner aware that data are submitted to PA Natural Diversity Inventory? **YES____ NO____**
- **IF A SPECIMEN WAS COLLECTED**: Please ask for the landowner's signature **for permission to save the specimen in a museum**: Landowner Signature:_____ Date:_____
- WHERE IS THE SPECIMEN BEING HELD_____

HABITAT DESCRIPTION: Give a general description of the site. You might include other plant/animal species at site, substrate/soils, topography, land use, weather, etc. If revisiting a site, indicate any obvious changes to the habitat.

DISTURBANCES/THREATS: Include human and/or natural disturbances and threats to the species at this site.

SPECIES DATA: Fill out as much of the following as you can - include anything else you feel is of importance.

♣Give general description of what you saw (*i.e.: found scat, heard song, animal crossing road, found plant in bog..*)

♣Count or estimate the number of plants / animals you observed & estimate the size of the area they occupy.

♣Age and condition of individual(s) (*i.e.: fresh adult butterfly; healthy mature plants - 50% flowering and with immature fruit...*)

♣Behavior (*animals*) (*i.e.: nectaring insect, breeding birds, turtle basking...*)

♣If revisiting this site, compare the heath and size of the population to previous visits.

♣Confidence level on Identification: ID Positive ID Somewhat Uncertain ID Unknown

♣Voucher specimen or photo taken? (*Please include if possible*)

♣Additional information:

APPENDIX II: Field Survey Form

Page _____ of _____

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: _____

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

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

APPENDIX II (continued)

Site #: _____ Source Code: _____ Date: _____

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

APPENDIX III: Federal and State Status, and PNHP Program Ranks

FEDERAL STATUS

U.S. FISH AND WILDLIFE SERVICE CATEGORIES OF ENDANGERED AND THREATENED PLANTS AND ANIMALS

The following definitions are extracted from the September 27, 1985 U.S. Fish and Wildlife Service notice in the 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 through all or a significant portion of their ranges.

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

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

C1 - Taxa for which the Service currently has on file substantial information on biological vulnerability and threat(s) to support the appropriateness of proposing to list them as endangered or threatened species.

C2 - Taxa for which information now in possession of the Service indicates that proposing to list them as endangered or threatened species is possibly appropriate, but for which substantial data on biological vulnerability and threats are not currently known or on file to support the immediate preparation of rules.

C3 - Taxa that are no longer being considered for listing as threatened or endangered species. Such taxa are further coded to indicate three categories, depending on the reason(s) for removal from consideration.

3A--Taxa for which the Service has persuasive evidence of extinction.

3B--Names that, on the basis of current taxonomic understanding, usually as represented in published revisions and monographs, do not represent taxa meeting the Act's definition of "species".

3C--Taxa that have proven to be more abundant or widespread than was previously believed and/or those that are not subject to any identifiable threat.

N - Taxa not currently listed by the U.S. Fish and Wildlife Service

STATE STATUS-NATIVE PLANT SPECIES

Legislative Authority: Title 25, Chapter 82, Conservation of Native Wild Plants, amended June 18, 1993, 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 have been 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 further decline in this Commonwealth, or if the species is greatly exploited by man.

PR - Pennsylvania Rare - Plant species which are uncommon within this Commonwealth. All species of native wild plants classified as Disjunct, Endemic, Limit of Range, and Restricted are included within the Pennsylvania Rare classification.

PX - Pennsylvania Extirpated - Plant species believed by the Department to be extinct within this Commonwealth. These plant species may or may not be in existence outside this Commonwealth. If plant species classified as Pennsylvania Extirpated are found to exist, the species automatically will be considered to be classified as Pennsylvania Endangered.

PV - Pennsylvania Vulnerable - Plant species which are in danger of population decline within Pennsylvania 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 - 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.

N - None - Plant species which are believed to be endangered, rare, or threatened, but which are being considered by the required regulatory review processes for future listing

APPENDIX III (continued)

STATE STATUS-ANIMALS

The following state statuses are used by the Pennsylvania Game Commission for (1990, Title 34, Chapter 133 pertaining to wild birds and mammals) and by the Pennsylvania Fish and Boat Commission (1991, Title 30, Chapter 75 pertaining to fish, amphibians, reptiles, and aquatic organisms):

PE - Pennsylvania Endangered - Game Commission - 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 has been 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 have been 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 and Boat Commission - Endangered Species are all species and subspecies: (1) declared by 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) declared by the Executive Director (PaFC) to be threatened with extinction and appear on the Pennsylvania Endangered Species List published in the Pennsylvania Bulletin.

PT - Pennsylvania Threatened - Game Commission - Species that may become endangered within the foreseeable future throughout their range in Pennsylvania unless the causal factors affecting the organism are abated. These are: 1) species whose populations within the Commonwealth are decreasing or have been heavily depleted by adverse factors and while not actually endangered, are still in critical condition; or 2) species whose populations may be relatively abundant in the Commonwealth but are under severe threat from serious adverse factors that have been 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 and Boat Commission - Threatened Species are all species and subspecies: (1) declared by 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) have been declared by the Executive Director (PaFC) 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.

PC - Pennsylvania Concern - Animals that could become endangered or threatened in the future. All of these are uncommon, have restricted distribution or are at risk because of certain aspects of their biology.

CP Candidate Proposed - Species comprising taxa for which the Pennsylvania Biological Survey (PBS) currently has substantial information on hand to support the biological appropriateness of proposing to list as Endangered or Threatened.

CA Candidate at Risk - Species that although relatively abundant now are particularly vulnerable to certain types of exploitation or environmental modification.

CR Candidate Rare - Species which exist only in one of a few restricted geographic areas or habitats within Pennsylvania, or they occur in low numbers over a relatively broad area of the Commonwealth.

CU Condition Undetermined - Species for which there is insufficient data available to provide an adequate basis for their assignment to other classes or categories.

N None - No current legal status, but is under review for future listing.

PNHP 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.

GNR = Global rank has yet to be assessed. A GNR rank indicates neither commonness nor

APPENDIX III (continued)

PNHP 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 very 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.

SA = Accidental 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).

SH = Of historical occurrence in the state with the expectation that it may be rediscovered.

SN = Regularly occurring, usually migratory and typically non-breeding 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.

SRF = Reported falsely (in error) from the state but this error persisting in the literature.

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

SX = Apparently extirpated from the state.

DL = Recently removed from the list of species of concern.

PENNSYLVANIA ELEMENT OCCURRENCE QUALITY RANKS

Quality Rank*	Explanation
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.
F	While know from the site, the last survey failed to find sufficient evidence to verify the element still occurred at the site

* Intermediate ranks may also be assigned.

APPENDIX IV: Community Classification

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 III 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 Name (Fike 1999)	**State Rank**	**Community Name** (Fike 1999)	**State Rank**
TERRESTRIAL FORESTS			
CONIFEROUS TERRESTRIAL FORESTS:			
Hemlock (white pine) forest	S4		
CONIFER – BROADLEAF TERRESTRIAL FORESTS			
Serpentine Virginia pine - oak forest	S1	Hemlock (white pine) - red oak - mixed hardwood forest	S4
Serpentine pitch pine - oak forest	S1	Pitch pine - mixed oak forest	S4
Rich hemlock - mesic hardwoods forest	S2S3	Hemlock (white pine) -northern hardwood forest	S5
Dry white pine (hemlock) - oak forest	S4	Virginia pine - mixed hardwood forest	S5
Hemlock - tulip tree - birch forest	S4		
BROADLEAF TERRESTRIAL FORESTS			
Sweet gum - oak coastal plain forest	S1	Black cherry - northern hardwood forest	S4
Mixed mesophytic forest	S1S2	Sugar maple - basswood	S4
Blackgum ridgetop forest	S3	Tuliptree- beech -maple forest	S4
Dry oak-mixed hardwood forest	S3	Dry oak-heath forest	S4S5
Aspen/gray (paper) birch forest	S3*	Red maple (terrestrial) forest	S5
Northern hardwood forest	S4	Red oak - mixed hardwood forest	S5
PALUSTRINE FORESTS			
CONIFEROUS PALUSTRINE FORESTS			
Black spruce - tamarack peatland forest	S3	Hemlock palustrine forest	S3
Red spruce palustrine forest	S3		
CONIFER – BROADLEAF PALUSTRINE FORESTS			
Red spruce - mixed hardwood palustrine forest	S3	Hemlock - mixed hardwood palustrine forest	S3S4
BROADLEAF PALUSTRINE FORESTS			
Great Lakes Region lake plain palustrine forest	S1	Red maple - black ash palustrine forest	S2S3
Red maple - magnolia coastal plain palustrine forest	S1	Sycamore - (river birch) - box-elder floodplain forest	S3
Bottomland oak - hardwood palustrine forest	S2	Silver maple floodplain forest	S3
Red maple - elm - willow floodplain swamp	S2	Red maple - blackgum palustrine forest	S3S4
TERRESTRIAL WOODLANDS			
CONIFEROUS WOODLANDS			
Pitch pine - rhodora - scrub oak woodland	S1	Pitch pine - heath woodland	S2
Red spruce rocky summit	S1	Pitch pine - scrub oak woodland	S2S3
CONIFER – BROADLEAF TERRESTRIAL WOODLANDS			
Red-cedar - mixed hardwood rich shale woodland	S1S2	Pitch pine - mixed hardwood woodland	S2S3
Virginia pine - mixed hardwood shale woodland	S2		
BROADLEAF – TERRESTRIAL WOODLANDS			
Great Lakes Region bayberry - cottonwood community	S1	Yellow oak - redbud woodland	S2
Great Lakes Region scarp woodland	S1S2	Dry oak - heath woodland	S3
Birch (blackgum) rocky slope woodland	S2		

APPENDIX IV: (continued)

Community Name (Fike 1999)	**State Rank**	**Community Name** (Fike 1999)	**State Rank**
PALUSTRINE WOODLANDS			
CONIFEROUS PALUSTRINE WOODLANDS			
Pitch pine - leatherleaf palustrine woodland	S1	Red spruce palustrine woodland	S2S3
Black spruce - tamarack palustrine woodland	S2		
BROADLEAF PALUSTRINE WOODLANDS			
Red maple - highbush blueberry palustrine woodland	S4	Red maple - sedge palustrine woodland	S4
Red maple - mixed shrub palustrine woodland	S4		
TERRESTRIAL SHRUBLANDS			
CONIFEROUS TERRESTRIAL SHRUBLANDS			
Red-cedar - pine serpentine shrubland	S1	Red-cedar - prickly pear shale shrubland	S2
CONIFER – BROADLEAF TERRESTRIAL SHRUBLANDS			
Red-cedar - redbud shrubland	S2		
BROADLEAF TERRESTRIAL SHRUBLANDS			
Low heath shrubland	S1	Low heath - mountain ash shrubland	S2
Rhodora - mixed heath - scrub oak shrubland	S1	Scrub oak shrubland	S3
PALUSTRINE SHRUBLANDS			
BROADLEAF PALUSTRINE SHRUBLANDS			
Buckthorn - sedge (*Carex interior*) - golden ragwort fen	S1	Water-willow (*Decodon verticillatus*) shrub wetland	S3
Great Lakes Region scarp seep	S1	Alder - *Sphagnum* wetland	S4
Great Lakes Region bayberry - mixed shrub	S1	Black willow scrub/shrub wetland	S4
Poison sumac - red-cedar - bayberry fen	S1	Buttonbush wetland	S4
Leatherleaf - bog rosemary peatland	S2	River birch - sycamore floodplain scrub	S4
Leatherleaf -cranberry peatland	S2S3	Highbush blueberry - meadow-sweet wetland	S5
Alder - ninebark wetland	S3	Highbush blueberry - *Sphagnum* wetland	S5
Leatherleaf - sedge wetland	S3		
TERRESTRIAL HERBACEOUS OPENINGS			
Great Lakes Region dry sand plain	S1	Side-oats grama calcareous grassland	S1
Great Lakes Region sparsely vegetated beach	S1	Calcareous opening/cliff	S2
Serpentine grassland	S1	Little bluestem - Pennsylvania sedge opening	S2
Serpentine gravel forb community	S1		
HERBACEOUS WETLANDS			
PERSISTENT EMERGENT WETLANDS			
Great Lakes Region palustrine sand plain	S1	*Sphagnum* - beaked rush peatland	S3
Open sedge (*Carex stricta, C. prairea,* and *C. lacustris*) fen	S1	Tussock sedge marsh	S3
Serpentine seepage wetland	S1	Golden saxifrage - Pennsylvania bitter-cress spring run	S3S4
Prairie sedge - spotted joe-pye-weed marsh	S1S2	Herbaceous vernal pool	S3S4
Riverside ice scour community	S1S2	Water-willow (*Justicia americana*)- smartweed riverbed community	S4
Golden saxifrage - sedge rich seep	S2	Skunk cabbage - golden saxifrage forest seep	S4S5
Many fruited sedge - bladderwort peatland	S2	Bluejoint - reed canary grass marsh	S5
Big bluestem - Indian grass river grassland	S3	Cattail marsh	S5
Bulrush marsh	S3	Wet meadow	S5*
Mixed forb marsh	S3		
NON-PERSISTENT EMERGENT WETLANDS			
Pickerel-weed - arrow-arum - arrowhead wetland	S4	Spatterdock - water lily wetland	S4
COMMUNITY COMPLEXES			
Acidic Glacial Peatland Complex		Ridgetop acidic barrens complex	
Erie lakeshore beach – dune – sand plain complex		River bed – bank– floodplain complex	
Great Lakes Region scarp complex		Serpentine barrens complex	
Mesic till barrens complex			

APPENDIX IV: (continued)

Community Name (Smith 1991)	State Rank	Community Name (Smith 1991)	State Rank
SUBTERRANEAN COMMUNITIES			
Talus cave community	S2S4	Solution cave terrestrial community	S3
Solution cave aquatic community	S3	Tectonic cave community	S3S4
DISTURBED COMMUNITIES			
Bare soil	S?	Meadow/pastureland	S?
Conifer plantation	S?	Successional field	S?
Cultivated land	S?	Young miscellaneous forest	S?
ESTUARINE COMMUNITIES:			
Deepwater subtidal community	S1	Freshwater intertidal mudflat	S1
Freshwater intertidal marsh	S1	Shallow-water subtidal community	S1
RIVERINE COMMUNITIES:			
High-gradient brownwater creek	S?	Medium-gradient clearwater creek	S3
High-gradient clearwater river	S?	High-gradient clearwater creek	S3
Medium-gradient clearwater river	S?	Low-gradient clearwater creek	S3S4
Spring community	S1S2	Waterfall and plungepool	S3S4
Spring run community	S1S2	High-gradient ephemeral /intermittent creek	S5
Low-gradient brownwater creek	S2S3	Low-gradient ephemeral/intermittent creek	S5
Low-gradient clearwater river	S2S3	Medium-gradient ephemeral/intermittent creek	S5
Medium-gradient brownwater creek	S3		
LACUSTRINE COMMUNITIES:			
Stable natural pool	S?	Natural pond	S2S3
Ephemeral/fluctuating limestone sinkhole	S1	Artificial lake	---
Ephemeral/fluctuating natural pool	S3	Artificial pond	---
Glacial lake	S1	Artificial pool	---
Nonglacial lake	S2		

* = Communities that are not tracked

APPENDIX V: 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. For more information, go to http://www.cas.psu.edu/docs/casdept/forest/stewardship/1page.html 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
137 Penn Nursery Rd.
Spring Mills, PA 16875
(814) 364-5157
E-mail: jstiehler@state.pa.us

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:

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(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

Forest Landowner Associations provide information and educational programs to help members better manage their forest resources. For more information, contact:

North Central Forest Landowners Association
(Cameron, Elk, McKean, and Potter Counties)
PO Box 141
Port Allegany, PA 16743

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

Forest Certification Program Information

Forest certification programs are important tools in safeguarding the long-term ecological health of forest resources. These programs develop a set of criteria for sustainable forest management, and offer accreditation to forest managers and producers of forest products if they demonstrate that their operations are consistent with the standards. The companies can then market their products with the stamp of the certification agency. The Forest Stewardship Council (FSC**;** http://www.fsc.org/), an international stakeholder-owned network dedicated to promoting responsible management of the world's forests, offers a comprehensive certification program. Because the program's growing popularity is leading to requests for ecological information, and because there is a great deal of convergence between the regional FSC standards and the information provided in the Natural Heritage Inventory (NHI), we offer the following comparison of NHI information and FSC standards to facilitate the use of the NHI report as a tool in certification. FSC standards are developed individually by region by a local working group; Pennsylvania falls within the Appalachian Region.

The NHI report information is most applicable to principles 6, 7, and 9 of the FSC's Appalachian Regional Working Group standards (AWG-FSC 2005).

Principle 6: Environmental Impact

6.1 Assessment of environmental impacts:
The NHI report provides the following relevant information:

- Sites hosting Vulnerable, Imperiled, and Critically Imperiled Plant Community Types (G1-G3, S1-S3 according to NatureServe and Natural Heritage Databases).
- Threatened and Endangered species according to state and federal listings, as well as species ranked G1-G3 and S1-S3 according to NatureServe and Natural Heritage Databases
- The LCA, IBA and IMA designations are a resource to assess landscape-level ecological impacts.

6.2 Safeguards for unique species & their habitats.
The NHI report identifies the habitat requirements of species meeting the above-listed criteria through the Biological Diversity Area designations, and recommendations regarding the compatibility of some forest management operations in these habitats are included. The report does not identify connectivity needs between populations.

6.4 Protection of representative samples of existing ecosystems
The CAs and the natural communities described in the NHI report are a good reference for identifying representative samples of existing ecosystems. The report also provides context for understanding the conservation significance of these ecosystems. However, as the report focuses only on those sites of highest conservation concern in the county, it is not a comprehensive listing of all existing ecosystem types.

Principle 7: Management Plan

The information contain in the NHI report can serve as baseline ecological data for use in developing a management plan.

Principle 9: High Conservation Value Forests

The criteria recommended for the identification of High Conservation Value Forests (HCVF) are identical to the criteria used to identify Conservation Areas in the NHI report, with one exception. The FSC standards include roadless areas of 500 acres or greater as High Conservation Value Forests, while such areas receive no NHI designation.

APPENDIX VI: Sources of Information on County Occurrences of Plant and Animal Species

Currently, there exists no all-inclusive list of species occurring within Pennsylvania. Below is a list of sources of species including information on county occurrences.

Amphibians and Reptiles:

The Pennsylvania Online Herpetological Atlas, available online: http://webspace.ship.edu/tjmare/resources.htm.

Hulse, A. C., C.J. McCoy, and E. J. Censky. 2001. Amphibians and Reptiles of Pennsylvania and the Northeast. Cornell University Press, Ithaca, NY. 419 p.

Birds:

Brauning, D.W. (editor). 1992. Atlas of Breeding Birds in Pennsylvania. University of Pittsburgh Press, Pittsburgh. 484 p. Available online: http://www.carnegiemnh.org/atlas/about_book.htm.

Insects:

Pennsylvania Aquatic Insects (primarily flies), available online: http://paaquaticfliesrus.bd.psu.edu/webroot/index.asp

List of Butterflies of Pennsylvania, available online: http://www.thebutterflysite.com/pennsylvania-butterflies.shtml

Dragonflies and Damselflies (Odonata) of the United States, Odonata of Pennsylvania, available online: http://www.npwrc.usgs.gov/resource/distr/insects/dfly/pa/toc.htm

Mammals:

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

Plants:

Rhoads, A. F. and W. M. Klein. Jr. 1993. The vascular flora of Pennsylvania: an annotated checklist and atlas. American Philosophical Society Memoirs Vol. 207. 636 p.

Museum collections are an excellent source of species occurrence information. The collections are typically organized by taxonomic group into separate departments or sections within the museum.

Academy of Natural Sciences of Philadelphia
1900 Benjamin Franklin Parkway
Philadelphia, PA 19103
(215) 299-1000
http://www.ansp.org/research/biodiv/index.php

The State Museum of Pennsylvania
300 North Street
Harrisburg, PA 17120
(717) 787-4980
http://www.statemuseumpa.org/home.html

Carnegie Museum of Natural History
4400 Forbes Avenue
Pittsburgh, PA 15213
(412) 622-3131
http://www.carnegiemnh.org/research/index.html

In addition, a significant collection of Pennsylvania bryophytes (mosses, liverworts, & hornworts) is located at the Missouri Botanical Garden. The New York Botanical Garden has a large collection of Pennsylvania fungi.

Universities with significant collections of western Pennsylvania species:

The Pennsylvania State University
Biology Department
208 Mueller Lab
University Park, PA 16802
(814) 863-0278
http://www.bio.psu.edu/home/

Youngstown State University
Department of Biological Sciences, Ward Beecher Hall
One University Plaza
Youngstown, OH 44555
(330) 941-3601
http://www.as.ysu.edu/~biology/

APPENDIX VII: Lepidoptera (Butterflies) collected during field surveys or known from McKean County

State Scientific Name	State Common Name	Global Rank	State Rank	*State Scientific Name*	State Common Name	Global Rank	State Rank
Amblyscirtes hegon	Pepper-and-Salt Skipper	G5	S4	*Nathalis iole*	Dainty Sulphur	G5	SNA
Amblyscirtes vialis	**Common Roadside-skipper**	**G5**	**S2S4**	*Nymphalis antiopa*	Mourning Cloak	G5	S5
Ancyloxypha numitor	Common Least Skipper	G5	S5	*Nymphalis milberti*	Milbert's Tortoiseshell	G5	S4
Atrytone logan	Delaware Skipper	G5	S4	*Nymphalis vaualbum*	Compton Tortoiseshell	G5	S4
Boloria bellona	Meadow Fritillary	G5	S5	*Papilio canadensis*	Canadian Tiger Swallowtail	G5	S4
Boloria selene myrina	**Silver-bordered Fritillary**	**G5T5**	**S1S3**	***Papilio cresphontes***	**Giant Swallowtail**	**G5**	**S2**
Celastrina ladon lucia	**Northern Spring Azure**	**G5**	**S3S4**	*Papilio glaucus*	Eastern Tiger Swallowtail	G5	S5
Celastrina neglecta	Summer Azure	G5	S5	*Papilio polyxenes*	Black Swallowtail	G5	S4
Cercyonis pegala	Common Wood-nymph	G5	S5	*Papilio troilus*	Spicebush Swallowtail	G5	S5
Chlosyne harrisii	**Harris' Checkerspot**	**G4**	**S3**	*Phyciodes tharos*	Pearl Crescent	G5	S5
Chlosyne nycteis	**Silvery Checkerspot**	**G5**	**S3S4**	*Pieris rapae*	Cabbage White	G5	SNA
Colias eurytheme	Orange Sulphur	G5	S5B	***Pieris virginiensis***	**West Virginia White**	**G3**	**S2S3**
Colias philodice	Clouded Sulphur	G5	S5	*Poanes hobomok*	Hobomok Skipper	G5	S5
Cupido comyntas	Eastern-tailed Blue	G5	S5	***Polites mystic***	**Long Dash**	**G5**	**S3**
Danaus plexippus	Monarch	G5	S5B	*Polites peckius*	Peck's Skipper	G5	S5
Enodia anthedon	**Northern Pearly-eye**	**G5**	**S3S4**	*Polites themistocles*	Tawny-edged Skipper	G5	S4S5
Epargyreus clarus	Silver-spotted Skipper	G5	S5	*Polygonia comma*	Eastern Comma	G5	S5
Erynnis baptisiae	Wild Indigo Duskywing	G5	S5	***Polygonia faunus***	**Green Comma**	**G5**	**SH**
Erynnis brizo brizo	Sleepy Duskywing	G5T5	S4	*Polygonia interrogationis*	Question Mark	G5	S5B
Erynnis icelus	Dreamy Duskywing	G5	S5	***Polygonia progne***	**Gray Comma**	**G5**	**SU**
Erynnis juvenalis	Juvenal's Duskywing	G5	S5	*Pompeius verna*	Little Glassywing	G5	S4
Euphydryas phaeton	**Baltimore Checkerspot**	**G4**	**S2S4**	***Satyrium acadicum***	**Acadian Hairstreak**	**G5**	**S2S4**
Euphyes vestris metacomet	Eastern Dun Skipper	G5T5	S5	*Satyrium liparops*	Striped Hairstreak	G5	S4
Eurema lisa	Little Yellow	G5	SNA	***Satyrium titus***	**Coral Hairstreak**	**G5**	**S3S4**
Everes comyntas	Eastern Tailed-blue	G5	S5	***Satyrodes eurydice***	**Eyed Brown**	**G4**	**S1S3**
Hesperia leonardus	**Leonard's Skipper**	**G4**	**S3S4**	***Speyeria aphrodite***	**Aphrodite Fritillary**	**G5**	**S3S4**
Hesperia sassacus	**Indian Skipper**	**G5**	**S3S4**	***Speyeria atlantis***	**Atlantis Fritillary**	**G5**	**SU**
Hylephila phyleus	Fiery Skipper	G5	SNA	*Speyeria cybele*	Great Spangled Fritillary	G5	S5
Limenitis archippus	Viceroy	G5	S5	*Thymelicus lineola*	European Skipper	G5	SNA
Limenitis arthemis	White Admiral	G5	S5	*Vanessa atalanta*	Red Admiral	G5	S5B
Lycaena hyllus	**Bronze Copper**	**G5**	**SU**	*Vanessa cardui*	Painted Lady	G5	S5B
Lycaena phlaeas	American Copper	G5	S5	*Vanessa virginiensis*	American Lady	G5	S5B
Megisto cymela	Little Wood Satyr	G5	S5	*Wallengrenia egeremet*	Northern Broken-dash	G5	S4
Nastra lherminier	**Swarthy Skipper**	**G5**	**S2S3**				

***species in bold are tracked by PNHP**

APPENDIX IIX: Odonates (dragonflies and damselflies) collected during or known from McKean County field surveys

State Scientific Name	State Common Name	Global Rank	State Rank	*State Scientific Name*	State Common Name	Global Rank	State Rank
Aeshna canadensis	Canada Darner	G5	S4S5	*Ischnura posita*	Fragile Forktail	G5	S5
Aeshna interrupta	Variable Darner	G5	S4	*Ischnura verticalis*	Eastern Forktail	G5	S5
Aeshna tuberculifera	**Black-tipped Darner**	**G4**	**S2S3**	*Ladona julia*	Chalk-fronted Corporal	G5	S5
Aeshna umbrosa umbrosa	Shadow Darner	G5T5	S5	***Lanthus parvulus***	**Northern Pygmy Clubtail**	**G4**	**S3S4**
Aeshna verticalis	**Green-striped Darner**	**G5**	**S3S4**	*Lestes congener*	Spotted Spreadwing	G5	S5
Anax junius	Common Green Darner	G5	S5	*Lestes disjunctus australis*	Common Spreadwing	G5T5	S4S5
Anax longipes	**Comet Darner**	**G5**	**S1S2**	***Lestes dryas***	**Emerald Spreadwing**	**G5**	**S3**
Argia fumipennis violacea	Variable Dancer	G5T5	S5	***Lestes forcipatus***	**Sweetflag Spreadwing**	**G5**	**S3S4**
Argia moesta	Powdered Dancer	G5	S5	*Lestes rectangularis*	Slender Spreadwing	G5	S5
Argia tibialis	**Blue-tipped Dancer**	**G5**	**S1**	*Lestes unguiculatus*	Lyre-tipped Spreadwing	G5	S4S5
Arigomphus villosipes	Unicorn Clubtail	G5	S5	*Leucorrhinia frigida*	Frosted Whiteface	G5	S4S5
Boyeria grafiana	**Ocellated Darner**	**G5**	**S3**	*Leucorrhinia hudsonica*	Hudsonian Whiteface	G5	S4S5
Calopteryx amata	**Superb Jewelwing**	**G4**	**S2S3**	*Leucorrhinia intacta*	Dot-tailed Whiteface	G5	S5
Calopteryx maculata	Ebony Jewelwing	G5	S5	***Leucorrhinia proxima***	**Red-waisted Whiteface**	**G5**	**S2**
Chromagrion conditum	Aurora Damsel	G5	S5	*Libellula julia*	Chalk-fronted Corporal	G5	S5
Cordulegaster diastatops	Delta-spotted Spiketail	G5	S5	*Libellula luctuosa*	Widow Skimmer	G5	S5
Cordulia shurtleffi	**American Emerald**	**G5**	**S3S4**	*Libellula lydia*	Common Whitetail	G5	S5
Didymops transversa	Stream Cruiser	G5	S5	*Libellula pulchella*	Twelve-spotted Skimmer	G5	S5
Enallagma antennatum	Rainbow Bluet	G5	S5	*Libellula quadrimaculata*	Four-spotted Skimmer	G5	S4S5
Enallagma basidens	**Double-striped Bluet**	**G5**	**S3S4**	*Libellula semifasciata*	Painted Skimmer	G5	S4S5
Enallagma civile	Familiar Bluet	G5	S5	*Macromia illinoiensis*	Illinois River Cruiser	G5	S5
Enallagma cyathigerum	**Northern Bluet**	**G5**	**S3**	*Nehalennia irene*	Sedge Sprite	G5	S5
Enallagma divagans	**Turquoise Bluet**	**G5**	**S3**	***Ophiogomphus mainensis***	**Maine Snaketail**	**G4**	**S3**
Enallagma ebrium	Marsh Bluet	G5	S5	*Pachydiplax longipennis*	Blue Dasher	G5	S5
Enallagma exsulans	Stream Bluet	G5	S5	*Pantala flavescens*	Wandering Glider	G5	S5
Enallagma geminatum	Skimming Bluet	G5	S5	*Plathemis lydia*	Common Whitetail	G5	S5
Enallagma hageni	Hagen's Bluet	G5	S5	***Somatochlora elongata***	**Ski-tailed Emerald**	**G5**	**S2**
Enallagma signatum	Orange Bluet	G5	S5	***Somatochlora forcipata***	**Forcipate Emerald**	**G5**	**S2**
Epitheca canis	Beaverpond Baskettail	G5	S4S5	*Somatochlora tenebrosa*	Clamp-tipped Emerald	G5	S5
Epitheca cynosura	Common Baskettail	G5	S5	***Somatochlora walshii***	**Brush-tipped Emerald**	**G5**	**S2**
Erythemis simplicicollis	Eastern Pondhawk	G5	S5	*Stylogomphus albistylus*	Least Clubtail	G5	S5
Gomphus borealis	Beaverpond Clubtail	G4	S4	***Stylurus scudderi***	**Zebra Clubtail**	**G4**	**S1**
Gomphus descriptus	**Harpoon Clubtail**	**G4**	**S1S2**	***Sympetrum obtrusum***	**White-faced Meadowhawk**	**G5**	**S3S4**
Helocordulia uhleri	**Uhler's Sundragon**	**G5**	**S3**	*Sympetrum vicinum*	Yellow-legged Meadowhawk	G5	S5
Ischnura hastata	Citrine Forktail	G5	S5	*Tramea lacerata*	Black Saddlebags	G5	S5

***species in bold are tracked by PNHP**

APPENDIX IX: Facts Sheets for selected Species of Special Concern in McKean County

Northern Water Shrew (*Sorex palustris albibarbis*)

Pennsylvania Candidate Rare Speceis

State Rank: S3 (vulnerable), Global Rank: G4T5 (apparently secure)

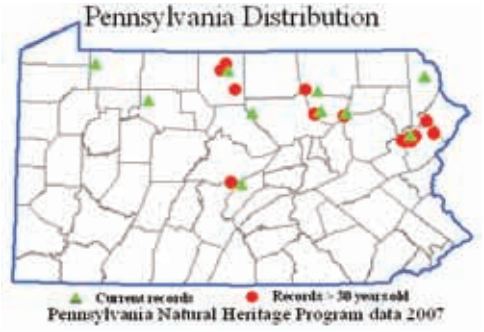
Identification

The northern water shrew (*Sorex palustris albibarbis*) is a relatively large member of the *Sorex* genus, reaching lengths of 130-170mm and weighting 10-16 grams. Water shrews are black to gray in color with a silvery-gray belly and a bicolored tail. Thin chin and throat of this species are whitish, noticeably more so than the belly. The large, partially webbed hind feet have hairs on the toes and sides and there are some hairs present on the fore feet. 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.

Photo source: Charlie Eichelberger (PNHP)

Habitat/Behavior

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. They are active both day and night and spend their lives in and around water. Water shrews can be found along streams and lake edges, in boulders and sphagnum moss. 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 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. In captivity, they have been found to feed almost every 10 minutes.



Status

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. Globally, this species is considered secure. However, in Pennsylvania, the northern water shrew is vulnerable and a candidate for listing as rare. It is only found in a few sites around the state and is affected by many factors, which could lead to declines in their populations.

Conservation

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, they 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.

References

- ENature.com Field Guide. Water Shrew (*Sorex palustris*). http://www.enature.com/fieldguide/
- Genoway, 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

Pennsylvania Natural Heritage Program

Northern Myotis (*Myotis septentrionalis*)

Pennsylvania Mammal Species of Concern

State Rank: S3B (vulnerable, breeding), **S3N** (vulnerable, non-breeding), **Global Rank: G4** (apparently secure)

Identification

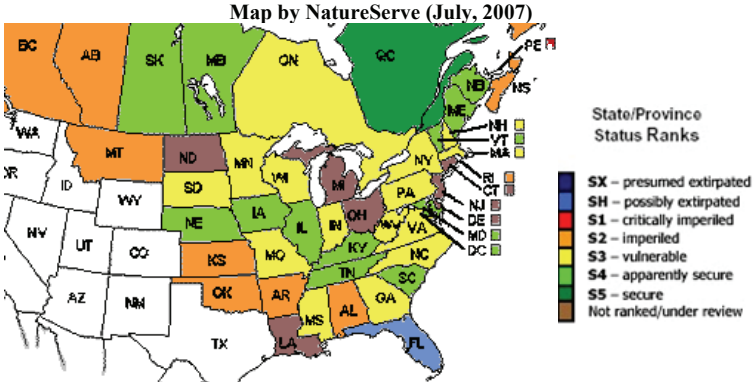
The Northern Myotis (*Myotis septentrionalis*), also known as the Northern Longed-eared Myotis, is characterized by its long-rounded ears that when folded forward, extend beyond the tip of the nose. Also, the shape of the tragus, the flap of skin inside the ear area, is long and dagger shaped compared to the little brown bats curved and blunted tragus. This species has a longer tail and larger wing area than other similar sized bats in this genus. The fur is dull yellow/brown above and a pale gray on the belly. Another characteristic of this species is that the calcar, a spur extending from the foot, lacks a keel. These bats weigh only 6 to 8 grams and have a wingspan of 9 to 10 inches.

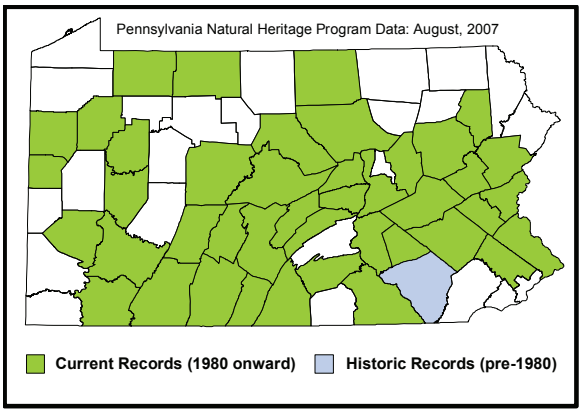
photo source: Aura Stauffer

Habitat/Behavior

In the more northern parts of their range the northern long-eared bat is associated with boreal forests. In Pennsylvania, this bay is found in forests around the state. Northern Myotis hunt at night over small ponds, in forest clearings, at tree top level and along forest edges. They eat a variety of night-flying insects including caddisflies, moths, beetles, flies, and leafhoppers. This species uses caves and underground mines for hibernation and individuals may travel up to 35 miles from their summer habitat for hibernation. Maternity roosts are located in tree cavities, under exfoliating tree bark and in buildings.

North American State/Province Conservation Status
Map by NatureServe (July, 2007)





Status/Conservation

The status of the Northern Myotis in Pennsylvania is uncertain. The state status of this species currently is candidate rare (CR). More information is needed before adequate management decisions can be made. It occurs throughout Pennsylvania, but has been found in relatively low numbers.

Traditionally, bats have been unpopular with the public because of a misunderstanding of their ecology and due to their presence as pests in homes and barns. However, bats play a very important role in the environment by eating large amounts of insects. For example, a single little brown bat (*Myotis lucifugus*) can eat up to 1,200 mosquito-sized insects in just one hour!

More than 50% of American bat species are rapidly declining or already listed as endangered. The loss of bat species in Pennsylvania could greatly affect our ability to protect our plants from pests and enjoy the outdoors. For more information on bats and bat houses visit the Bat Conservation International website at http://www.batcon.org/.

References

- Bat Conservation International, Inc. 2002. "Bat Species: U.S. Bats: Myotis septentrionalis" Website: www.batcon.org/discover/species/mystep.html
- Ollendorff, J. 2002. "Myotis septentrionalis" (On-line), Animal Diversity Web. Accessed February 25, 2004 at Http://animaldiversity.ummz.umich.edu/site/accounts/information/Myotis_septentrionalis.htm .

PNHP
Pennsylvania Natural Heritage Program

Northern Goshawk (*Accipiter gentilis*)

Pennsylvania Candidate Rare Species

State Rank S2S3B, S3N (imperiled/vulnerable breeding, vulnerable nonbreeding), Global Rank: G5 (secure)

Identification:

The Northern Goshawk is a large forest raptor, occupying boreal and temperate forests throughout the entire Northern Hemisphere. It is the largest member of the genus *Accipiter* that occurs in North America. Males generally weigh between 1.4 and 2.4 pounds, average 22 inches in length, and have a wingspan ranging from 38.5 to 41 inches. Females are slightly larger, weighing, on average, between 1.9 and 3 pounds, and having a wingspan of 41 to 45 inches and an average length of 24 inches.

All accipiters, including Northern Goshawks, have a distinctive white grouping of feathers that form a band above the eye. In goshawks this band is thick and more pronounced than in the other members of the genus. The eye color of adult goshawks is red to reddish-brown, in juveniles eye color is bright yellow.

The colorings of adult male and female Northern Goshawks range from slate blue-gray to black. Their backs, the feathers at the leading edge of the wings, and heads are usually dark, and their undersides are white with fine, gray, horizontal barring. Their tails are light gray with three or four dark bands. The coloring of a juvenile goshawk is quite different than that of an adult. Their backs, the feathers at the leading edge of the wings, and heads are brown, and their undersides are white with vertical brown streaking.

Adult Northern Goshawk

Range of the Northern Goshawk in North America

Habitat/Behavior:

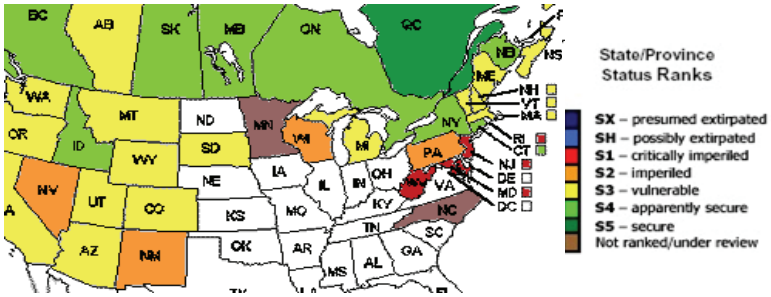
In the eastern U.S., the Northern Goshawk nests in hardwood-hemlock (*Tsuga canadensis*) forests, where black birch (*Betula lenta*) and American beech (*Fagus grandifolia*) are preferred nest trees. They prefer mature forests consisting of a combination of old, tall trees with intermediate canopy coverage and small open areas within the forest for foraging. Each pair of goshawks build and maintain between three and nine nests within their home range, but use and defend only one (or less) per year. Northern Goshawks are highly territorial and a mating pair will advertise their nesting territory by performing an elaborate aerial display before and during nest construction and/or repair. If their nesting area is encroached upon, they will defend it fiercely. Goshawks breed once yearly, usually between early April and mid-June. The female lays between 2 to 4 eggs that hatch in 28 to 38 days. The young may begin to fly when they are 35 to 46 days old. Juvenile fledglings may continue to be fed by their parents until they are about 70 days old.

The goshawk is a top predator and opportunistic hunter that preys on ground and tree squirrels, rabbits and hares, large passerines, woodpeckers, game birds, corvids, and occasionally reptiles and insects. Prey may be taken on the ground, in vegetation, or in the air.

Status:

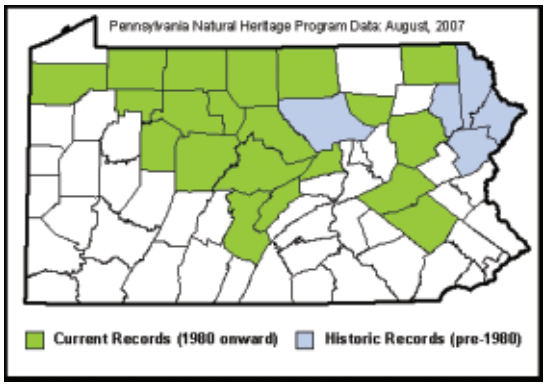
In Pennsylvania, the Northern Goshawk is near the southern extent of its range in eastern North America. Population trends are difficult to determine due to the paucity of historic quantitative data and because of biases inherent in the various survey methods used to track bird populations. Nesting range in the eastern U.S. is currently expanding as second-growth forests mature.

North American State/Province Conservation Status
Map by NatureServe (2007)



Conservation Considerations:

Timber harvesting is the principal threat to breeding populations of northern goshawk. In addition to the relatively long-term impacts of removing nest trees and degrading habitat by reducing stand density and canopy cover, logging activities conducted near nests during the incubation and nestling periods can result in nest failure due to abandonment. Following canopy reduction by logging, goshawks are often replaced by other raptors including the Red-tailed Hawk (*Buteo jamaicensis*).



Because the goshawk is both a top predator and an ecological engineer, its decline contributes to the unraveling of forest ecosystems, stressing other forest dependent species. Northern goshawks play an important role in the forest food web as voracious predators of squirrels, jays, flickers, rabbits, snowshoe hares, and songbirds. As builders of numerous, large nests, goshawks provide essential nesting opportunities for many species which can not build their own nests. Empty goshawk nests may be utilized by the Great Gray Owl (*Strix nebulosa*), Cooper's Hawk (*Accipiter cooperii*), Red-tailed Hawk, Great Horned Owl (*Bubo virginianus*), Short-eared Owl (*Asio flammeus*), squirrels, and many other species. Within a decade of goshawks being driven from a forest, their nests collapse from lack of maintenance and a precious wildlife habitat is lost.

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PNHP
Pennsylvania Natural Heritage Program

Bald Eagle (*Haliaeetus leucocephalus*)

Pennsylvania Threatened Bird Species

State Rank: S2B (imperiled, breeding) Global Rank: G4 (apparently secure)

Identification

Bald Eagles are large raptors with a body length up to 32 inches and a wingspan up to 80 inches. Male and female Bald Eagles are similar in plumage. The most notable features are a white head and upper neck, whiter tail, dark brown body, and a heavy yellow bill. Juveniles are dark brown overall, and gradually acquire adult plumage over a period of four years. Juveniles have a dark bill and cere, dark brown body plumage, including head and tail, variable amounts of white on the undertail coverts, belly, and back.

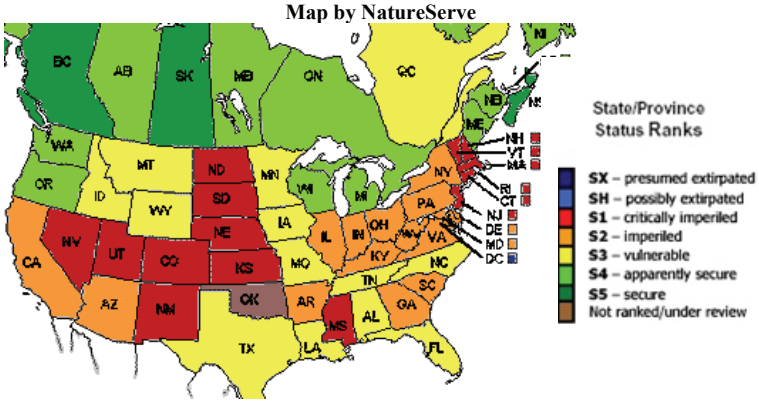
photo source: Ron Austing

Range

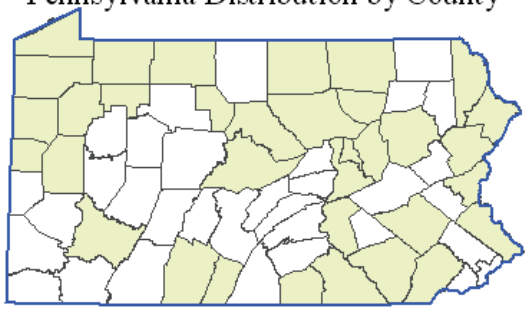
Bald Eagles have extensive breeding populations in Alaska, with major populations in the coastal regions. This species breeds throughout most of Canada, especially along coastal areas. In the continental United States, Bald Eagles breed extensively along the Atlantic Coast from Florida to the Maritime Provinces of Canada. Also, this species breeds in the Great Lake States in Minnesota, Michigan, and Wisconsin, and in the Pacific Northwest (California, Oregon, and Washington). Breeding populations occur along the Gulf Coast in Louisiana and Texas. In Pennsylvania, Bald Eagle populations have been increasing, and can now been found throughout Pennsylvania, with most sightings concentrated in the northwestern and southeastern corners of the state.

North American State/Province Conservation Status

Map by NatureServe



Pennsylvania Distribution by County



Pennsylvania Natural Heritage Program data 2007

Habitat

This species is typically associated with forested areas adjacent to large bodies of water. Bald Eagles nest in trees, rarely on cliff faces, and ground nest in treeless areas. The majority of Bald Eagle nesting areas are found in mature and old-growth forests with some habitat edge, usually within 2 kilometer to water with suitable foraging opportunities. The quality of foraging areas are defined by diversity, abundance, and vulnerability of the prey base, structure of aquatic habitats, such as the presence of shallow water, and the absence of human development and disturbance. In Pennsylvania, this species nests on islands in major rivers and in forested areas and erected platforms along major rivers, reservoirs, large wetlands, lakes, ponds, and streams.

Conservation Status

This species is currently listed as a Threatened species at the state and federal level. Bald Eagles breeding in Pennsylvania have made a major contribution to the downgrading of this species from Endangered. In the 1970's, Bald Eagle nesting pairs were at an all time low of two due to the effect of the insecticide DDT and pollution of major waterways. Since then, this species has made a comeback, and recently, over 100 nests have been recorded across the state. Continued success of the breeding areas will depend on protection from human persecution and environmental contaminants. Other threats include water quality degradation, disturbance of nesting areas, and disease. If ecological conditions in Pennsylvania continue to improve, there is no reason why this species will not increase nesting populations to increase assurance that Bald Eagles will be around for generations to come.

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PNHP
Pennsylvania Natural Heritage Program

Osprey (*Pandion haliaetus*)

Pennsylvania Threatened

State Rank: S2B (imperiled, breeding) Global Rank: G5 (secure)

Identification

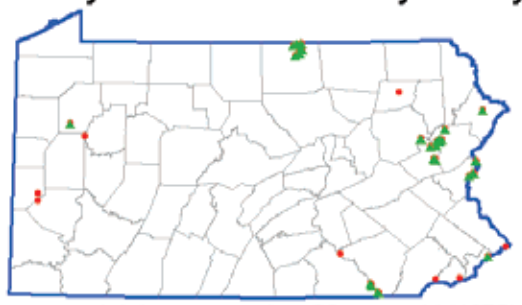
The osprey, or fish eagle, is a distinctive bird of prey with white underparts, a brown back and wings, and a white head with a small crest and a brown eye stripe. A "necklace" of dark streaks is more common on the females than the males. Fish make up the vast majority of the osprey's diet.

David Behrans, Animal Diversity Web

Range

Ospreys inhabit every continent but Antarctica, nesting in trees, snags, and man-made structures located near high quality fresh- or saltwater fishing grounds.

Pennsylvania Distribution by County



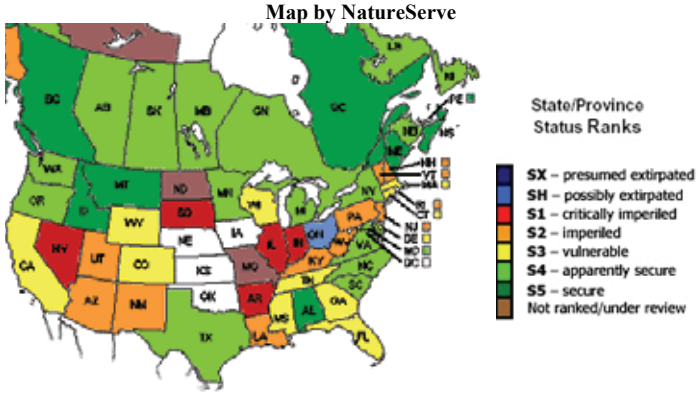
Pennsylvania Natural Heritage Program data 2005

Status

Like the bald eagle, the osprey suffered declines linked to the use of a group of chemicals called organochlorines in the mid-twentieth century. These toxins bioaccumulate or become more concentrated as they moved up the food chain from aquatic organisms to fish, until top predators like ospreys received the chemical in much higher concentrations than were present in their immediate environment. This resulted in birds laying thin-shelled eggs that endangered the developing young. Osprey populations have begun to recover as organochlorine pesticide use declines in the United States.

North American State/Province Conservation Status

Map by NatureServe



Conservation

Osprey populations can be supported by the construction of nesting platforms, protection of breeding and fishing habitat, and releasing captive-raised fledglings. Continued reduction and monitoring of pollutants including pesticides and heavy metals will also be necessary, since top predators such as the osprey are particularly vulnerable to these poisons. Reduction of organochlorine pesticide use in the species' South American range is a high priority.

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Pennsylvania Natural Heritage Program

Northern Harrier (*Circus cyaneus*)

Pennsylvania Candidate at Risk Bird Species

State Rank: S3B; S4N (vulnerable, breeding; apparently secure, non-breeding) **Global Rank: G5** (secure)

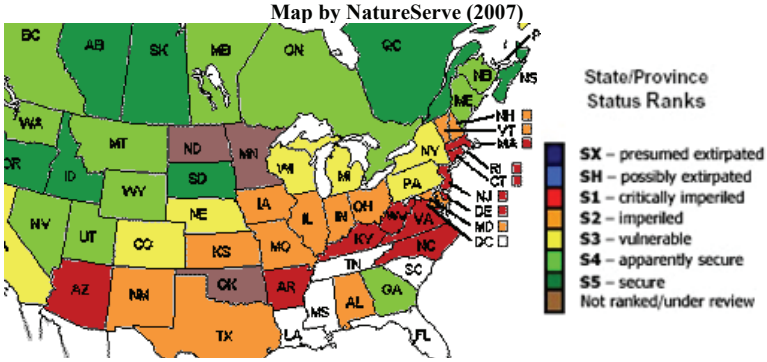
Identification

Northern Harriers are medium-sized, long-winged, long-tailed hawks with rounded wings that can appear pointed while gliding. This species is typically 16.5 inches long with a wingspan of 42 inches, with the females averaging a bit larger. Field marks include a white rump, short, dark, hooked beak, and flat face with an owl-like facial disk. This species has the behavior of often flying low over marshes and fields on wings held in a strong dihedral. The male is pale gray above and even paler on the underside with a dark gray head, with dark tips on the flight feathers, and narrow dark bars on the tail. The female is dark brown above, with buff underparts with dark streaks on the breast, belly, and under wing coverts, dark barring on the tail, and dark patch on inner wing created by dark secondaries and secondary coverts.

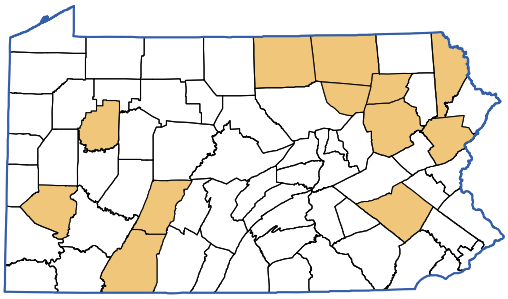
photo source: Ron Austing

North American State/Province Conservation Status

Map by NatureServe (2007)



Pennsylvania Distribution by County



Pennsylvania Natural Heritage Program data 2007

Range

This species breeds widely but is locally distributed in North America, from N. Alaska and Canada, south to n. Baja Peninsula, Mexico, and east to s. Nevada, s. Utah, n. Texas, s. Kansas, central Iowa, central Wisconsin, s. Michigan, n. Ohio, s. Pennsylvania, se Virginia and northeast North Carolina. It is an absent breeder in parts of New England and mountain and arid regions of the west.

Habitat

Northern Harriers use open wetlands, including marshy meadows, wet lightly grazed pastures, old fields, freshwater and brackish marshes, also dry uplands, including upland prairies, mesic grasslands, drained marshlands, croplands, cold desert shrub-steppe, and riparian woodlands. In Pennsylvania, this species also uses reclaimed strip mines for nesting in some areas.

Conservation Status

Breeding Northern Harriers declined slowly from 1966 to 1987 throughout North America, including Pennsylvania, where there is little data to report. Loss of wetlands and suitable field habitat are the primary causes of the widespread decline. Other reasons for decline may include suburban development, reforestation, conversion of hay crops to row crops, and intensive farming. This species is listed as an endangered species in Illinois, Iowa, Indiana, Missouri, New Jersey, Connecticut, and Rhode Island and it is listed as threatened in several other states. The protection of large, open wetlands and open fields in Pennsylvania will secure the future for the Northern Harrier in Pennsylvania.

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Pennsylvania Natural Heritage Program

Swainson's Thrush (*Catharus ustulatus*)

Pennsylvania Candidate Rare Bird Species

State Rank: S2S3B; S5N (imperiled/vulnerable, breeding; secure, non-breeding) **Global Rank: G5** (secure)

Identification

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.

Swainson's Thrush

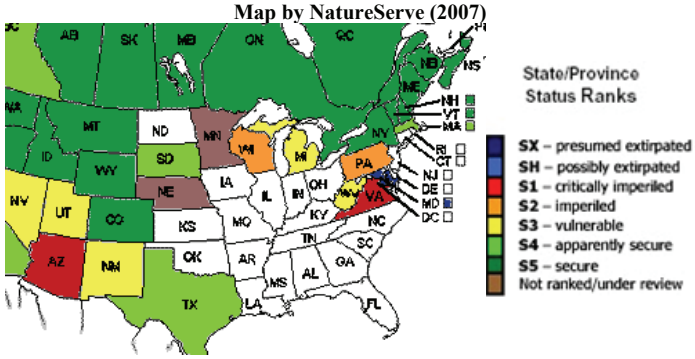
photo source: www.nps.gov

Range

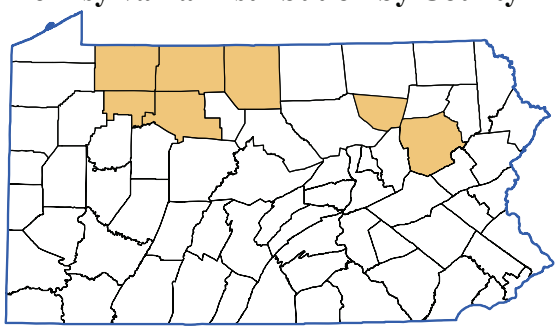
The breeding range of this species extends from Alaska, east across Canada, and south through the northern portion of the Appalachians; it is contiguous throughout the west but absent in the Midwest and southeast United States. Swainson's thrushes winter in the central Amazon.

North American State/Province Conservation Status

Map by NatureServe (2007)



Pennsylvania Distribution by County



Pennsylvania Natural Heritage Program data 2007

Habitat

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.

Conservation Status

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. 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 uneven-aged management or selective cutting, is recommended.

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Pennsylvania Natural Heritage Program

Great Blue Heron (*Ardea herodias*) Rookery

State Rank: S3S4 (vulnerable/apparently secure), Global Rank: G5 (secure)

Identification

A rookery is a colony of nesting birds. Great Blue Herons build their nests as high as 30 meters off the ground, in wooded areas isolated from human disturbance. Although they are wading birds, living on fish caught at the edges of rivers, in ponds, and in wetlands, Great Blue Heron rookeries may be located well away from water features; one colony found in Pennsylvania was as much as 17 miles from good fishing grounds. Great Blue Herons may also nest in mixed-species rookeries with other heron species, other waterbirds, or even raptors such as owls and hawks.

photo source PNHP

Habitat/Behavior

Great Blue Herons usually return to the same rookery site every year, starting in the spring when males arrive to scout the area and claim their nests, from which they court the later-arriving females. Nests are re-used and expanded year-to-year – they start as simple platforms of sticks but can eventually become saucers up to a meter deep. Each mated pair builds up the nest together, the male bringing new twigs and other materials to the female, who adds them to the structure.

photo source: Larry Master, NatureServe

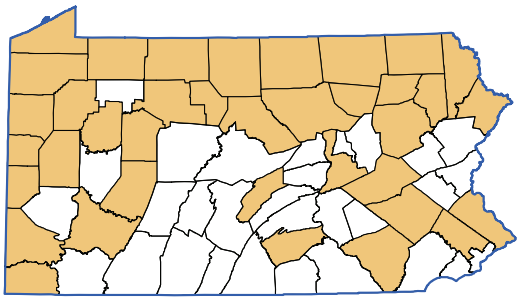
In Pennsylvania, the eggs are laid from mid-March to early June, after the female has had access to sufficient food for a period of about a week. Chicks hatch about a month later, usually a little less than two days apart, in the order in which their eggs were laid. Broods usually contain two or three chicks. The parents share the tasks of incubating the eggs and feeding the chicks, catching more than 20 percent of their own body weight in fish every day.

Great Blue Herons chicks are covered with a light coat of gray down. Chicks require the most food between 26 and 41 days after hatching, when they may eat 270 grams (about 0.6 pounds) of fish each day. The chicks are ready to leave the nest by the end of the summer.

Conservation

Protection of breeding grounds is one of the keys to conserving bird species. Great Blue Herons tolerate fewer disturbances to their breeding colonies than most waterbirds. It is recommended that human activity be excluded from a buffer zone of 300 meters (roughly 1000 feet) around heron rookeries to prevent people from scaring the herons off their nests. Severe or prolonged disturbance may cause the birds to abandon the nesting site, though they may re-colonize nearby if they find suitable habitat. Rookeries are also vulnerable to destruction of forest habitat and, when they are located in wetlands, changes to the flood regime that may kill trees.

Pennsylvania Distribution by County



Pennsylvania Natural Heritage Program data 2007

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PNHP
Pennsylvania Natural Heritage Program

Timber Rattlesnake (*Crotalus horridus*)

Reptile Species of Concern

State Rank: S3S4 (vulnerable/apparently secure), Global Rank: G4 (apparently secure)

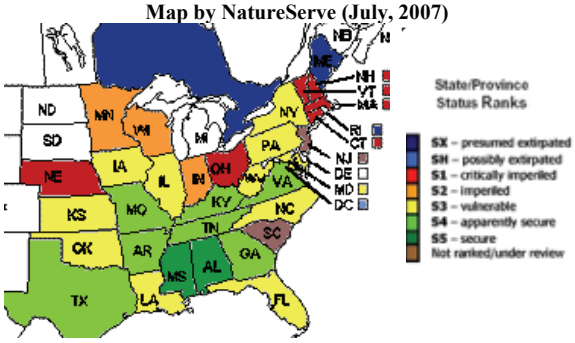
Identification

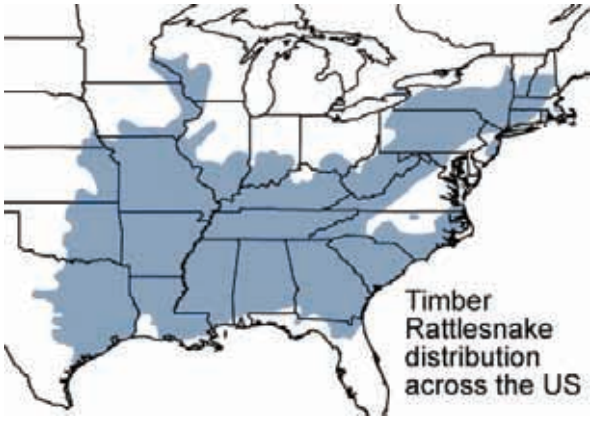
Timber rattlesnakes (*Crotalus horridus*) are easily distinguished from other snakes in Pennsylvania. Timber rattlesnakes are stout-bodied, large snakes reaching lengths of up to 5 feet. Color is extremely variable but usually consists of brown or black bands on bright yellow to black coloration. The head is triangular in shape and a rattle is present at the end of the black tail. This species may be confused with the less common eastern massasauga (*Sistrurus catenatus catenatus*) only present in the western portion of the state. The timber rattlesnake can be distinguished from the massasauga by the lack of white facial lines, the black tail forward of the rattle, and numerous small head-scales.

Habitat

Crotalus horridus is associated with deciduous forests and rocky outcrops. Hibernacula are usually found on south-facing rocky slopes with adequate crevices to provide shelter during the winter months. Males may travel far from the den site in the summer, moving into valleys and low-lying areas. Gravid females are far less mobile and tend to stay within a short distance of the den. Timber rattlesnakes are venomous, however are generally mild-mannered and not likely to strike.

North American State/Province Conservation Status
Map by NatureServe (July, 2007)





Conservation Status

Timber rattlesnake numbers have decreased significantly from historic records. This species was once widespread across the state. The remaining populations are usually found in remote, isolated areas. Collection and destruction of habitat are likely the main reasons for reductions in population size. Den sites have been targets for collection and should be the focus of conservation efforts for this species. The state status of the timber rattlesnake is candidate at risk (CA). Though this species is still relatively abundant across the state, it remains vulnerable to exploitation.

Permits are now required to collect rattlesnakes and only one snake can be taken each year. Snake hunts still occur in the state but after capture, snakes must be marked and release and the site of capture. Biologists are gathering information from collectors and individual studies to determine the current status of this species in the state.

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Pennsylvania Natural Heritage Program

Mountain Earth Snake *(Virginia pulchra)*

Pennsylvania Species of Special Concern

State Rank: S3 (vulnerable), Global Rank: G5T3T4 (secure; subspecies vulnerable/apparently secure)

Identification

The Mountain Earth Snake is a fossorial species, meaning it is adapted for life underground. These snakes rarely exceed a foot in length, with females being proportionally larger than males. Both genders have short tails and the head is approximately the same width as the body. Mountain Earth Snakes are a buff brown or grey on the back, with a white belly that is sometimes tinged with yellow or pink. These snakes have several longitudinal rows of small black dots running down the back and the scales have a slight ridge running down the center of them.

Mountain Earth Snakes could be confused with the common Northern Brown Snake and the Northern Red-bellied Snake, but these species typically have more patterning and two more prominent black splotches on the neck, with the later having a distinctive red belly. The head on the Northern Brown Snake is also noticeably wider than the head of the Mountain Earth Snake. Other fossorial snake species that could be encountered with the Mountain Earth Snake include the Northern Ringneck Snake, and the Eastern Worm Snake. Both of these species have smooth, un-keeled scales.

photo source: Rita Hawrot (PNHP)

Range

Mountain Earth Snakes have a very globally restricted range, occurring mostly in Pennsylvania with very limited ranges in West Virginia, Maryland, and Virginia. In fact, Pennsylvania is thought to house about 80% of the global population of Mountain Earth Snakes. Within Pennsylvania, this species is restricted to the Allegheny front. Currently, 4 distinct populations segments exist, but this is likely a factor of under surveying the areas between these population segments. Pennsylvania lists this snake as a species of special concern, as do West Virginia and Virginia, while Maryland lists the snake as state endangered.

Habitat/Behavior

Mountain Earth Snakes emerge from brumation (reptilian hibernation) in late spring, with activity peaking in September. This suggests that the Mountain Earth Snake is a fall breeder. Four to 11 live young are birthed in late August and September.

Rocky slopes in deciduous and mixed woods are the primary habitat for this secretive species. Mountain Earth Snakes appear to exist at lower densities than some of the other more common fossorial snake species in the state. Mountain Earth Snakes feed exclusively on earthworms and will never bite if handled.

Conservation

Mountain Earth Snakes in the Commonwealth, and throughout their range for that matter, are much understudied. With Pennsylvania having the majority of the global population of Mountain Earth Snakes, the state has a responsibility for the overall conservation of the species.

Threats to the Mountain Earth Snake include habitat destruction, predation by domestic cats, raccoons and opossums, and destruction of food webs due to indiscriminate pesticide and herbicide use. It is not surprising that pesticides are known to harm Mountain Earth Snakes by reducing populations of prey items, but herbicides are also known to outright kill other fossorial insectivorous snake species. The frequent proximity of Mountain Earth Snake populations with rocky, open road right of ways creates a conflict with many road maintenance practices.

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

Pennsylvania Natural Heritage Program

Burbot (*Lota lota*)

Pennsylvania Endangered Fish Species

State Rank: S1S2 (critically imperiled/imperiled) **Global Rank: G5** (secure)

Identification

The Burbot is our only fresh water representative of the primarily ocean-dwelling species of the Codfish Family. Though reaching a length of 46 inches, it averages half that. The hindmost dorsal fin and the anal fin are quite long and nearly equal in length. Both of these fins are separated from the rounded tail fin. A pair of pelvic fins is situated in the throat region in front of the large pectoral fins. A barbel-like tube extends from each nostril and a single barbel extends from the tip of the lower jaw.

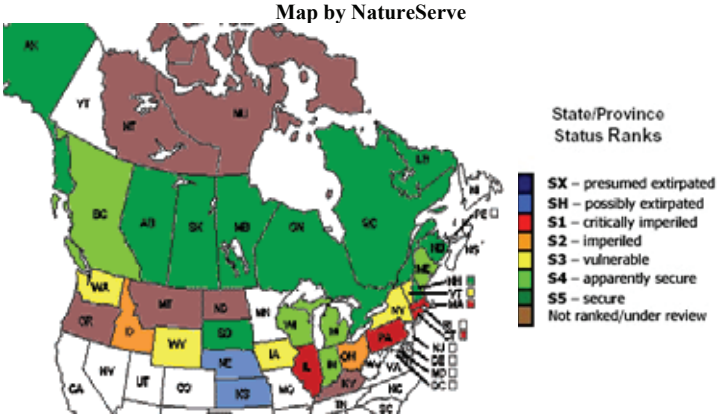
Photo: John G. Shedd Aquarium

Biology-Natural History

The burbot is one of only a few Pennsylvania freshwater fishes to spawn in midwinter. Spawning may take place at night, over a sand-gravel bottom in the shallow portions of lakes or tributary streams under a covering of ice. Up to a dozen individuals may be involved in a constantly moving group of spawners that broadcast fertilized eggs over a wide area of the bottom. Eggs drift along the bottom and hatch within 30 days. The young grow rapidly for their first four years, feeding mostly at night on a variety of invertebrates. They spend most of this time in lake shallows or stream channels. Adults more than 20 inches feed almost entirely on other fishes during the summer, when in deeper water, and on invertebrates in the winter.

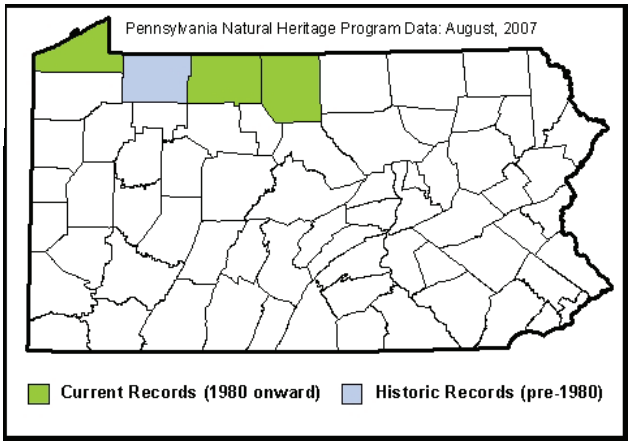
North American State/Province Conservation Status

Map by NatureServe



Habitat

Burbot prefer deep, cold waters of lakes and rivers. During late winter and early spring, after spawning, they often migrate from lakes to tributary rivers. The only Pennsylvania populations occur in Lake Erie and the Allegheny River headwaters.



Reasons for Being Endangered

The Allegheny River population represents a relic/distribution. This small population has persisted, but is more vulnerable to some of the environmental changes (pollution, competition with other species, overfishing) causing a reduction of Great Lakes populations in the past.

Management Practices

Watershed management practices that maintain or enhance the physical and chemical conditions required by this species are necessary to assure its continued existence as a part of our fauna.

References

- NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: August 20, 2007).

Pennsylvania Natural Heritage Program

Ohio Lamprey (*Ichthyomyzon bdellium*)

Pennsylvania Candidate Species

State rank: S2 (imperiled), Global rank: G3G4 (vulnerable/apparently secure)

Identification

Lampreys are a group of boneless, jawless fish found in fresh and salt waters throughout the world. Their blind larvae, called an *ammocoete,* live by filtering microorganisms from the water, but the eel-like adults are often parasites, using their toothed oral discs to attach to large fish and rasping holes in their hosts' sides.

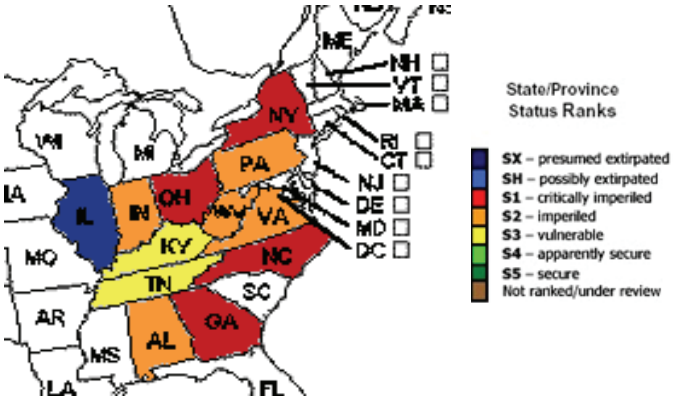
Ohio DNR Native Fish Conservancy, Animal Diversity Web

Biology-Natural History

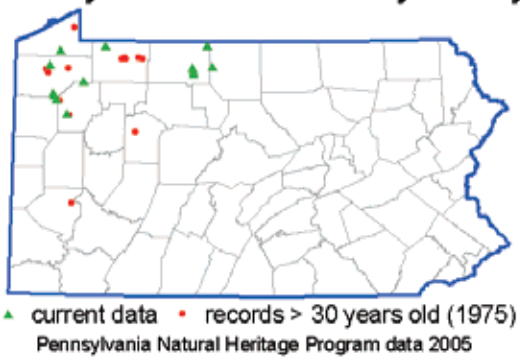
The Ohio lamprey, *Ichthyomyzon bdellium*, is a parasitic species found throughout the Ohio River drainage. Its single dorsal fin is notched, and it is blue to gray above with a lighter, mottled underside. Its oral disc is lined with sharp, well-developed teeth, and as wide or wider than its head when expanded. A black lateral line runs down each side from head to tail.

North American State/Province Conservation Status

Map by NatureServe



Pennsylvania Distribution by County



Pennsylvania Natural Heritage Program data 2005

Habitat

Ohio lamprey adults are found in medium to large rivers; they lay their eggs in nests constructed in gravel streambeds. The ammocoete larvae burrow into the muddy bottoms of tributary streams to feed by filtration. This species remains in larval form for about four years, and lives for two more as an adult.

Reasons for Being Endangered

Ohio lampreys are widespread throughout their range, but they are known only from scattered occurrences. NatureServe suggests that more intensive sampling would reveal previously undocumented occurrences.

Management Practices

Because its larval state is a filter-feeder, the Ohio lamprey is sensitive to changes in water chemistry and quality. Environmental changes that adversely affect its host fish populations will also affect the lamprey; and human-built barriers may cut lampreys off from spawning grounds.

References

- Branson BA. 1970. "Measurements, counts, and observations on four lamprey species from Kentucky (Ichthyomyzon, Lampetra, and Entosphenus." *American Midland Naturalist*, 84(1): 243-7.
- "Ichthyomyzon bdellium." Animal Diversity Web [web application]. University of Michigan Museum of Zoology, Ann Arbor, Michigan. Available at http://animaldiversity.ummz.umich.edu/site/accounts/information/Ichthyomyzon_bdellium.html. Accessed 22 April 2005.
- NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: August 13, 2007).
- Page, Lawrence M. and Brooks M. Burr. 1991. *Peterson Field Guides Freshwater Fishes*. Boston: Houghton Mifflin Company. 273-326.

Pennsylvania Natural Heritage Program

Channel Darter (*Percina copelandi*)

Pennsylvania Threatened

State Rank: S2 (imperiled) Global Rank: G4 (apparently secure)

Identification

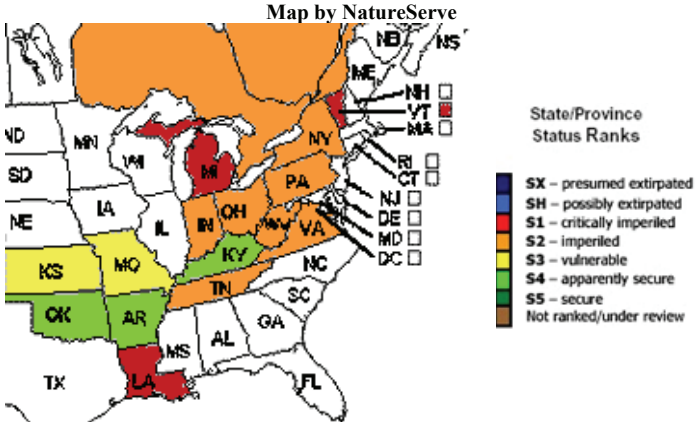
This delicate, tan, brown-spotted species seldom exceeds 2 1/2 inches. The fleshy connection (frenum) linking the middle of the snout with the front-most paired bones of the upper jaw is very weakly developed or lacking in this species. Males have a row of large, spined scales along the hindmost midline portion of the belly. The body and fins of males darken greatly during breeding, and a blue-green sheen develops over the sides of the body.

Biology Natural History

Spawning takes place in spring to mid-summer. Males select and establish small territories downstream from large stones scattered over a clean sand-small gravel bottom. Females move into these territories, burrow into the gravel behind each stone, and spawn here with various males. Small numbers of eggs are deposited and fertilized with each spawning, until up to 400 eggs are laid. Small aquatic insect larvae, as well as algae and organic detritus, are their food items.

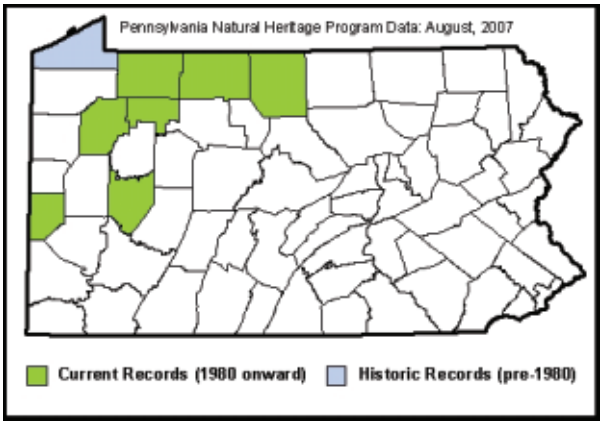
North American State/Province Conservation Status

Map by NatureServe



Habitat

The channel darter inhabits large clean streams and rivers with moderate current and bottoms consisting of large rocks, fine gravel and sand. Riffle areas are utilized during spawning and summer feeding, and deeper, quiet backwaters during the winter.



Reasons for being Threatened

This species is discontinuously distributed across the Deep South and Midwest, and in a separate, larger area of the Ohio River, Great Lakes, and St. Lawrence drainages. In Pennsylvania, it is known from Lake Erie and larger tributaries, where its populations have declined, and the upper part of the Allegheny River drainage. It is seldom abundant at any locality.

Management Practices

Strict watershed management is required to safeguard against the physical and chemical deterioration of the upper Allegheny River system. This darter and other animals associated with it in this habitat are excellent barometers of the health of this stream system.

Reference:

- NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: August 20, 2007).

Longhead Darter (*Percina macrocephala*)

Pennsylvania Threatened Fish Species

State Rank: S2S3 (imperiled/ vulnerable), Global Rank: G3 (vulnerable)

Identification

This is one of our larger darters, reaching a maximum length of about four inches. The head is elongated with a sharp, cone-shaped snout. The upper body is brown marked with black; the lower body is white. A series of large black blotches are joined along both sides of the lateral line. A separate round black spot is situated et the base of the tail fin that is diffusely extended downward. A black "tear" mark below each eye continues backward onto the lower front corner of the cheek. Breeding males are darkly colored.

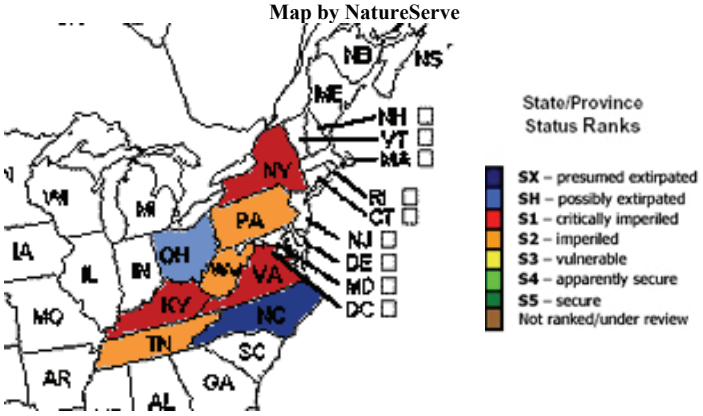
Photo Credit: Rob Criswell

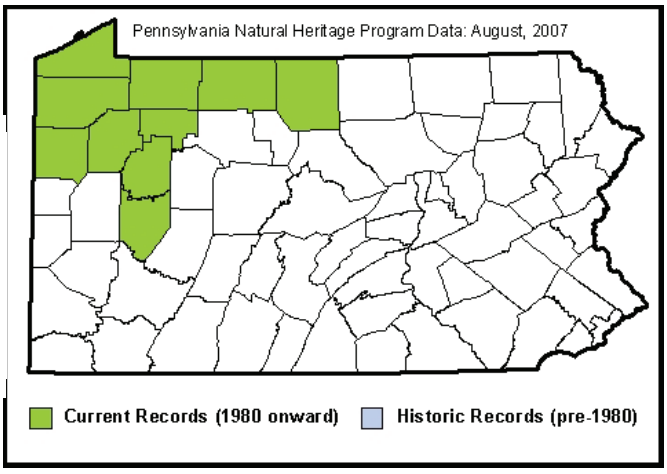
Biology-Natural History

No spawning observations are on record, largely because this species is encountered only sporadically and in small numbers throughout its range. Adults feed on small crayfish and larger insect larvae.

North American State/Province Conservation Status

Map by NatureServe





Habitat

The longhead darter prefers clean, fast, rocky riffles, or clear pools. Medium sized, unpolluted streams with a moderate current are required.

Reasons for Being Threatened

This species is known in Pennsylvania only from scattered sites in the Allegheny River and French Creek headwaters. It is only sporadically encountered throughout its distribution along the western side of the Appalachians, from southwestern New York to North Carolina and Tennessee.

Management Practice

The sporadic encounters of small numbers of the longhead darter indicate its vulnerability to environmental degradation. Strict watershed management is required to safeguard against the physical and chemical deterioration of the upper Allegheny River system. This darter and other animals associated with it in this habitat are excellent barometers of the health of this stream system.

Pennsylvania Natural Heritage Program

References:

- NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: August 21, 2007).

Elktoe *(Alasmidonta marginata)*

Freshwater Mussel Species of Concern

State Rank: S4 (apparently secure), Global Rank: G4 (apparently secure)

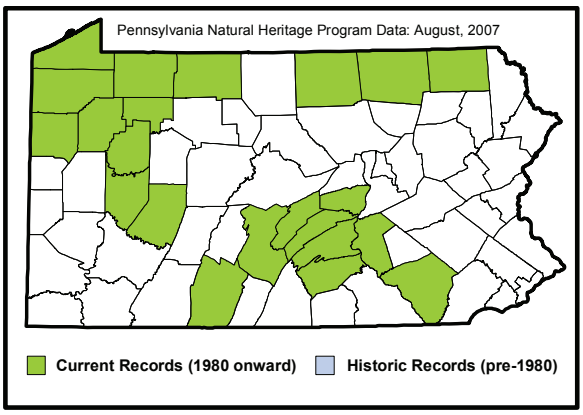
Identification

The Elktoe (*Alasmidonta marginata*) is a moderately sized mussel, commonly reaching 75 mm in length. The shell is trapezoidal or rhomboid shaped, inflated, and thin (Parmalee 1998, Strayer and Jirka 1997). The anterior margin is rounded, with a somewhat straight ventral margin. The ventral and posterior margins meet in a blunt, squared point (Parmalee 1998). The posterior ridge is the focal point of the shell and is sharply angled. The posterior slope is flattened with fine, well-developed ridges crossing the growth lines. The beaks are high, inflated, and are comprised of three to four heavy double-looped ridges. The periostracum (outer covering) is usually yellowish or greenish, with green rays and darker spots that may appear connected to the rays (rays may appear interrupted). Lateral teeth are vestigial and appear as nothing more than indistinct bumps along the hinge line. The nacre (inner iridescent coloring) is usually bluish-white (Parmalee 1998; Sietman 2003; Strayer and Jirka 1997).

Photo: http://www.lwatrous.com/missouri_mollusks/mussels/images/a_marginata.jpg

Habitat

The Elktoe can be found in medium to large size streams, but is most common in smaller streams. This species is present in greatest abundance in small shallow rivers with a moderately fast current and riffles. The preferred substrate is fine gravel mixed with sand (Parmalee 1998; Sietman 2003; Strayer and Jirka 1997; NatureServe 2005).



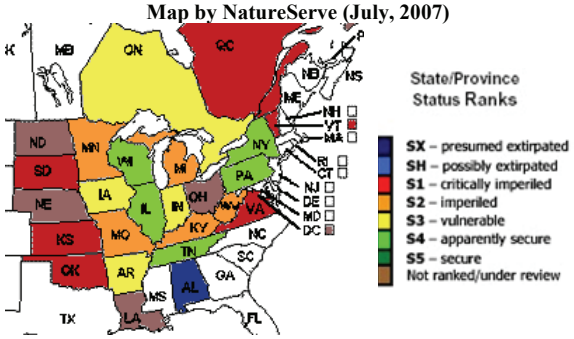
Host Fish

Hosts for Elktoe glochidia include the white sucker, northern hogsucker, shorthead redhorse, rockbass, and warmouth (Parmalee 1998; Strayer and Jirka 1997).

Status

Populations of *Alasmidonta marginata* can be found from Ontario, Canada to Alabama. Its eastern boundary ranges along the east coast from New York to Virginia and the western boundary ranges from North Dakota to Oklahoma. Most populations are located in Ohio, Indiana, and Illinois. This mussel is thought to have been extirpated from Alabama since it has not been reported during surveys for several decades (NatureServe 2005; Parmalee 1998; Strayer and Jirka 1997). This species is not common in Pennsylvania but has been found in the Susquehanna River and Ohio drainages. The proposed state status of the Elktoe is not ranked (N), meaning there is insufficient data available to provide an adequate basis for assignment to specific categories concerning the security of known populations (PNHP). The state rank of this species suggests it is secure at some sites within Pennsylvania state boundaries. However, more surveys are required to determine the status of this species and other freshwater mussels in Pennsylvania.

North American State/Province Conservation Status
Map by NatureServe (July, 2007)



Alasmidonta marginata is typically thought of as an interior basin species. It is not well understood how *Alasmidonta marginata* reached the Susquehanna River basin from its native range. Some researchers believe it may have drifted from the Allegheny River basin to Susquehanna via postglacial influences. An alternative theory states this species was introduced to the Susquehanna River basin via human activity (Strayer and Jirka 1997).

References

- NatureServe Explorer: An online encyclopedia of life [web application]. 2005. Version 4.5. Arlington, VA. Website: www.natureserve.org/explorer.
- Parmalee, P.W. and Bogan, A.E. 1998. The Freshwater Mussels of Tennessee. The University of Tennessee, Knoxville, TN 328 pp.
- Pennsylvania Natural Heritage Program. Biota of Concern In Pennsylvania (BOCIP) Lists. Website: www.naturalheritage.state.pa.us/invertebrates.aspx
- Sietman, B.E. 2003. Field Guide to the Freshwater Mussels of Minnesota. Minnesota Department of Natural Resources, St. Paul, MN 140 pp.
- Strayer, D.L. and K.J. Jirka. 1997. The Pearly Mussels of New York State. The New York State Education Dept., Albany, N.Y. 113 pp and plates.

Creek Heelsplitter (*Lasmigona compressa*)

Pennsylvania Freshwater Mussel Species of Concern

State Rank: S2S3 (imperiled/vulnerable), Global Rank: G (secure)

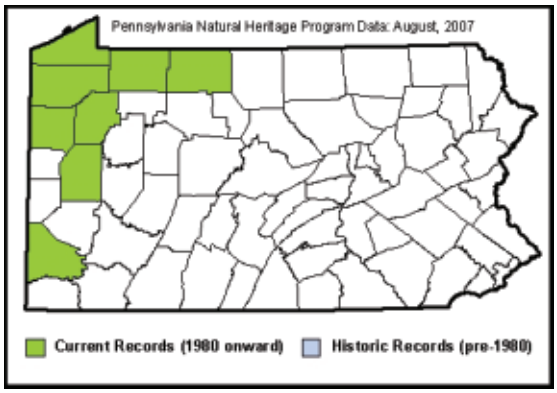
Identification

The creek heelsplitter (*Lasmigona compressa*) is a moderately sized mussel, usually less than 100 mm in length. The shell is subtrapeziodal in shape, compressed, and moderately thick. Juvenile specimens can sometimes have a small dorsal wing . The periostracum (outer covering) is somewhat smooth and varies from greenish (juvenile) to greenish-black (adult), sometimes with fine green rays (usually apparent in young individuals). The beak sculpture is obvious and double-looped. Pseudocardinal teeth are present but are usually smooth and lamellar (reduced). Lateral teeth are delicate, but functional and interlocking. There is a prominent interdental tooth in the left valve between the lateral teeth and pseudocardinal teeth. The nacre (inner iridescent coloring) is usually white, but can be cream or salmon colored (especially toward the beak cavity).

Creek Heelsplitter (*Lasmigona compressa*)
Photo Source :L Darby Creek Assoc.
www.darbycreeks.org/creekheelsplitterLittleDarby72.jpg

Habitat

The creek heelsplitter is typically located in creeks, but can sometimes be observed in streams too small to adequately support other species of freshwater mussels. It is most commonly found in headwaters of small or medium rivers in fine gravel or sand.



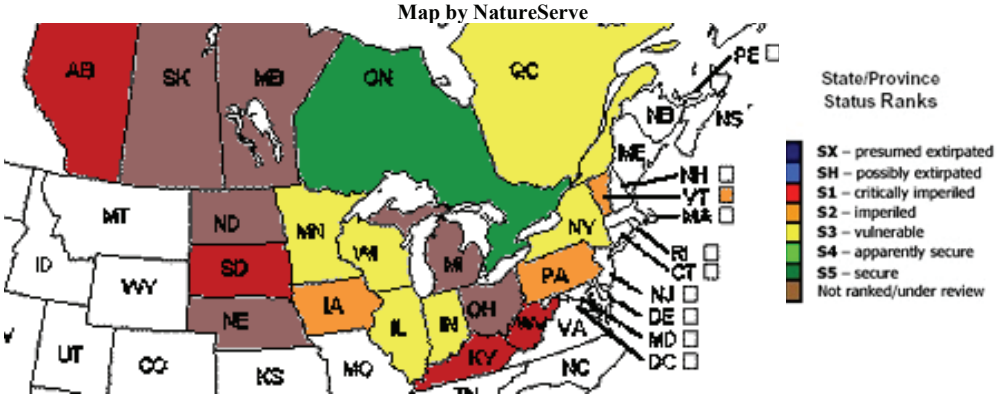
Host Fish

Suitable host fish for the creek heelsplitter include the slimy sculpin, spotfin shiner, black crappie, and the yellow perch

Status

Lasmigona compressa lives in the Mississippi River basin from Kentucky north, as well as in the St. Lawrence basin, the Great Lakes basin, and the Hudson River basin. Additionally, *Lasmigona compressa* has been located in the northeastern headwaters of the Susquehanna River basin. It is not well understood how this species migrated to these locations. The Pennsylvania proposed state status of the creek heelsplitter is condition rare (CR) due to a lack of individuals located during mussel surveys. Little is known about the status of freshwater mussels in Pennsylvania and the United States. Because of this, more surveys are required to determine the status of this species and other freshwater mussels in Pennsylvania.

North American State/Province Conservation Status
Map by NatureServe



The creek heelsplitter can be characterized by its compressed, trapezoidal shape, small dorsal wing, and large interdental tooth. However, it can be confused with *Lasmigona subviridis*. The latter species is smaller, more ovate, and has a significantly smaller interdental tooth. Additionally, its beak sculpture only has three to four smaller, less deeply curved double-looped bars that are distinctly nodulous. The beak sculpture of *Lasmigona compressa* consists of four to five large, deeply grooved double-looped bars of even height. Additionally, *Lasmigona compressa* is one of the few freshwater mussels that are hermaphroditic.

References

- National Park Service. U.S. Department of the Interior. Mississippi National River and Recreation Area. Website: www.nps.gov/miss/features/mussels/musselpages/creekheelsplitter.html
- NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlingt http://www.natureserve.org/explorer. (Accessed: August 31, 2007).
- Pennsylvania Natural Heritage Program. Biota of Concern In Pennsylvania (BOCIP) Lists. Website: www.naturalheritage.state.pa.us/invertebrates.aspx
- Sietman, B. E. 2003. Field Guide to the Freshwater Mussels of Minnesota. Department of Natural Resources, St. Paul, MN 140 pp.
- Strayer, D.L. and K.J. Jirka. 1997. The Pearly Mussels of New York State. The New York State Education Dept., Albany, NY 113 pp and plates

PNHP
Pennsylvania Natural Heritage Program

Ski-tailed Emerald (*Somatochlora elongata*)

Pennsylvania Invertebrate Species of Concern
State Rank: S2 (imperiled) Global Rank: G5 (secure)

Identification

The ski-tailed emerald, *Somatochlora elongata*, is a large dragonfly species colored in brown tones that reflect bronze or green in direct light. Its front, or face-plate, is bronze-green and edged with yellow; its thorax bears three vertical, parallel yellow stripes on each side. Adults grow 52 to 62 millimeters long.

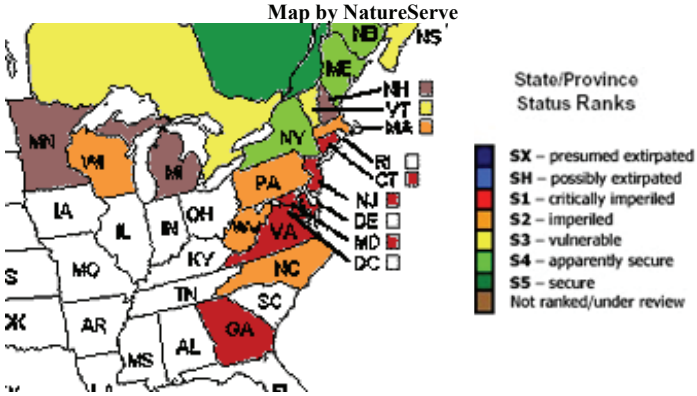
Dragonfly larvae are aquatic predators. Larvae of the genus *Somatochlora* have a spreading posture, and their heads are generally twice as wide as long, with small eyes. The abdomen is slightly wider than the head.

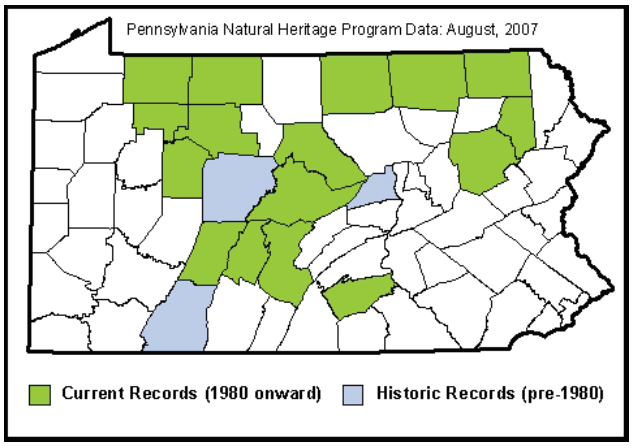
Ski-tailed Emerald (*Somatochlora elongata*)
Photo Source: Dave Czaplak

Habitat/Behavior

The ski-tailed emerald ranges from Quebec south to Georgia and west to Minnesota. The Emeralds are active and persistent flyers and even eat their prey while in flight. When they do rest, they tend to perch either vertically or obliquely from vegetation. Its preferred habitat includes small to medium streams with moderate to sluggish flow and at least some emergent vegetation; they have also been sighted in wetland areas and around beaver ponds.

North American State/Province Conservation Status
Map by NatureServe





Reasons for Being Threatened

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.

Conservation

Protection of the ski-tailed emerald will require preservation and restoration of both the terrestrial streamside 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.

References

- Czaplak D. 2005. "Dragonflies" [web page]. Available online at http://odolep.com/. Accessed 26 April 2005.
- Dunkle, S.W. 2000. Dragonflies through Binoculars: A Field Guide to Dragonflies of North America. Oxford University Press, New York, NY.
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- Nikula, B., J.L. Loose, M.R. Burne. 2003. A Field Guide to the Dragonflies and Damselflies of Massachusetts. Massachusetts Division of Fisheries & Wildlife, Natural Heritage & Endangered Species Program, Westborough, MA.

PNHP
Pennsylvania Natural Heritage Program

Creeping Snowberry (*Gaultheria hispidula*)

Pennsylvania Plant Species of Concern

State Rank: S3 (vulnerable), Global Rank: G5 (secure)

Identification

This member of the heath family (Ericaceae) has trailing stems that can be mat-forming. It smells of wintergreen when crushed. The leaves are dark green and oval, approximately 1/2-inch long, and have no teeth at the edges. Unlike cranberry plants, which the snowberry resembles somewhat, the leaves lie flat on the ground. The flowers are small and white with five petals. The fruits are white berries roughly 1/2 inch in diameter that ripen in late summer.

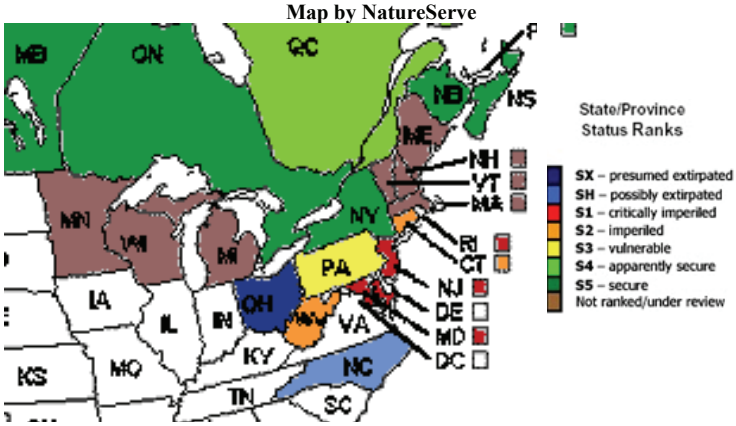
Photo: Western Pennsylvania Conservancy

Habitat

The creeping snowberry is a plant most commonly found in northern boreal forests. Pennsylvania is near the southern limit of its range; the locations where it is found in the state are sphagnous wetlands and wet coniferous forests with a northern character to the climate and flora. It is typically found on raised hummocks and old hemlock stumps.

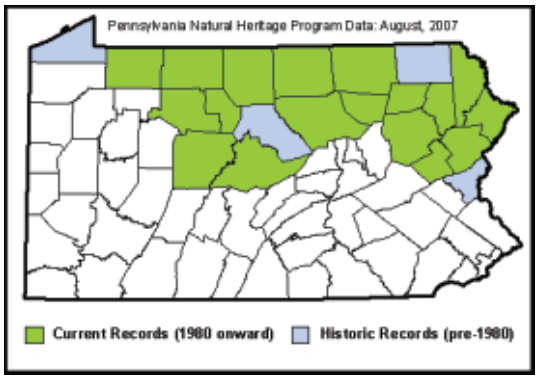
North American State/Province Conservation Status

Map by NatureServe



Status

Pennsylvania is near the southern limit of the range of this species, and the climatic conditions appear to be unsuitable except in a few habitat areas of a more northern character.



Conservation Considerations

The creeping snowberry is likely to be sensitive to changes in temperature or water regime at the sites it inhabits. Therefore, any modifications at a site that reduce the tree canopy or alter the natural hydrologic pattern may detrimentally impact a population.

References

- NatureServe. 2004. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.1. NatureServe, Arlington, Virginia. Available online: <http://www.natureserve.org/explorer
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PNHP
Pennsylvania Natural Heritage Program

Queen-of-the-prairie (*Filipendula rubra*)

Pennsylvania Plant Species of Concern

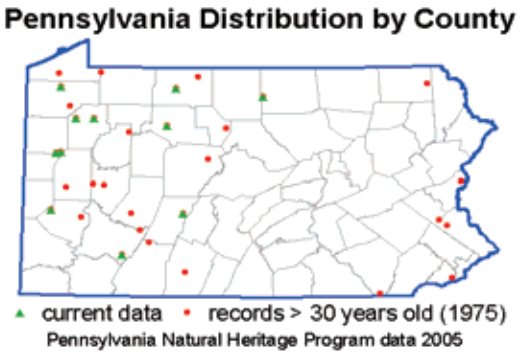
State Rank: S1S2 (critically imperiled/imperiled) **Global Rank: G4G5** (apparently secure/secure)

Identification

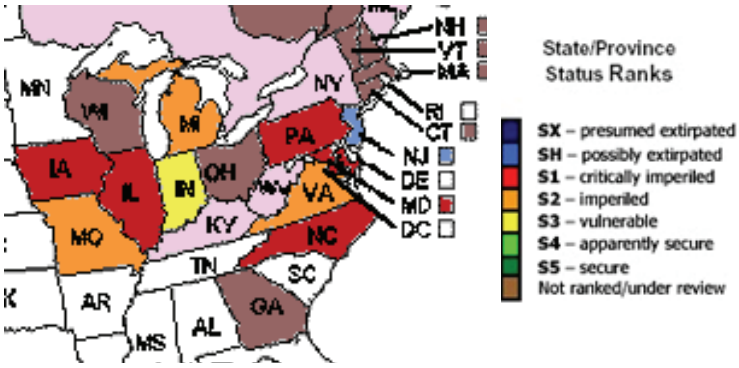
Queen-of-the-prairie is a member of the rose family (Rosaceae) that spreads clonally by the growth of underground stems called rhizomes as well as reproducing sexually. Individual ramets, or members of a clone, grow from one to two meters tall; a single clone may spread over scores of square meters. Leaves are pinnately compound, with the terminal leaflet the largest, up to 20 centimeters wide, divided into five to nine palmate lobes, and coarsely toothed. Flowers usually have five deeply pink petals, with a ring of long stamens surrounding a cluster of club-shaped pistils. They grow in large, showy inflorescences up to 20 centimeters wide.

Habitat

Queen-of-the-prairie grows mainly in fens, calcium-rich peat-producing wetlands, but clones may also be found in wet woodlands and grassland seeps. It grows from Newfoundland south in to Georgia, and has been found as far west as Wyoming; but its natural range is probably somewhat smaller.



North American State/Province Conservation Status
Map by NatureServe



Status

Queen-of-the-prairie is rare because its preferred habitat, fens, are generally rare. The species also suffers from potential reproductive limitations – some populations produce very little viable seed. This may be because queen-of-the-prairie populations are often composed of only a handful of clones, which reduces their genetic variability.

Conservation Considerations

Queen-of-the-prairie populations will benefit greatly from protection of their wetland habitats, which are often destroyed or fragmented by human development. Forest management practices can also be altered to allow more natural disturbances to create early successional habitat, and existing populations should be protected from collection, which may be a minor concern. Efforts to re-establish queen-of-the-prairie populations in unoccupied habitat should make use of seed or transplant material taken from a wide variety of parent clones to ensure that new populations will have sufficient genetic diversity to produce viable seed.

References

- Aspinwall, Nevin, and Terry Christian. 1992a. "Clonal structure, genotypic diversity, and seed production in populations of Filipendula rubra (Rosaceae) from the northcentral United States." American Journal of Botany, 79(5): 488-94.
- . 1992b. "Pollination biology, seed production, and population structure in queen-of-the-prairie, Filipendula rubra (Rosaceae) at Botkin Fen, Missouri." American Journal of Botany, 79(3): 294-9.
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PNHP
Pennsylvania Natural Heritage Program

APPENDIX X: Fact Sheets for Aquatic Systems in McKean County

High Quality Headwater Stream Macroinvertebrate Community

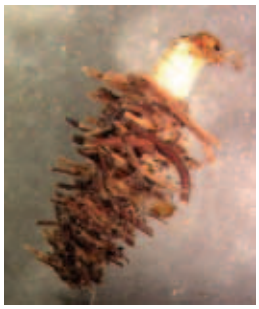
Typified By: forestfly stonefly (*Amphinemura*), tube-case caddisfly *(Lepidostoma*), rolled winged stonefly (*Leuctra*), blackfly (*Prosimulium*)

Stream Quality Rating: High

Habitat: This community occurs in high quality, fast-flowing headwater streams at high elevation. These catchments are well forested. There is very little urbanization in these watersheds, but there is some agricultural land where this community is found. Water temperatures are typically cool and water chemistry values show little to no impairment of stream quality.

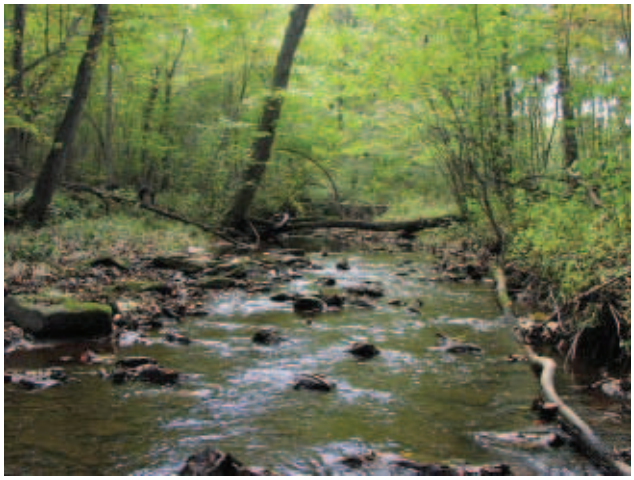
The High Quality Headwater Stream Community shows good biological diversity for headwater streams, and contains many environmentally-sensitive organisms. The community is sparsely distributed in headwater streams throughout McKean County.

Forestfly (Amphinemura**)**
Photo source: http://www.lrca.org



Tubecase caddisfly (Lepidostoma**)**
Photo source: http://www.dfg.ca.gov/

Threats: Small, high-elevation streams such as these generally have poor acid buffering capacity, which can exacerbate the effects of acidic inputs (including acid precipitation) and lead to stream acidity levels outside the tolerable range for most organisms. The effects of poorly maintained agricultural land in the watershed may be affecting water quality and stream habitat in some places where this community is found.



Small, forested, high-gradient streams provide the typical habitat for this community type.
Photo Source: PNHP

Conservation Recommendations: This community type represents the highest quality headwater stream macroinvertebrate assemblage in the State of Pennsylvania. Poor quality headwater streams of similar size that are in need of restoration may use the community type as a restoration target.

Installing riparian buffers along streams in areas of poorly maintained agricultural land can reduce nutrient runoff and stream bank erosion. Excluding livestock from streams and riparian zones will also restore stream quality and habitat. Addressing water pollution from acid deposition is also important for this community. Liming watersheds or streams is one option for minimizing the effects of acid deposition in areas of poorly-buffered soils.

References

- Walsh, M., J. Deeds, and B. Nightingale. 2007a. Classifying lotic systems for conservation: project methods and results of the Pennsylvania Aquatic Community Classification Project. Pennsylvania Natural Heritage Program.
- Walsh, M. C., J. Deeds, and B. Nightingale. 2007b. User's manual and data guide to the Pennsylvania Aquatic Community Classification. Pennsylvania Natural Heritage Program, Western Pennsylvania Conservancy, Middletown, PA, and Pittsburgh, PA.

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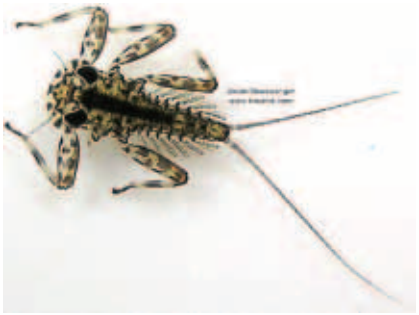
High Quality Small Stream Macroinvertebrate Community

Community Indicators: iron dun mayfly (*Epeorus),* riffle beetle (*Oulimnius*) stripetail stonefly (*Isoperla*), salmonfly stonefly (*Pteronarcys*), free-living caddisfly (*Rhyacophila*)

Stream Quality Rating: High

Habitat: This community type is found in smaller streams flowing through high elevation, heavily forested catchments with very little urbanization. Agricultural development is sparse in these watersheds as well. Water temperatures are typically cool and chemistry values reflect little impairment.

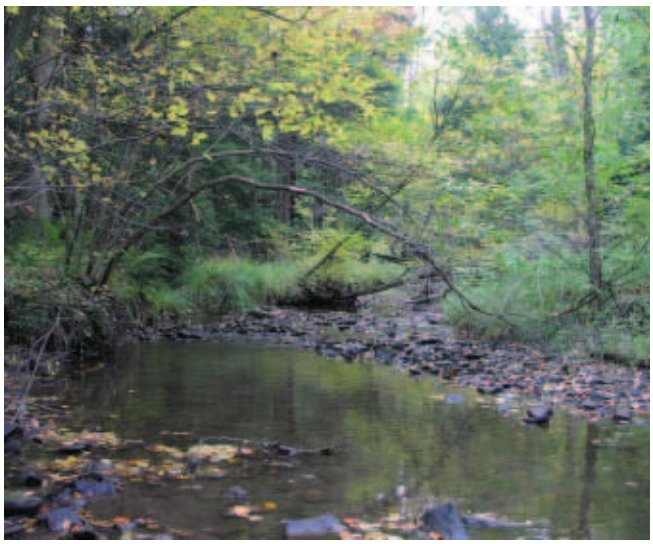


Iron dun mayfly (*Epeorus*)
Photo source: www.troutnut.com

Riffle beetle (*Oulimnius*)
Photo Source: Brady Richards

The High Quality Small Stream Community has a rich assemblage of organisms, including a large number macroinvertebrates sensitive to pollution. The most common community members indicate the presence of quality riffle habitat. This community is widespread across McKean County.

Threats: Found in high-elevation headwater streams, this community faces fewer threats than communities in valley stream, which are generally in more developed watersheds. However, in a few locations the High Quality Small Stream Community may be in habitats degraded by poorly maintained agricultural land. Poorly buffered agricultural areas can contribute unhealthy levels of sediment and nutrients to these streams via non-point source runoff. Additionally, in small watersheds such as these, unpaved roads can cause increased sedimentation rates in streams.



The High Quality Stream Community is found in forested streams with little watershed disturbance.
Photo source: PNHP

Conservation Recommendations: This community group is a strong indicator of a high quality, naturally functioning small stream system. This community can serve as a target community type for the restoration of similar streams that are in poor condition. Addressing runoff issues and water acidification from acidic deposition are critical for the High Quality Small Stream Community. In agricultural areas, runoff and stream bank erosion can degrade stream quality by enriching nutrient concentrations beyond safe levels and smothering important stream habitat with sediment. Nutrient enrichment and sedimentation can be controlled by installing vegetated riparian buffers of sufficient widths along pastures and crop fields. Adequate maintenance of unpaved road surfaces, and management of stormwater from paved roads, will also help reduce the amount of sediments and contaminants introduced to streams.

References

- Walsh, M., J. Deeds, and B. Nightingale. 2007a. Classifying lotic systems for conservation: project methods and results of the Pennsylvania Aquatic Community Classification Project. Pennsylvania Natural Heritage Program.
- Walsh, M. C., J. Deeds, and B. Nightingale. 2007b. User's manual and data guide to the Pennsylvania Aquatic Community Classification. Pennsylvania Natural Heritage Program, Western Pennsylvania Conservancy, Middletown, PA, and Pittsburgh, PA.

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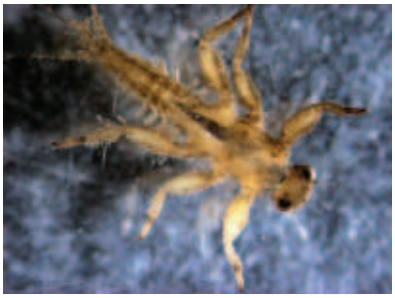
High Quality Large Stream Macroinvertebrate Community

Typified By: blue-winged olive dun mayfly (*Drunella),* acentrellan mayfly (*Acentrella*), dark leadwinged olive mayfly (*Serratella*), ephemerellid mayfly (*Ephemerella*), pale evening dun mayfly (*Leucrocuta*), fingernet caddisfly (*Dolophilodes*), netspinner caddisfly (*Ceratopsyche*), small minnow mayfly (*Baetis*).

Stream Quality Rating: High

Habitat: This community represents high-quality mid-reach streams found at higher elevations and moderate gradients. Water chemistry values suggest some disturbance in the watershed, but do not indicate elevated levels of pollution for larger streams. Stream water is typically cool, as these are high quality habitats existing in highly forested catchments. The amount of urban land cover in the watersheds associated with this group is very low. Agricultural land area in the watershed is also low for streams of this size.



Blue-winged olive dun (*Drunella*)
Photo source: http://ceratium.ietc.wwu.edu/IWS

Acentrellan mayfly (*Acentrella*)
Photo source: http://ceratium.ietc.wwu.edu/IWS

Biological community indicators confirm the description of high quality habitat. This is a biologically diverse assemblage of organisms, many of which are intolerant of organic pollution. In McKean County, habitat for this community exists in sections of the Allegheny River, Potato Creek and Tunungwant Creek.

Threats: Mid-reach streams usually exist below high quality headwaters and therefore receive waters with little impairment. However, threats to water quality become more prevalent once streams reach valleys, where the landscape is subject to greater development pressure. Pollution and habitat alteration associated with poorly managed agricultural land (e.g., sedimentation, nutrient enrichment, changes in temperature regime) might affect this stream type. In addition, acidic precipitation may increase acidity levels in these streams to concentrations that may be intolerable to the sensitive organisms that live there.

Conservation Recommendations: High quality valley streams are valuable natural resources, as they are readily accessible and appealing for recreational use. Streams of this type support some of the state's designated coldwater fisheries. This community represents the highest quality mid-reach stream habitats in Pennsylvania, and should be a priority for conservation and protection. To protect the recreational and intrinsic value of these streams, active conservation strategies should be implemented. In areas with intense agriculture, remediation of poorly managed agricultural land may be necessary. Stream bank fencing and riparian vegetation plantings will facilitate the mitigation of sedimentation and agricultural runoff that affect water quality.

Although urban areas do not appear to be prevalent in areas where this community occurs, retention and treatment of any municipal discharges helps improve stream water quality and habitat condition. Acid precipitation is another issue that affects streams in this region, and should be addressed.

Large streams of high quality are rare in Pennsylvania and are important to this community type.
Photo source: PNHP

References

- Walsh, M., J. Deeds, and B. Nightingale. 2007a. Classifying lotic systems for conservation: project methods and results of the Pennsylvania Aquatic Community Classification Project. Pennsylvania Natural Heritage Program.
- Walsh, M. C., J. Deeds, and B. Nightingale. 2007b. User's manual and data guide to the Pennsylvania Aquatic Community Classification. Pennsylvania Natural Heritage Program, Western Pennsylvania Conservancy, Middletown, PA, and Pittsburgh, PA.

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Eastern Elliptio Mussel Community

Typified by: Eastern Elliptio (*Elliptio complanata*). The rainbow mussel (*Villosa iris*), yellow lampmussel (*Lampsilis cariosa*), and eastern lampmussel (*Lampsilis radiata*) are not consistent community members, but are often associated with this community.

Eastern Elliptio (*Elliptio complanata*)
Photo source: PNHP

Species of Conservation Concern: Rainbow Mussel (S1/G5), Yellow Lampmussel (S3S4/G3G4), and Eastern Lampmussel (S1/G5).

Stream Quality Rating: medium

Community Description and Habitat: The Eastern Elliptio Community is widely distributed across eastern Pennsylvania and is found in a variety of environments. The most common community member, Eastern Elliptio, tolerates many habitats, but this community is generally found with some sand and silt mixed with larger cobble and gravel. In McKean, the community can be found in the southeastern corner of the county, in the portion of the county that is located in the Susquehanna River watershed.

Water quality in the habitats of this community is typified by moderate alkalinity, and high conductivity. Water chemistry parameters may be influenced by non-point source pollution from agriculture and resource extraction. Agriculture in the watershed may contribute non-point source pollution.

Additional study of the Eastern Elliptio Community is needed. The primary indicator species are statistically strong indicators of this community, and thus when found, strongly indicate that this community is present. However, they are also found in other community types.

The Eastern Elliptio Community can occupy diverse habitats from small streams to large rivers like the Susquehanna, above.
Photo source: PNHP

Conservation Recommendations: Although the Eastern Elliptio is not rare in Pennsylvania, some of the associated species that may occur with this community are less common. Protection of current mussel habitats and high water quality will mean that communities will endure and potentially be reintroduced where they have been lost.

Zebra Mussels (*Dreissena polymorpha*) have been reported in the most of major drainage basins in Pennsylvania: Delaware River, Susquehanna River, Genesee River, and Ohio River and Lake Erie basins. Monitoring of Zebra Mussel infestation will document the spread and effects of the non-native species on native mussel populations.

Reducing non-point source pollution and habitat degradation from agriculture is important for the preservation of this community type. Stream bank fencing, riparian restoration, rotational grazing, and soil conservation are some recommendations for improving streams and maintaining habitat to support mussel communities in agricultural watersheds.

References

- Walsh, M., J. Deeds, and B. Nightingale. 2007a. Classifying lotic systems for conservation: project methods and results of the Pennsylvania Aquatic Community Classification Project. Pennsylvania Natural Heritage Program.
- Walsh, M. C., J. Deeds, and B. Nightingale. 2007b. User's manual and data guide to the Pennsylvania Aquatic Community Classification. Pennsylvania Natural Heritage Program, Western Pennsylvania Conservancy, Middletown, PA, and Pittsburgh, PA.

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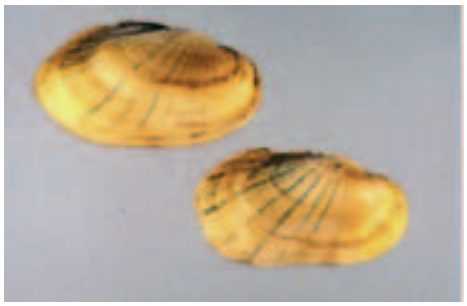
Fatmucket Mussel Community

Typified by: Fatmucket (Lampsilis siliquoidea), giant floater (Pyganodon grandis), three-ridge (Amblema plicata), Wabash pigtoe (Fusconaia flava).



Fatmucket (*Lampsilis siliquoidea*)
Photo source: www.inhs.uiuc.edu

Species of Conservation Concern: Wabash pigtoe (S2/G5), three-ridge (S2S3/G5).

Stream Quality Rating: Moderate to low

Habitat: Preferring quiet muddy waters in Pennsylvania, the Fatmucket Community inhabits various size streams, but usually occurs in rivers 4th order or greater. The community is common in streams with some urban and agricultural influences in the watershed, although forested area is also prevalent in the landscape. Water quality in Fatmucket Community habitats may be slightly degraded by non-point source pollution from agriculture sources. Sandstone and shale geology classes dominate the watersheds supporting this community.

Fatmucket mussels prefer quiet or slow moving water with mud bottoms and avoid riffles (Parmalee and Bogan 1998). Consequently, this community is most common in standing water, in clay, silt, or mud substrate. A moderate number of rare and intolerant taxa are associated with this community. The Fatmucket Community is common throughout the Ohio River basin.

Threats: Since the Fatmucket Community habitat is often located in landscapes with potential non-point source pollution (such as un-mitigated runoff from agricultural or urban areas), water quality may be compromised in these habitats. In some locations, siltation and removal of stream bank vegetation depress mussel communities. Silt may fill in the slow backwaters of large streams and rivers and degrade habitat conditions. Runoff may carry excessive nutrients, herbicides, and pesticides into the stream.

The Fatmucket Community is usually found in slow-moving sections of rivers and larger streams.
Photo source: PNHP

Conservation Recommendations:
Conserving naturally occurring low-gradient streams and the backwaters of rivers is a priority for the Fatmucket Community. Managing non-point sources in watersheds with potential runoff from agriculture and urban sources will maintain quality habitats. In addition, preventing severe in-stream and riparian habitat disturbance near community habitats will also ensure community survival over the long term. Maintaining and restoring wetlands and riparian buffers in these watersheds will ensure that runoff is filtered before entering the stream, reducing the amount of sediment and nutrient levels that reach the water and make the habitat unsuitable for these mussels. Other agricultural best management practices, such as utilizing grassed waterways and fencing cattle from streams, will provide additional protection to locations where this community is found.

References

- Walsh, M., J. Deeds, and B. Nightingale. 2007a. Classifying lotic systems for conservation: project methods and results of the Pennsylvania Aquatic Community Classification Project. Pennsylvania Natural Heritage Program.
- Walsh, M. C., J. Deeds, and B. Nightingale. 2007b. User's manual and data guide to the Pennsylvania Aquatic Community Classification. Pennsylvania Natural Heritage Program, Western Pennsylvania Conservancy, Middletown, PA, and Pittsburgh, PA.

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Spike Mussel Community

Typified by: Spike mussel (*Elliptio dilatata*) and black sandshell (*Ligumia recta*). Several other mussels including the mucket (*Actinonaias ligamentina*), fatmucket (*Lampsilis siliquoidea*), fluted-shell (*Lasmigona costata*) and pocket-book (*Lampsilis cardium*), are also found with this community, but are common in other communities as well.

Spike mussel (*Elliptio dilatata)*
Photo source: http://www.inhs.uiuc.edu

Species of Conservation Concern: black sandshell (S3S4 G5), mucket (S4/G5), fatmucket (S4/G5), flutedshell (S4/G5)

Stream quality rating: High

Habitat: The habitat range for the Spike Community varies medium streams to large rivers, both fast-flowing and low gradient. In McKean County, the community is most commonly found in the larger tributaries to the Allegheny River and sections of Potato Creek.

The species in this community are typically found in medium to large rivers in sand and gravel substrate, and are often associated with riffles. The spike mussel exists in a wide range of habitats, of varied size and depth. It is one of the most abundant mussels in the Allegheny River basin (Strayer and Jirka 1997). A number of rare and intolerant taxa are often associated with this community. Thus, this community is found in ecosystems that are still able to support species that cannot survive in other areas, and is a high protection priority.

Threats: The habitats supporting this community type in McKean County are generally found in watersheds with substantial amounts of agricultural land. Tributaries to the Allegheny River may be impaired from agricultural sources and likely have organic enrichment and low dissolved oxygen. Adverse effects from agriculture in watersheds can be remediated by installing riparian fencing of adequate widths along stream banks and excluding livestock from streams.

Conservation Recommendations: This community is characterized by high mussel diversity, many rare species, and few species that can tolerate pollution. Consequently, it is a high conservation priority. This community occurs in sections of the county that are currently used regularly for agricultural practices, and appropriate measures should be taken to ensure that the effects of improperly managed agricultural areas are lessened.

Managing agricultural runoff is a priority for the Spike Community watersheds in McKean County. Stream habitats and water quality should be improved where streams are impaired. Strategies for retention of stormwater and encouraging groundwater recharge could be applied where impervious surfaces create runoff. Proactive approaches to reducing sediment and nutrient loading from agriculture, including management of livestock, crops, and soils to minimize stream degradation, are also suggested.

The spike community is found in low gradient areas of the Allegheny River (above, at Turtlepoint) and some of its tributaries in McKean County.
Photo source: PNHP

References

- Walsh, M., J. Deeds, and B. Nightingale. 2007a. Classifying lotic systems for conservation: project methods and results of the Pennsylvania Aquatic Community Classification Project. Pennsylvania Natural Heritage Program.
- Walsh, M. C., J. Deeds, and B. Nightingale. 2007b. User's manual and data guide to the Pennsylvania Aquatic Community Classification. Pennsylvania Natural Heritage Program, Western Pennsylvania Conservancy, Middletown, PA, and Pittsburgh, PA.

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Coldwater Fish Community

Typified by: brook trout (*Salvelinus fontinalis*) mottled sculpin (*Cottus bairdii*), brown trout (*Salmo trutta*), rainbow trout (*Oncorhynchus mykiss*)

Brook Trout
Photo source: http://www.cnr.vt.edu/efish

Species of Conservation Concern: none

Stream Quality Rating: High

Community Description and Habitat: This headwater stream community occurs in small swift headwater streams. Water temperatures are the coldest among the fish communities. The Coldwater Community represents small, swift streams with brook trout and slightly larger streams with both brook trout and brown trout or with brown trout only. The Coldwater Community is common across McKean County, in most of the smaller tributaries in each major watershed (Kinzua, Potato, Clarion and Tunungwant Creeks, and the Allegheny River headwaters).

An undisturbed forested landscape often surrounds the streams where the Coldwater community is found and supports the quality stream habitat. Forested riparian buffers and watersheds preserve the cold and well-oxygenated waters and maintain high quality stream habitats and water quality. Natural cover – like logs and woody debris from the forest and loose gravel required for spawning habitat – should be abundant to support the fish community. Forage fish and invertebrates serve as a food supply for the brook and brown trout. Streams supporting this community type often flow from sandstone or shale headwater streams and have a unique water chemistry signature with few dissolved cations and low buffering capacity.

Threats and Disturbances: Headwater streams may be acidic from acid deposition. Acidic precipitation may be occurring in McKean County, and stream acidity may be heightened further if soils in the watershed have poor buffering capacity. Other problems with small streams include disturbances from suburban developments and agriculture. Runoff from roads can result in siltation and poor water quality. Habitat and water quality may also be threatened by poor agricultural practices in small streams.

This community is common in small, forested headwater streams such as this.
Photo Source: PNHP

Conservation Recommendations: Protecting head-water streams with natural landcover should be a priority for McKean County. Preventing pollution and habitat disturbance in high quality, small streams will protect the Coldwater Community. However, fixing ongoing watershed problems at the headwaters is beneficial for downstream waters. Addressing road and impervious surface runoff in McKean County is especially important when new homes and commercial developments are built. Riparian buffers, rotational grazing, erosion control and other strategies may be necessary to minimize agricultural impacts to streams.

Streams in these watersheds may have wild-reproducing populations of brook and brown trout and may be a recreational fishery resource. Trout streams in Pennsylvania are highly valued by fisherman, but have been greatly altered by the transplantation of European brown trout and rainbow trout from western North America. Habitats for native brook trout have been restricted by competition with other, sometimes introduced, trout species.

References

- Walsh, M., J. Deeds, and B. Nightingale. 2007a. Classifying lotic systems for conservation: project methods and results of the Pennsylvania Aquatic Community Classification Project. Pennsylvania Natural Heritage Program.
- Walsh, M. C., J. Deeds, and B. Nightingale. 2007b. User's manual and data guide to the Pennsylvania Aquatic Community Classification. Pennsylvania Natural Heritage Program, Western Pennsylvania Conservancy, Middletown, PA, and Pittsburgh, PA.

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Coolwater Fish Community

Typified by: Blacknose dace *(Rhinichthys atratulus*), creek chub (*Semotilus atromaculatus*), stocked brown trout (*Salmo trutta*), white sucker (*Catostomus commersoni*), redside dace (*Clinostomus elongatus*), longnose dace (*Rhinichthys cataractae*), fathead minnow (*Pimephales promelas*), pearl dace (*Margariscus margarita*), and slimy sculpin (*Cottus cognatus*)

Blacknose dace (*Rhinichthys atratulus*)
Photo source: www.ohiodnr.com/dnap/

Species of concern: none

Stream Quality Rating: Low to moderate

Community Description and Habitat: This community type has varied habitat and can represent a variety of stream conditions. Generally, stream types are small to medium sized, fairly fast flowing and have intermediate water temperatures. These streams may be called "Cold Water Fishery" by PA DEP, typically meaning that they support brown trout. In many cases, fish tolerant of cool and warm temperatures are also present. The best examples of Coolwater Stream Community habitat are valley streams that have cobble and gravel substrates and available cover for fish. In some cases, agriculture warms otherwise cold streams and may degrade stream habitats resulting in a loss of natural fish community. In some areas, this community may represent habitat that is transitional between small headwater streams and warmer, larger steams and rivers. In McKean County, several streams were classified as the Coolwater Stream Community; sections of Kinzua Creek, Chappel Fork, Fivemile Run, Marvin Creek, Potato Creek, Allegheny Portage Creek, Cole Creek, Knapp Creek and Tunungwant Creek.

Threats: A number of pollution types are found in watersheds where this community occurs. The community generally occurs in streams impaired by agricultural and urban runoff, as well as various disturbances such as land development or wastewater outfalls. Stream temperature may be warmer than natural temperatures because riparian vegetation has been removed. Stream habitats may have been altered where this community is found. In Crooked Creek, Coolwater Stream community habitat is impaired by hydrologic modification, siltation, and low dissolved oxygen; the headwaters of Muddy Creek are degraded from road runoff and resulting siltation (PA DEP 2006).

Valley streams with moderate gradients and a mix of substrate types are typical of coolwater habitats.
Photo source: PNHP

Conservation Recommendations:
Restoration of stream temperature, habitat, and water quality to natural conditions is recommended. Management of storm water runoff and riparian vegetation restoration are critical to improvement of community conditions. Addressing sediment and nutrient loading will improve water quality for this community type. Where stocking of non-native fish is occurring with the Coolwater community, native fish are displaced. Restoration of fish community to native fish is recommended. The habitat for the Coolwater community represents an important transition between cold headwater streams and warm, larger streams. The habitat is distinct among other habitat types and should be protected and restored.

References

- Walsh, M., J. Deeds, and B. Nightingale. 2007a. Classifying lotic systems for conservation: project methods and results of the Pennsylvania Aquatic Community Classification Project. Pennsylvania Natural Heritage Program.
- Walsh, M. C., J. Deeds, and B. Nightingale. 2007b. User's manual and data guide to the Pennsylvania Aquatic Community Classification. Pennsylvania Natural Heritage Program, Western Pennsylvania Conservancy, Middletown, PA, and Pittsburgh, PA.

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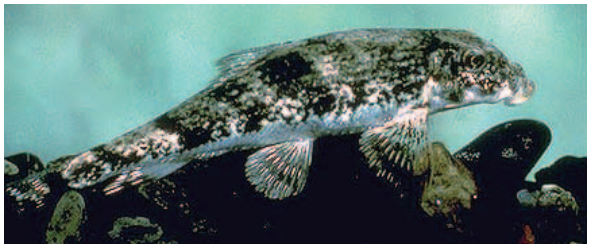
Warmwater Fish Community

Typified by: Greenside darter (*Etheostoma blennioides*), central stoneroller (*Campostoma anomalum*), rainbow darter (*Etheostoma caeruleum*), rosyface shiner (*Notropis rubellus*), johnny darter (*Etheostoma nigrum*), fantail darter (*Etheostoma flabellare*), logperch (*Percina caprodes*), stonecat (*Noturus flavus*), silver shiner (*Notropis photogenis*), golden redhorse (*Moxostoma erythrurum*), mimic shiner (*Notropis volucellus*), pumpkinseed (*Lepomis gibbosus*), yellow bullhead (*Ameiurus natalis*), large-mouth bass (*Micropterus salmoides*), green sunfish (*Lepomis cyanellus*), tonguetied minnow (*Exoglossum laurae*), Ohio lamprey (*Icthyomyzon bdellium*)



Northern Hogsucker
Photo Source: http://www.ohiodnr.com/dnap

Species of Conservation Concern: none

Community Description and Habitat: The Ohio Warmwater Community occurs in the larger streams found in McKean County, such as lower Kinzua Creek and the Allegheny River. These streams are characterized by a diverse fish community ranging from game fish to small, bottom-dwelling darters and minnows.

Warm water temperatures are characteristic of this community group. Thermal tolerances of fish in the community group are higher than the cold- and cool-water communities. The habitat of community fish is a range of conditions. This stream community, in undisturbed condition, probably represents small to medium-size warmwater systems with little silt and turbidity. In impaired systems, poorer water quality conditions and increased turbidity and low dissolved oxygen (DO) occur.

Stream Quality Rating: Medium

Threats and Disturbances: Water quality and habitat may be influenced by non-point source pollution. Runoff from impervious surfaces and poorly managed agricultural areas can be a threat to this community. The watersheds that support this community have a relatively large amount of agricultural land within them. Streams supporting this community type may be impaired by siltation, low DO, organic enrichment, and hydro modification from agricultural sources (PA DEP 2006).

Potential point sources from municipal and industrial discharges may negatively influence water quality in some warmwater community habitats. Sewage treatment plants may damage stream habitats through nutrient loading.

Mid-sized streams like Potato Creek, above, without many groundwater inputs are typical of Warmwater Community streams. Stream sequences of pools (slow-moving habitats), riffles (swift current habitats), and runs (intermediate current habitats) provide a variety of habitats and support warmwater fish communities.
Photo source: PNHP

Conservation Recommendations: This community is a high conservation priority. Warmwater streams in good condition are not common. The fish associates of this community type are not especially rare individually, however, the community group occupies habitats in need of protection in Pennsylvania.

Since warmwater streams mainly occur in valleys downstream of human influences, they are often subject to pollution from non-point sources, such as agriculture and urban runoff. Storm water management, restoration of riparian buffer zones, erosion control, and exclusion of livestock from streams are some mitigation techniques for non-point source pollution. Managing storm water runoff is especially important for valley streams.

References

- Walsh, M., J. Deeds, and B. Nightingale. 2007a. Classifying lotic systems for conservation: project methods and results of the Pennsylvania Aquatic Community Classification Project. Pennsylvania Natural Heritage Program.
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