

LAWRENCE COUNTY NATURAL HERITAGE INVENTORY

Prepared for:

**The Lawrence County Planning Commission
430 Court Street
New Castle, PA 16101**

Prepared by:

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This project was funded by the Pennsylvania Department of Conservation and Natural Resources, Bureau of Recreation and Conservation (Keystone Recreation, Park and Conservation Fund Program grant), the Pennsylvania Department of Community and Economic Development, the Hoyt Foundation and David Barenfeld.

PREFACE

The Lawrence County Natural Heritage Inventory identifies and maps Lawrence County's most significant natural places by investigating plant and animal species and natural communities that are unique or uncommon in the county. Areas important for wildlife habitat and scientific study were also included.

The inventory, while not bestowing protection to any of the areas listed, acts as a tool for informed and responsible decision-making. Public and private organizations may use the inventory to guide land acquisition and conservation decisions as local municipalities and the County may use it to help with comprehensive planning, zoning and the review of development proposals. Developers, utility companies and government agencies all may benefit from access to this environmental information prior to the creation of detailed development plans.

Using tested and proven methodology the inventory operates as a preliminary report of Lawrence County's natural heritage. Further investigations could potentially uncover previously unidentified Natural Heritage Areas, which would then be mapped and described in future updates of the inventory. Additionally, in-depth investigations of areas listed in this report could reveal features of further or greater significance than those documented previously. Anyone wishing to visit inventory areas other than those on public lands should obtain permission from the property owner(s) prior to visitation.

The Western Pennsylvania Conservancy served as the principal investigator for the study and prepared the report and maps as the products of the study. The Western Pennsylvania Conservancy, a private, non-profit, conservation organization, protects natural lands, promotes healthy communities, and preserves Fallingwater. Questions concerning sites or updates to the inventory should be addressed to the Western Pennsylvania Conservancy, 209 Fourth Avenue, Pittsburgh, PA 15222; phone: (412) 288-2777.

The Lawrence County Planning Commission administered this study. Requests for copies of the inventory can be addressed to the Lawrence County Planning Office, 430 Court Street, New Castle, PA 16101 Phone: (724) 658-3589.

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Robert B. Coxe
Ecologist
Western Pennsylvania Conservancy

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EXECUTIVE SUMMARY

This study was commissioned by Lawrence County and administered by the Lawrence County Planning Commission. The Pennsylvania Department of Conservation and Natural Resources, Bureau of Recreation and Conservation, Pennsylvania Department of Community and Economic Development and private sources funded this study. The Western Pennsylvania Conservancy served as the principal investigator and prepared the report and maps as the products of the study.

The Lawrence County Natural Heritage Inventory identifies and maps Lawrence County's most significant natural places by investigating plant and animal species and natural communities that are unique or uncommon in the county. Areas important for wildlife habitat and scientific study are also included.

The inventory does not bestow protection to any of the areas listed but is a tool to help informed and responsible decision-making. Public and private organizations may use the inventory to guide land acquisition and conservation decisions. Local municipalities and county officials may use it to help with comprehensive planning, zoning and the review of development proposals. Developers, utility companies and government agencies all may benefit from access to this environmental information prior to the creation of detailed development plans.

The inventory is best viewed as a preliminary report of Lawrence County's natural heritage. Further investigations could potentially uncover previously unidentified Natural Heritage Areas. In addition, in-depth investigations of sites listed in this report could reveal features of further or greater significance than have been documented. Some areas are privately owned, which means anyone wishing to visit these areas should obtain permission from the property owner(s) prior to visitation.

Western Pennsylvania Conservancy is a private, non-profit conservation organization with the mission of enriching the human relationship with the natural world by saving the places we care about. Western Pennsylvania Conservancy protects natural lands, promotes healthy communities, and preserves Fallingwater. Questions concerning sites or updates to the inventory should be addressed to: Western Pennsylvania Conservancy, 209 Fourth Avenue, Pittsburgh, PA 15222; phone: (412) 288-2777.

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INTRODUCTION

The first steps in ensuring protection of environmentally sensitive/ecologically important areas are identifying them and determining their importance. This information helps county, state, and municipal government, the public, and business interests plan development with the preservation of these environmentally important sites in mind. The Lawrence County Natural Heritage Inventory is designed to identify and map important biotic (living) and ecological resources present in Lawrence County. The biotic resources inherited by the citizens of this region include:

- areas that have been left relatively undisturbed by human activity
- potential habitats for species of special concern [species facing imperilment at a state and/or global level (i.e., endangered, threatened, etc.)]
- significant natural communities (assemblages of plants and animals) areas important for general wildlife habitat, open space, education, scientific study, and recreation.

This Natural Heritage Inventory focuses on areas that are the best examples of living *ecological resources* in Lawrence County. Although agricultural lands and open space may be included as part of inventory areas, the emphasis of the designation and delineation of the areas are the ecological values present. Existence of habitat for specific plants and animals and the rarity of natural communities are important selection criteria for Natural Heritage Areas but equally important are the size and homogeneity of an area containing good quality natural features. Large areas provide the backbone that links habitats and allows plants and animals to shift and move across sizable portions of the landscape. There are many important resources in Lawrence County not addressed in this inventory. Historic, cultural, geological, educational, water supply, agricultural and scenic resources are among many the county will address through other projects and programs.

NATURAL HERITAGE INVENTORY METHODS

Presently, ten County Natural Heritage Inventories (CNHI) have been completed for Western Pennsylvania. These include the Butler County CNHI (Smith et al., 1991), Centre County CNHI (Stack et al., 1991), Beaver County CNHI (Smith et al., 1993), Clinton County CNHI (Wagner et al., 1993), Erie County CNHI (Kline et al., 1993), Allegheny County CNHI (Smith et al., 1994), the Washington County CNHI (Wagner et al., 1994), Westmoreland County CNHI (Smith et al., 1998) and the Fayette County CNHI (Wagner, et al., 2000). Methods used in this inventory are based on the previous reports, as well as those used by Anonymous (1985); Reese, G.A., et al., (1988); and Davis A.F., et al., (1990). The eleventh in this series, Lawrence County CNHI was conducted using the same methodologies which proceeded in the following stages:

I. Gathering Existing Information

A review of the Pennsylvania Natural Diversity Inventory (PNDI) database (see Appendix II) was performed in order to determine what, if any, sites for special concern species and important natural communities are known to exist in Lawrence County. Members of local land trusts and conservancies, environmental advisory councils and other conservation oriented citizen groups were contacted, as well as other individuals that were able to contribute information to the inventory. Individuals from the Pennsylvania Department of Conservation and Natural Resources-Bureau of Forestry were contacted for existing site information.

II. Aerial Photo and Map Interpretation

The Lawrence County Planning Commission made available the most recent aerial photos of Lawrence County (1998). Initial study of these photos revealed large-scale natural features (e.g., contiguous forest, wetlands, shale barrens), disturbances (e.g., utility line right-of-ways, strip mines, timbered areas) and a variety of easily interpretable features. Investigation of areas on the ground and review of the same areas on the photos helped to establish a set of “signatures” that allowed a more detailed review of areas not visited on the ground. Some sites could be eliminated if they proved to be highly disturbed or fragmented or purely attributable to human-made features (e.g., impoundments, clearings, farm fields).

III. Ground Survey

Areas identified on maps, aerial photographs and from the air as potential sites were scheduled for ground surveys. Landowners were contacted and the sites were examined to evaluate the condition and quality of the habitat and to classify the communities present. The flora, fauna, level of disturbance, appropriate age of community and local threats were among the most important data recorded for each site. In some instances when permission was not obtained to visit a site or when enough information was available from other sources, sites were not ground surveyed.

IV. Aerial Reconnaissance

Flying over the landscape greatly helps in interpretation of features because of color and tonal differences and because of the 3-Dimensional perspective gained of areas and objects that on photographic sheets appear as 2-Dimensional. Some sites can be eliminated after such direct inspection. Information concerning extent, quality and context can be gathered easily from the air. Any sites that can be eliminated via aerial inspection can save many hours of ground inspection, particularly when dealing with remote areas. The use of aerial reconnaissance flights, as well as aerial photos, proves particularly important in evaluating sites for which permission to perform field surveys was not granted or pursued due to time constraints.

V. Data Analysis

The sites visited were ranked by relative significance. In the cases when sites could not be compared through the detailed information that ground surveys provide, aerial photographs and existing data provided the necessary information that allowed decisions to be made concerning the site and its inclusion in the inventory.

Field data for natural communities and for all plant and animal species of special concern found were synthesized with existing data and summarized. Boundaries for each site were digitized using ArcView 3.2a GIS software; base maps were georeferenced digital raster graphics of 1:24,000 scale USGS topographic quadrangles in the UTM zone 17 projection and the NAD 27 NADCON datum. Site boundaries were designed to delineate those areas where natural resource impacts should receive special consideration during land use planning.

NATURAL HERITAGE AREA CLASSIFICATION

The following classification provides definitions and examples of the two types of Natural Heritage Areas, as well as a management designation included in this report:

- BIOLOGICAL DIVERSITY AREA (BDA)
- LANDSCAPE CONSERVATION AREA (LCA)
- ^m Managed Lands

BIOLOGICAL DIVERSITY AREA (BDA)

An area that contains one or both of the following:

One or more locations of plants, animals or natural communities recognized as a state or federal species of special concern

High quality examples of natural communities or areas supporting exceptional native diversity

LANDSCAPE CONSERVATION AREAS (LCA)

A large contiguous area which is important because of its size, open space, habitats, and/or the inclusion of one or more Biological Diversity Areas. Although an LCA includes a variety of land uses, it typically has not been heavily disturbed and thus retains much of its natural character.

Managed Lands

Managed Lands are owned or leased properties with importance, or potential importance, to the overall maintenance and protection of ecological resources of Lawrence County. Managed Lands are of three types:

- Public properties established and managed to a large extent for natural resources. These properties have the potential to manage such resources in order to maintain or enhance important ecological assets in the county, and by this evaluation are deemed to be among the most ecologically valuable of public properties. Examples include state game lands, state forests, state parks, national historic sites, and county or municipal parklands.
- Private properties held by private organizations concerned with the management and protection of natural resources, and which upon evaluation have been selected to be among the most ecologically "valuable" of such properties. Examples include: private nature preserves, private environmental education centers.

Dedicated Area (DA): A public or private property, possibly disturbed in the past, where the owner's stated objectives are to protect and maintain the ecological integrity and biological diversity of the property. This is usually done largely through a hands-off management approach, with intervention only when there are demonstrable threats to the ecology of the area.

RESULTS

The Lawrence County Natural Heritage Inventory recognized 35 areas of significance – 33 Biological Diversity Areas (BDA's) and two Landscape Conservation Areas (LCA's). Natural Heritage Areas are contained in 18 out of the 27 municipalities in the county. Two of the county's most significant areas - Slippery Rock Gorge and Plain Grove Fen were included as part of Slippery Rock Gorge LCA and Plain Grove BDA, respectively.

Below are the areas identified for the Natural Heritage Inventory for Lawrence County and the Municipalities on which they are located. The areas are listed in order of their significance to the protection of the biological diversity and ecological integrity of the region.

LANDSCAPE CONSERVATION AREAS

MUNICIPALITY

EXCEPTIONAL Significance

Slippery Rock Gorge LCA

Slippery Rock Township

HIGH Significance

North Fork Little Beaver Creek LCA

Little Beaver Township

BIOLOGICAL DIVERSITY AREAS**MUNICIPALITY****EXCEPTIONAL Significance**

Plain Grove BDA
Fringed Gentian BDA
CS and M Mine BDA
Grange Hall Fen BDA
Hell Run BDA

Plain Grove Township
Shenango Township
Wayne Township
Plain Grove Township
Slippery Rock Township

HIGH Significance

Westminster College BDA
Brush Run BDA
County Line Wetlands BDA

New Wilmington Borough
Slippery Rock Township
Little Beaver Township

NOTABLE Significance

Beaver River Islands BDA
Beaver River Floodplain BDA
Little Neshannock Creek BDA
Sunset Valley Floodplain BDA
Brent BDA
Enon Valley BDA
McConahy Road Wetland BDA
Upper Coffee Run BDA
Honey Creek BDA
Quaker Falls BDA
Harris Bridge Slopes BDA
Hawk Marsh BDA
Maryvale Swamp BDA
Rock Point BDA
Taylor Run Marsh BDA
Deer Creek Confluence BDA
Grindstone Confluence BDA
Gardner Swamp BDA

North Beaver Township
Taylor Township
New Wilmington Borough
Neshannock Township
Plain Grove Township
Enon Valley Borough
Plain Grove Township
Pulaski Township
Little Beaver Township
Mahoning Township
Perry Township
Hickory Township
Pulaski Township
Wayne Township
Plain Grove Township
Pulaski Township
Perry Township
Shenango Township

BIOLOGICAL DIVERSITY AREAS

MUNICIPALITY

Stateline Floodplain BDA

Little Beaver Township

COUNTY Significance

Muddy Creek Falls BDA

Slippery Rock Township

Triangle Woods BDA

Plain Grove Township

Soap City Slopes BDA

Mahoning Township

Edinburg Swamp BDA

Mahoning Township

Briar Hill BDA

Hickory Township

Harlansburg Swamp BDA

Scott Township

Managed Lands

McConnell's Mill State Park

Perry Township

Slippery Rock Township

McConnell's Mill State Park Natural Area
DA

Perry Township

Slippery Rock Township

Plain Grove DA

Plain Grove Township

State Game Lands #148

New Beaver Borough

State Game Lands #150

Pulaski Township

State Game Lands #151

Washington Township

Plain Grove Township

State Game Lands #178

Neshannock Township

State Game Lands #216

Scott Township

State Game Lands #284

Washington Township

Plain Grove Township

Westminster College Woods DA

Wilmington Township

RESULTS

The results of the Natural Heritage Inventory for Lawrence County are summarized in tabular form. Table 1 lists Natural Heritage Areas in order of their significance to the protection of the biological diversity and ecological integrity of the region, and provides a summary of the important features of the study area. Table 2 lists the Natural Heritage Areas according to the municipality (ies) in which they are located. Fig. 1 precedes this table and identifies the municipalities in Lawrence County. Table 3 (Dedicated Areas) supplies a list and description of areas dedicated to the protection of ecological resources in the study area.

Table 1: Natural Heritage Areas in order of relative significance.

The Natural Heritage Areas that have qualified for inclusion in this report are ranked according to their significance as areas of importance to the biological diversity and ecological integrity of Lawrence County. Areas that are state significant due to the presence of a plant or animal species of special concern or significant natural community are given priority. Sites which are significant to Lawrence County but less unique within the state as a whole, follow. Significance ranks are **Exceptional, High, Notable, and County** (for a full explanation of these items, see Appendix I). Significance ranks are used to prioritize all identified sites and suggest the relative attention sites should receive for the amount and degree of protection. For example, an opportunity may come available in the county to create or advise the creation of a conservation area or park. To assure that the most important sites and resources receive priority, the county could focus on areas listed as “Exceptional”.

<u>SITE</u>	<u>MUNICIPALITY</u>	<u>DESCRIPTION</u>
EXCEPTIONAL		
1. Slippery Rock Gorge LCA	Slippery Rock Township	Watershed that contains numerous natural communities, plants and animals of special concern.
2. Plain Grove Wetlands BDA	Plain Grove Township	Wetland complex that includes Fen and seepage wetland communities and is the location of numerous plant species of special concern.
3. Fringed Gentian BDA	Shenango Township	Location of a fen that is habitat for several plant species of special concern and a riparian area that supports an animal species of special concern.
4. CS and M Mine BDA	Wayne Township	Active mine that provides habitat for several animal species of special concern.
5. Grange Hall Fen BDA	Plain Grove Township	Calcareous fen community and the location of several Pennsylvania plant species of special concern one of which is rare throughout its range.
6. Hell Run BDA	Slippery Rock Township	Exceptional value stream and gorge of Hell Run supporting several old growth forest natural communities.

<u>SITE</u>	<u>MUNICIPALITY</u>	<u>DESCRIPTION</u>
HIGH		
7. North Fork Little Beaver LCA	Little Beaver Township	Significant watershed protecting a high quality stream community as well as other natural communities and special species habitats.
8. Westminster College BDA	New Wilmington Borough	Wetland along Little Neshannock Creek that provides habitat for an animal species of special concern. Also the location of a mature forest community.
9. Brush Run BDA	Slippery Rock Township	Open marsh that provides habitat for several plant species of special concern.
10. County Line Wetlands BDA	Little Beaver Township	High quality stream community that provides habitat for an animal species of special concern.
11. Beaver River Islands BDA	North Beaver Township	Forested islands and riparian area of the Beaver and Shenango Rivers that contains an exemplary riverine habitat.
12. Beaver River Floodplain BDA	Taylor Township	Floodplain of the Beaver River and location of a notable natural community.
13. Little Neshannock Creek BDA	New Wilmington Borough	Stream community and riparian area that provides a home for an animal species of special concern.
14. Sunset Valley Floodplain BDA	Neshannock Township	Forested floodplain along Neshannock Creek that provides habitat for a plant species of special concern.
15. Brent BDA	Plain Grove Township	Reclaimed strip mine, now grassland, that provides habitat for an animal species of special concern.
16. Enon Valley BDA	Enon Valley Borough	Forested floodplain and open wetlands that are the location of an animal species of special concern.

<u>SITE</u>	<u>MUNICIPALITY</u>	<u>DESCRIPTION</u>
NOTABLE		
17. McConahy Road Wetland BDA	Plain Grove Township	Black ash swamp and tussock sedge marsh that is a habitat for a plant species of special concern.
18. Upper Coffee Run BDA	Pulaski Township	Open marshes and forested communities that are a location of a plant species of special concern.
19. Honey Creek BDA	Little Beaver Township	Stream community supporting an animal species of special concern.
20. Quaker Falls BDA	Mahoning Township	Forest valley of Falling Spring Run that is the location of Quaker Falls and a high quality natural community.
21. Harris Bridge Slopes BDA	Perry Township	Forested slope of the Slippery Rock Creek gorge and location of a high quality natural community.
22. Hawk Marsh BDA	Hickory Township	Open marshy area at the headwaters of Hottenbaugh Run and the location of a high quality natural community.
23. Maryvale Swamp BDA	Pulaski Township	Wetland featuring a buttonbush swamp- a unique natural community for Lawrence County.
24. Rock Point BDA	Wayne Township	Large, contiguous forested area currently the historic location of a plant species of special concern and historically significant.
25. Taylor Run Marsh BDA	Plain Grove BDA	Two quality wetland natural communities in the Taylor Run watershed.
26. Deer Creek Confluence BDA	Pulaski Township	Wetland at the confluence of tributaries to Deer Creek that is the location of a quality natural community.
27. Grindstone Confluence BDA	Perry Township	Gorge, riverine islands and floodplain that is the location of a sycamore (river birch) floodplain scrub community.
28. Gardner Swamp BDA	Shenango Township	Emergent wetland located at the headwaters of McKee Run and the location of a plant species of special concern.

SITE

MUNICIPALITY

DESCRIPTION

NOTABLE

29. Stateline Floodplain BDA

Little Beaver
Township

Forested riparian area and slopes along North
Fork Little Beaver Creek.

COUNTY

30. Muddy Creek Falls BDA

Slippery Rock
Township

Falls of Muddy Creek, natural community and
historic location of a plant species of special
concern.

31. Triangle Woods BDA

Plain Grove
Township

Rich, mature and diverse northern hardwoods
forest.

32. Soap City Slopes BDA

Mahoning Township

Dry, forested slope community above the
Mahoning River.

33. Edinburg Swamp BDA

Mahoning Township

Water-willow community located in the
floodplain of the Mahoning River and one of
the few forested floodplains of the river.

34. Briar Hill BDA

Hickory Township

Herbaceous and shrub wetland at the top of a
glacial moraine. Historic location for a plant
species of special concern.

35. Harlansburg Swamp BDA

Scott Township

Shrub swamp and historic location of a plant
species of special concern.

**Figure 1.
Lawrence County
Municipalities**

OHIO

Mercer County



Butler County

OHIO

Beaver County

Table 2. Summary of Natural Heritage Areas and Managed Lands by municipality

<u>Municipality</u>	<u>Site Names & Managed Lands</u>	<u>School District</u>
Bessemer Borough	None	Mohawk
Ellport Borough	None	Ellwood City Area
Ellwood City Borough	None	Ellwood City Area
Enon Valley BDA	Enon Valley BDA	Laurel Area
Hickory Township	Briar Hill BDA Hawk Marsh BDA Sunset Valley Floodplain BDA	Laurel Area
Little Beaver Township	County Line Wetlands BDA Enon Valley BDA Honey Creek BDA North Fork Little Creek LCA Stateline Floodplain BDA	Mohawk
Mahoning Township	Edinburg Swamp BDA Soap City Slopes BDA Quaker Falls BDA	
Neshannock Township	Sunset Valley Floodplain BDA <i>State Game Lands #178</i>	Neshannock Township
New Beaver Borough	Beaver River Floodplain BDA County Line Wetlands BDA North Fork Little Beaver Creek LCA Rock Point BDA	Mohawk
City of New Castle	Beaver River Island BDA	New Castle Area
New Wilmington Borough	Westminster College BDA <i>Westminster College Woods DA</i>	Wilmington Area
North Beaver Township	Beaver River Floodplain BDA Beaver River Islands BDA	Mohawk

Table 2 (cont.)

<u>Municipality</u>	<u>Site Names & Managed Lands</u>	<u>School District</u>
Perry Township	Grindstone Run Confluence BDA Harris Bridge Slopes BDA Slippery Rock Gorge LCA <i>McConnell's Mill Natural Area DA</i> <i>McConnell's Mill State Park</i>	Ellwood City Area
Plain Grove Township	Brent BDA Grange Hall Fen BDA McConahy Road Swamp BDA Plain Grove Wetlands BDA Taylor Run Marsh BDA Triangle Woods BDA <i>Plain Grove Wetlands DA</i> <i>State Game Lands #151</i> <i>State Game Lands #284</i>	Wilmington Area
Pulaski Township	Deer Creek Confluence BDA Maryvale Swamp BDA Upper Coffee Run BDA <i>State Game Lands #150</i>	Wilmington Area
Scott Township	Harlansburg Swamp BDA Plain Grove Wetlands BDA Slippery Rock Gorge LCA <i>State Game Lands #216</i>	Laurel Area
Shenango Township	Beaver River Floodplain BDA Fringed Gentian Fen BDA Gardner Swamp BDA Slippery Rock Gorge LCA <i>Fringed Gentian Fen DA</i>	Shenango Area
Slippery Rock Township	Brush Run BDA Grindstone Confluence BDA Harris Bridge Slopes BDA Hell Run BDA Muddy Creek Falls BDA Slippery Rock Gorge LCA	Laurel Area

Table 2 (cont.)

<u>Municipality</u>	<u>Site Names & Managed Lands</u>	<u>School District</u>
Slippery Rock Township (cont.)	<i>McConnell's Mill Natural Area DA</i> <i>McConnell's Mill State Park</i> <i>State Game Lands #216</i>	
SNPJ Borough	None	Mohawk
South New Castle Borough	None	Shenango Area
Taylor Township	Beaver River Floodplain BDA Beaver River Islands BDA	New Castle Area
Union Township	Edinburg Swamp BDA	Union Area
Volant Borough	None	Wilmington Area
Wampum Borough	None	Ellwood City Area
Washington Township	<i>State Game Lands #151</i> <i>State Game Lands #284</i>	Wilmington Area
Wayne Township	Beaver River Floodplain BDA CS and M Mine BDA Rock Point BDA Slippery Rock Gorge LCA <i>McConnell's Mill State Park</i>	Ellwood City Area
Wilmington Township	Little Neshannock Creek BDA Westminster College BDA <i>Westminster College Woods DA</i>	Wilmington Area

Table 3: Dedicated Areas protecting biotic resources in Lawrence County.

As a primary objective the Lawrence County Natural Heritage Inventory provides information utilized in planning for the protection of the biological diversity and ecological integrity of the region. The preservation of such resources depends, in part, upon the establishment of specific areas and management plans dedicated to protection of these resources called Dedicated Areas. The “Natural Heritage Areas Classification” section of the report gives a full definition and description of a category of managed lands termed Dedicated Areas.

Lawrence County contains four areas that qualify as Dedicated Areas:

- 1. McConnell’s Mill Natural Area DA**
- 2. Plain Grove Wetlands DA**
- 3. Fringed Gentian Fen DA**
- 4. Westminster College Woods DA**

McConnell’s Mill Natural Area DA encompasses most of McConnell’s Mill State Park along Slippery Rock Creek. Administered by the Department of Conservation and Natural Resources as part of the State Park Natural Area system, the area is managed for its ecological attributes. The description of the Slippery Rock Creek LCA covers the natural features of this Dedicated Area.

Plain Grove Wetlands DA includes a swamp, fen and floodplain along Taylor Run. Located in Plain Grove Township, the Western Pennsylvania Conservancy owns and manages the property for its ecological value. This property contains fens and seepage wetlands supporting many plant species of special concern in the county.

Fringed Gentian Fen DA owned by the Western Pennsylvania Conservancy constitutes a small portion of Fringed Gentian Fen BDA in Shenango Township. Greater landscape planning is needed for the protection of this fen in order to insure that the recharge area is protected. Located in Shenango Township, this fen shares similarities with the fen at Plain Grove.

Westminster College Woods DA is part of the outdoor teaching facilities at Westminster College. Located in Wilmington Township, this area contains old growth forest and potentially important wetlands along Little Neshannock Creek.

Two other places in the county may one day meet the definition we have provided for dedicated areas. These include:

Rock Point: Large contiguous forested area and historically significant area. During the 1880’s to the early 1900’s it served as the location of an amusement park.

Shaw Island: This island in the Beaver River is owned by DCNR through the unclaimed property act. The island, along with the adjacent floodplain contains an exemplary riverine community.

Numerous areas recognized in this inventory, including both public and private lands, could be forged into Dedicated Areas through a variety of landowner agreements, easements, special programs, or a combination of methods. Ultimately, areas set aside now will be the exemplary natural areas of the future, and if planned well and of sufficient size, will become the premier areas for biodiversity protection in the region.

COUNTY NATURAL HERITAGE INVENTORIES

INTRODUCTION

The first steps in ensuring the protection of environmentally sensitive/ecologically important areas are identifying them and determining their importance. This information helps county, state, and municipal government, the public, and business interests plan development with the preservation of these environmentally important sites in mind. The Lawrence County Natural Heritage Inventory identifies and maps important biotic (living) and ecological resources present in Lawrence County. The biotic resources inherited by the citizens of this region include: areas that are left relatively undisturbed by human activity, potential habitats for species of special concern [species facing imperilment at a state and/or global level (i.e., endangered, threatened, etc.)], significant natural communities (assemblages of plants and animals), and areas important for general wildlife habitat, open space, education, scientific study, and recreation.

Many important resources present in Lawrence County are not addressed in this inventory. Historic, cultural, geological, educational, water supply, agricultural and scenic resources are among many the county will address through other projects and programs. This Natural Heritage Inventory focuses on the best examples of living *ecological resources* in Lawrence County. Although agricultural lands and open space may be included as part of inventory areas, the emphasis of the designation and delineation of the areas are the ecological values present. The existence of habitat for specific plants and animals and the rarity within the state of an area's natural communities are important selection criteria for Natural Heritage Areas but equally important is the size and contiguousness of an area containing good quality natural features. Large areas provide the backbone that links habitats and allows plants and animals to shift and move across sizable portions of the landscape.

NATURAL HERITAGE AREAS CLASSIFICATION

The Natural Heritage Areas identified in this report are recognized according to the classification below. Sites chosen are those that are believed to be of sufficient size and quality (i.e., the natural systems are relatively intact) to continue as viable communities in the foreseeable future.

The inventory identifies ecologically important sites that are of significance in Lawrence County. Some sites are significant at the state level, due to rarity or quality of their features. Also included are sites whose features are not necessarily uncommon in the region or state, but are unique or uncommon in this county. For example, a 50-acre mature hemlock-swamp common to many places around Pennsylvania would be uncommon both in size and community type within Lawrence County and would, therefore, thus would be included in the inventory.

The following classification provides definitions and examples of the three types of Natural Heritage Areas and a management designation included in this report.

- BIOLOGICAL DIVERSITY AREA (BDA)
- LANDSCAPE CONSERVATION AREA (LCA)
- ^m Managed Lands

Definitions and examples of each of these Natural Heritage Areas follow:

BIOLOGICAL DIVERSITY AREA (BDA)

An area containing, and important, in the support of known occurrences of plants and animals of special concern at either state or federal levels, exemplary natural communities, or exceptional native diversity.

LANDSCAPE CONSERVATION AREAS (LCA)

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

Managed Lands

"Managed Lands" are owned or leased properties that are included in the report because of their importance, or potential importance, to the overall maintenance and protection of ecological resources of Lawrence County. Managed Lands are of two types:

- Public properties established and managed to a large extent for natural resources, and/or those that have the potential to manage such resources in order to maintain or enhance important ecological assets in the county, and by this evaluation are deemed to be among the most ecologically "valuable" of public properties. Examples include: state game lands, state forests, state parks, national historic sites, county or municipal park lands.
- Private properties held by private organizations concerned with the management and protection of natural resources, and which upon evaluation are selected to be among the most ecologically "valuable" of such properties. Examples include: private nature preserves, private environmental education centers.

Managed Lands do not necessarily include, nor are they necessarily included within, identified Biological Diversity Areas. These properties are often large in size (e.g., essentially all state game lands) and, for this and potentially other reasons, are ecologically important in a general sense. The ecological importance and value of some Managed Lands stems from their association with an area identified for natural heritage significance, e.g., a Managed Land within the boundaries of a Biological Diversity Area. However, Managed Lands are legally bounded properties, and are not to be confused with areas of natural heritage importance, which are identified by their ecological significance. Many Managed Lands have the potential to become even more ecologically valuable if their management becomes more sensitive to biological diversity issues and protection.

Managed Lands dedicated to the protection of natural ecological systems and biological diversity are referred to as **Dedicated Areas**. These properties are distinct from other

Managed Lands because of the ecological emphasis of the owner's management practices and goals. Dedicated Areas are among the most important managed lands since plans to protect the ecological resources therein already exist. An evaluation based upon the stated management criteria and existing practices of the owner/manager determines whether a site is a Dedicated Area.

NATURAL HERITAGE INVENTORY METHODS

Presently, ten County Natural Heritage Inventories (CNHI) are completed for Western Pennsylvania. These include the Butler CNHI (Smith et al., 1991), Centre CNHI (Stack et al., 1991), Beaver CNHI (Smith et al., 1993), Clinton CNHI (Wagner et al., 1993), Erie CNHI (Kline et al., 1993), Allegheny CNHI (Smith et al., 1994), the Washington CNHI (Wagner et al., 1994), Westmoreland CNHI (Smith et al., 1998) and the Fayette CNHI (Wagner and Coxe, 2000). Additional inventories are under way including Mercer County, Elk County, Huntingdon County, Clearfield County and an update of Centre County. Methods used in this inventory are based on those published in previous reports, as well as those used by Anonymous (1985); Reese, G.A., et al., (1988); and Davis A.F., et al., (1990). The Lawrence County Natural Heritage Inventory followed the same methodologies, which proceeded in the following stages:

- gathering existing information
- aerial photo and map interpretation
- aerial reconnaissance
- ground survey
- data analysis

Gathering Existing Information

A review of the Pennsylvania Natural Diversity Inventory (PNDI) database (see Appendix II) determined what, if any, sites for special concern species and important natural communities are known to exist in Lawrence County. Members of local land trusts and conservancies, environmental advisory councils, and other conservation oriented citizens groups were sought out and contacted, as well as other individuals that were able to contribute information to the inventory. Individuals from the PA Department of Conservation and Natural Resources – Bureau of Forestry were contacted for existing site information.

General information from other sources such as soil maps, geology maps, earlier field studies, and published materials on the natural history of the area helped to provide a better understanding of the area's natural environment.

Aerial Photo and Map Interpretation

The Lawrence County Planning Commission made available the most recent aerial photos of Lawrence County (1998). Initial study of these photos revealed large-scale natural features (e.g., contiguous forest, wetlands, shale barrens), disturbances (e.g., utility line right-of-ways, strip mines, timbered areas) and a variety of easily interpretable features. Investigation of areas on the ground and review of the same areas on the photos helped to establish a set of "signatures" that allowed a more detailed review of areas not visited on the ground. Some sites could be eliminated if they proved to be highly disturbed or

fragmented or purely attributable to human-made features (e.g., impoundments, clearings, farm fields).

Aerial Reconnaissance

Flying over the landscape greatly helps in interpretation of features because of color and tonal differences and because of the 3-Dimensional perspective gained of areas and objects that on photographic sheets appear as 2-Dimensional. Again, some sites can be eliminated after such direct inspection. Also, information concerning extent, quality and context can be gathered easily from the air. Any sites that can be eliminated via aerial inspection can save many hours of ground inspection, particularly when dealing with remote areas. Sites falling within this space could, therefore, not be evaluated from the air. The use of aerial reconnaissance flights, as well as aerial photos, proves particularly important in evaluating sites for which permission to perform field surveys was not granted or pursued due to time constraints.

Ground Survey

Areas that were identified on maps, aerial photographs and from the air as potential sites were scheduled for ground surveys. Landowners were contacted and the sites examined to evaluate the condition and quality of the habitat and to classify the communities present. Field survey forms (Appendix III) were completed for each site. Boundaries for each site were drawn as a theme in ArcView. Site boundaries include both the key features of the site and the additional buffer areas critical to the protection of the site.

The flora, fauna, level of disturbance, approximate age of community and local threats were among the most important data recorded for each site. In some instances where permission to visit a site was denied, when enough information was available from other sources or when time did not permit, sites were not ground surveyed.

Data Analysis

A dedicated electronic file exists for each visited site and contains the site survey form for that site and any additional information about or pertinent to the site. Characteristics such as size, condition, recoverability and rarity are contained in these files. How well a site fulfilled the definition as one of the Natural Heritage Area types described in the introduction helped to establish the site's quality. Ranking of sites by inventory methods determined its relative significance (Appendix I). The PNDI ranks are included here to indicate the rarity or uniqueness of a species of special concern or natural community within the state and in the world. Such a ranking gives information about the range of a species or community and provides some means of comparing resources at a broad scale, especially where official ranks are lacking (see Appendix V for details of ranking systems). In the cases when sites could not be compared through the detailed information that ground surveys provide, aerial photographs and existing data provided the necessary information that allowed decisions to be made concerning the site and its inclusion in the inventory.

Field data for natural communities and for all plant and animal species of special concern found were synthesized with existing data and summarized. Boundaries for each site were digitized using ArcView 3.2a GIS software; base maps were georeferenced digital raster graphics of 1:24,000 scale USGS topographic quadrangles in the UTM zone 17 projection and the NAD 27 NADCON datum. Site boundaries were designed to delineate those areas where natural resource impacts should receive special consideration during land use planning. Thus, a site boundary not only includes the area directly occupied by significant natural features, but also extends to delineate any areas where new activities could potentially impact the natural features. In many cases the health of the surrounding landscape is critical to the health of the resource itself. County municipalities served as the organizing unit for the data with maps of each municipality provided. Municipalities were subsequently grouped by school district.

GENERAL RECOMMENDATIONS FOR THE PROTECTION OF NATURAL HERITAGE AREAS

The inventory identifies significant Natural Heritage Areas in order to promote their protection. Specific site recommendations for the maintenance of these important biotic and ecological resources are made based upon (1) the classification as to type of Natural Heritage Area (i.e., Biological Diversity Area (BDA), Dedicated Area (DA) or Landscape Conservation Area (LCA); (2) the ecological characteristics of each site; (3) evidence of past or present disturbance within the site; and (4) the potential effects of the land-use activities that surround the site. Thus, these recommendations and site mapping recognize the interaction between the site's biotic resources and the natural ecosystems and/or land-use activities in proximity to the site. The general recommendations furnished below are meant to further clarify the differences between the various sites and to provide a general framework into which specific management recommendations can be made.

Natural Heritage Areas

Biological Diversity Areas

Biological Diversity Areas include those sites that are recognized as supporting populations of state, national or globally significant species (Appendix VI) or natural communities, high quality examples of natural communities or ecosystems, or exceptional native diversity. Occasionally these areas require some form of management in order to maintain suitable conditions for the species, group of species, or natural communities (e.g. removal of exotic plant species that are threatening the integrity of the natural community may be an acceptable practice, whereas, spraying for gypsy moth probably would not be considering the broad scale effects of the pesticide). Actions and projects impacting BDA's should take into consideration the ecological requirements of the species/community present in the area. 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.

Landscape Conservation Areas

Landscape Conservation Areas recognize large pieces of the landscape that are of higher ecological quality than other areas of similar size. Contiguous natural communities, minimal human disturbance and often the presence of Biological Diversity Areas within the LCA allow ecological processes to function across an entire landscape. Management requirements for LCA's are less stringent than those for either BDA's or DA's because they encompass a variety of land uses, some which are not directly involved in the protection of specific species or communities. Whereas with BDA's and DA's, disturbances should be evaluated in terms of direct impacts to areas; with LCA's disturbances should be considered on a broad scale in terms of fragmentation and general habitat integrity. Sustainable land-uses that are sensitive to the natural features within the LCA are essential for the long-term preservation of the natural qualities recognized by the LCA. Construction of new roads and utility corridors, non-conservation timber harvesting, clearing or disruption of large pieces of land, and other activities that divide and alter the character of the landscape decrease the integrity and value of LCA's. People and human created features are part of LCA's but do not dominate the landscape. By limiting the amount of land in intensive use (agricultural zones, residential zones, etc.) and by compressing development into already disturbed areas (villages, roads, existing ROW's, etc.), large pieces of the landscape can be maintained intact. Some LCA's are designed with aquatic resources in mind, and in those cases, a watershed boundary may be used to identify the LCA.

Geological Features

Geologic features include those areas that illustrate regional geologic processes, landforms or scenery and are those that are recognized as outstanding in Pennsylvania by Geyer and Bolles (1979, 1987). These places are not necessarily of importance to biological diversity and are therefore not considered Natural Heritage Areas. However, they are included as natural history references in the county.

One geological feature of note, Harlansburg Cave, is in Lawrence County. This cave is the longest mapped cave in Pennsylvania and is therefore worthy of note. It is located in Scott Township near the Village of Harlansburg. Geological features are not discussed in the text.

Other Recommendations

Buffers

Buffers or buffer zones are the areas surrounding the core areas of a site and provide insulation between significant ecological qualities and the existing, or potential, negative disturbances nearby. The size of the buffer depends upon physical factors (slope,

topography, and hydrology) and ecological factors (species present, disturbance regime, etc.) as well as characteristics of the buffer itself, such as uniformity, species composition, and age. Although similar sites may have similar kinds of buffers, no two buffers will be exactly alike in size or extent. Two wetlands, for instance, of exactly the same size, and in the same region, may require very different buffers, if one receives mostly ground water and the other mostly surface water, or if one supports migratory waterfowl and the other does not.

The buffer and the area being "buffered" constantly interact and affect one another. As an example, protecting a section of old growth forest surrounded by second growth forest would involve creating a buffer that would allow plant species unique to the old growth section to spread outward and, at the same time, discourage inward colonization by weedy, opportunistic species. The buffer would also protect the site from heavy winds and storms. Buffers must always be considered in the context of what they are protecting and how these zones will evolve when functioning as buffers. In the case of the old growth forest, a hiking trail through the buffer would probably not significantly change the buffer or impact the old growth forest. However, the expansion of camping facilities into the buffer could slow or prevent the build-up of humus and the reproduction of trees, introduce invasive species and pollutants, and eventually alter the character of the buffer and ultimately decrease its effectiveness in protecting the old growth site.

The decision as to how large a buffer should be for an individual site takes into account the requirements of the natural community or species habitat that were the focus of the site. Buffers are not regarded as fixed distance areas around sites and the often-irregular site boundaries demonstrate that point. A fixed buffer may serve to reduce direct impacts on a site, but may not account for the connections a site has with other parts of the landscape. By either failing to protect the natural system of the site (e.g. ground water recharge zone for a spring) or by allowing other land-uses nearby (e.g. ore extraction within a rock formation supporting a bat cave), a buffer can fail to provide adequate protection to a site. Aquatic communities are buffered using the recommendations of Brown and Schaefer et al., (1987) and by the D.C.N.R. Bureau of Topographic and Geologic Survey to the Western Pennsylvania Conservancy on the use of buffers to protect water quality and quantity, as well as to maintain the ecological integrity of the Natural Heritage Area.

Each mapped Biological Diversity Area includes both the feature and a buffer area intended to protect the feature. The maps do not designate a primary boundary or the line delineating the feature. The line that does appear for Biological Diversity Areas, referred to as the secondary boundary, includes the feature (which would be the primary boundary) and a buffer.

Exotic Invasive Species

Exotic invasive species are a great threat to the ecosystems in Lawrence County. These species dominate habitat used by native species and disrupt the integrity of the ecosystems involved. Exotic invasive species can be plants or animals. Examples of some of the exotic plant species threatening Lawrence County include multiflora rose (*Rosa*

multiflora), garlic mustard (*Alliaria petiolata*), common reed (*Phragmites australis*), purple loosestrife (*Lythrum salicaria*) and Japanese knotweed (*Polygonum cuspidatum*).

Management for these species depends upon extent of establishment of the species. Small infestations may be easily controlled or eliminated but more well established populations may present difficult management challenges. Many sources of information are available about exotic species.

Dedicated Areas

Dedicated Areas are recognized because of the owner's specific intention to protect their present and potential future ecological resources. Under such protection, those sites that are not presently examples of special habitat or exemplary communities will be permitted to mature and attain qualities recognized for Biological Diversity Areas. Sites that are already significant as BDA's will be allowed to continue, undisturbed, as the best examples of natural communities in the area. The management of DA's may therefore follow the recommendations furnished for BDA's and may involve some level of carefully planned intervention to maintain their significant ecological resources. Usually, management involves simply leaving the area alone to mature and recover from previous disturbance. Generally, many land-uses such as mineral extraction, residential or industrial development, agriculture, utility right-of-way construction, and certain forestry practices (diameter limit cuts, non-management silvicultural practices, etc.), are not compatible with DA's and should be avoided.

Important Bird Areas (IBA)

An IBA is 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 objective criteria. Since the IBA program is voluntary, there are no legal or regulatory restrictions.

To qualify as an IBA in Pennsylvania, a site must satisfy at least one of several criteria, as follows:

- Any site having exceptional concentration or diversity of birdlife
- Sites with a significant population of state or federally-listed endangered or threatened species
- Site supporting a significant population of one or more species on Pennsylvania's "special concern" list.
- Sites containing representative, rare, threatened or unique habitats
- Site where long-term avian research or monitoring is ongoing

IBA information can be found at "pa.audubon.org/Ibamain.htm".

OVERVIEW OF LAWRENCE COUNTY NATURAL FEATURES

Lawrence County covers 362 square miles of the Glaciated Pittsburgh Plateau Section and the Pittsburgh Low Plateau Section of the Appalachian Plateau Physiographic province (Sevon 2000). Slippery Rock Creek essentially forms the boundary between the two sections. The Pittsburgh unglaciated plateau, characterized by broad, narrow ridge tops, and steep-sloped valleys, encompasses all of the land in the southeast corner of the county, mostly contained within Perry Township. The Glaciated Pittsburgh Plateau, defined by a gentle rolling topography smoothed by glacial action, covers the remaining sections of the county.

GEOLOGY

Elevations in the county range from a high of 1,440 feet just to the west of Slippery Rock Creek in Slippery Rock Township to a low of 740 feet at Rock Point where the Beaver River flows south out of the county in Wayne Township. Variations in aspect, slope, and elevation combine to create a number of different microenvironments throughout the county. Numerous soil types influenced by weathering of underlying bedrock, slope, organic material and climate and sometimes the bedrock itself create the ecological foundation for Lawrence County.

The underlying bedrock of the county can be divided into four groups. The Pocono group from the Mississippian period underlies the steep slopes of the upper Mahoning and Shenango Rivers. It is composed of massive, hard, gray sandstone and conglomerate. The Pottsville and Allegheny Groups and the Conemaugh Formation from the Pennsylvanian period underlie the rest of the county. This Pottsville Group is sandstone and conglomerate interbedded with thin strata of shale. The Allegheny Group has layers of sandstone, siltstone, shale, limestone and coal. The Conemaugh Formation consists of red and gray shale and siltstone with strata of limestone and coal (Smith 1982).

Soils in the Pittsburgh Plateau section of Lawrence County are part of the Gilpin-Wharton-Wiekert Association. These level to steeply sloping soils, are well drained and formed in the residual material from acid shale, siltstone and sandstone. Many different associations cover the glaciated part of the county. The Conotton-Chili-Holly association underlies the major rivers and streams, such as the Beaver, Shenango and Mahoning Rivers and North Fork Little Beaver and Slippery Rock Creeks. This soil formed from glacial outwash and alluvium can be level to very steep. Moisture ranges from excessively to poorly drained. The Ravenna-Canfield-Frenchtown and Canfield-Ravenna-Loudonville associations cover the uplands. Both of these soils associations are level to very steep, well to poorly drained and formed in glacial till. Plain Grove Township hosts a small area of the Candice-Frenchtown-Holly Association formed from glacial lake sediment.

Various river and stream valleys dissect the landscape of Lawrence County. All of these drainages are tributaries to the Beaver River except for North Fork Little Beaver Creek,

which flows directly to the Ohio River via Little Beaver Creek. Lawrence County can be roughly divided into three main hydrologic features. These include the area around Slippery Rock Creek and Connoquenessing Creek; The Shenango, Mahoning and Beaver River; and North Fork Little Beaver Creek.

NATURAL COMMUNITIES

Lawrence County lies mostly within the Beaver River watershed except for the southwestern section of the county which is drained by North Fork Little Beaver Creek. Larger tributaries to the Beaver River in Lawrence include the Shenango and Mahoning Rivers, which join downstream of New Castle. Connoquenessing Creek joins the Beaver River at the southern county line. The Shenango River has Neshannock Creek as a large tributary and Connoquenessing Creek has Slippery Rock Creek.

Slippery Rock Creek and the associated communities within its valley differ from other drainages in the county attributable to its geological history. The depth of the gorge and the varied microtopography of the valley support numerous natural communities.

The uplands in the county vary in species composition. In drier areas oaks (*Quercus* spp.), including white oak (*Quercus alba*) and red oak (*Quercus rubra*), dominate. Wetlands not associated with the larger stream courses contain species such as pin oak (*Quercus palustris*) and red maple (*Acer rubrum*) and shrubs such as arrow-wood viburnum (*Viburnum dentatum*), winterberry (*Ilex verticillata*) and highbush blueberry (*Vaccinium corymbosum*).

On the lower slopes, dry, more acidic forest communities are replaced by mesic forest communities of red and white oak, sugar maple, beech, black birch, slippery elm (*Ulmus rubra*), basswood (*Tilia americana*), white ash (*Fraxinus americana*), tulip tree (*Liriodendron tulipifera*), and cucumber tree (*Magnolia accuminata*). On the northern slopes or along the lower sections of the deeply cut stream valleys, hemlock (*Tsuga canadensis*), yellow birch (*Betula allegheniensis*), and beech (*Fagus grandifolia*) along with rosebay (*Rhododendron maximum*) mix with the deciduous species in response to the cooler, moister conditions. These communities take on the character of the northern conifer hardwood forests typical further north. Ground cover in these lower, moister forests is generally more rich and diverse than that at higher elevations.

Aquatic communities associated with the county vary a great deal across the landscape. Mining activities have severely impacted some streams, but most streams are impacted to some extent by agricultural runoff and nutrient enrichment from septic systems and sewage treatment plants. Hell Run is the only exceptional value stream (EV) in Lawrence County. Major watersheds in Lawrence County are described below.

WATERSHEDS

Descriptions of the watersheds are included to reflect that most of the exceptional natural communities in Lawrence County are located along a river or within the river valleys throughout the county. Data is presented on the history of the watershed, geology, major tributaries and some of the issues within the watershed. Some watersheds have been studied more than others and as such may have more information presented.

Beaver River

General Overview and History

The Beaver River begins at the confluence of the Mahoning and Shenango Rivers and flows southward to the Ohio River. The water quality of the Beaver River reflects the land uses of both of its major source watersheds, receiving the combined volumes as well as the combined pollution of the Mahoning and Shenango Rivers. Water quality impacts as traceable to three major periods: 1850 to 1900, 1900 to 1950 and 1950 to the current day (Beaver River 1977).

Pre-1850, Jared Potter Kirtland studied The Mahoning River around 1837 to 1847. As part of a work to describe the fishes of Ohio, he concentrated on the Mahoning drainage and found 63 species representing 15 families. In the early 1900's, A.E. Ortman (Ortman 1909) studied the mussel fauna and found a wide diversity of mussels living in the river.

The period from 1850 to 1900 saw the rise of the steel mills in the Youngstown and Warren, Ohio area. Discharges from the steel mills and associated industries unloaded chemicals and raised the temperature of the water. Aquatic life declined in the Mahoning and Beaver Rivers. The Shenango River only saw these effects in its lowermost section due to back flooding of the Beaver River.

The period from 1900 to 1950 saw the added effects of abandoned mine drainage. Dams placed on the river helped settle out some of the pollutants and inadvertently helped the aquatic communities. Unfortunately, the dams prevented migratory fish from reaching the upper reaches of the Shenango and Mahoning Rivers.

The period from 1950 to present saw the decline of the steel industry and the closure of the mills resulted in a general improvement in water quality. The river remains in very poor condition since over the years, toxic compounds deposited remain in place on the bottom of the river and do not biologically degrade. Thirty-seven fish kills occurred in the Mahoning River between 1950 and 1964 due to the pollution in the river (PA Power 1977).

More recent studies of the river have indicated an increasing diversity of fish life as sampling station locations progressed down the river from the confluence of the Mahoning and Shenango Rivers (Selcher 1974). For example, on the Beaver River upstream of Connoquenessing Creek, four fish species were found. Near the mouth of

Connoquenessing Creek 17 species of fish were found that same year. A study the next year found 34 fish species at West Pittsburg about four miles upstream of the mouth of the Connoquenessing Creek (Billingsley and Johns 1990).

The PA Fish and Boat Commission divides the Beaver River into two sections for its assessment reports. Section 01 includes the section from the headwaters south to Connoquenessing Creek. Section 02 spans the section from Connoquenessing Creek to the Ohio River. Section 01 can be described as a free flowing river with forested banks (Billingsley and Johns 1990). Lingering pollution effects of the Mahoning and Shenango River still cause depressed numbers of fish. White sucker (*Catostomus commersoni*) constituted most of the catch in a 1990 survey of the river (Billingsley and Johns 1990). The lock and dam system impounds Section 02. The backwaters of Eastvale lock and dam extend to the mouth of Connoquenessing Creek, barely into Lawrence County. Echoing a trend of increased diversity with increased downstream distance from the Mahoning and Shenango Rivers, fish life is more abundant with 19 species of fish catalogued in 1990 (Billingsley and Johns 1990).



Figure 2. Beaver River upstream of West Pittsburg power plant

Geology and Physical Characteristics

The Beaver River cuts through a variety of geological formations on its way to the Ohio River. Sharon Shale underlies the uppermost section from the confluence of the Shenango and Mahoning Rivers to about one river mile downstream. Further downstream, the river flows through the Pottsville sandstone series, which includes the Homewood sandstone and the Connoquenessing sandstone (Dewolf 1929).

Tributaries

The Beaver River in Lawrence County has one major tributary, Connoquenessing Creek and several smaller tributaries; McKee Run, Snake Run, Edwards Run, Wampum Run and Jenkins Run. Since the smaller tributaries flow through heavily strip-mined areas, abandoned mine drainage (AMD) is a common problem. Connoquenessing Creek is discussed in its own summary.

Land Use

Strip mining and gravel quarries are prevalent in the floodplain of the Beaver River. Farther up its tributaries, there exists some limited agriculture and rural residential development. Most of the human population is concentrated in boroughs such as West Pittsburg, Wampum, Chewton and Ellwood City. CSX Corporation operates railroads on both sides of the river for the entire length of the Beaver River in Lawrence County.

Connoquenessing Creek

General Overview and History

Connoquenessing Creek, a warm-water stream, begins in northern Butler County and drains 838 square miles. The creek flows through only a small section of Lawrence County, but picks up a major tributary, Slippery Rock Creek in the process. The confluence of this creek and the Beaver River is named for the rock outcrop that overlooks the confluence, known as Rock Point.

Connoquenessing Creek is considered to be the second most polluted waterway in the United States, primarily due to the pollution from AK Steel (Hopey 2001). AK Steel currently releases about 31 million pounds of nitrate into the creek each year. Although the pollution does not seem to impact the fish fauna, full aquatic assessment would be required to determine the full effects of the nitrate in the stream. Recent fish surveys found 22 species of fish upstream of Slippery Rock Creek and 12 species of fish downstream of Slippery Rock Creek where Connoquenessing Creek becomes more river-like in size.



Figure 3. Connoquenessing Creek at Confluence with the Beaver River (Rock Point)

Geology and Physical Characteristics

Connoquenessing Creek drains the northern edge of the non-glaciated region of north Western Pennsylvania. The Pottsville series including the Homewood and Connoquenessing sandstones predominates the geology along the Lawrence County section of the Connoquenessing.

Tributaries

Slippery Rock Creek, the only tributary to the Connoquenessing in Lawrence County, joins the main stem at Wurtemberg. Due to its size, we have dedicated a separate section to Slippery Rock Creek.

Land Use

Connoquenessing Creek flows through a gorge in the urban areas of Ellwood City, Ellport and Wayne Township in Lawrence County. Most of the urbanized areas of the watershed

are located at the top of the gorge. Floodplains in the gorge are narrow and in some areas non-existent.

Pollution and Issues in the Watershed

AK Steel in Butler, PA releases nitrate containing effluents into Connoquenessing Creek. The company has been given until 2002 to remediate the nitrates and cease the pollution into the stream (Hopey 2001). Other pollution comes from more typical avenues such as agricultural runoff, sewage and siltation.

Mahoning River

General Overview and History

The Mahoning River begins about 10 miles southeast of Alliance, Ohio and flows through Pennsylvania for about 11 miles. The name Mahoning means “place of the saltlick” (Mahoning River Consortium, 2000) and this very fact drew early explorers to the river in search of salt. Jared Potter Kirtland studied the fishes of the Mahoning River and its tributaries in 1838 to 1847, giving some historical context to its current condition. Construction of dams along the Beaver River the receiving stream of the Mahoning reduced the fish of the Mahoning to those that are non-migratory.

Beginning in 1880 pollution problems started to plague the river and continue today with compounds bound to sediments on the bottom of the river. Steel mills and electrical conductor plants in Youngstown, Ohio used the water in their production processes and then released the water back into the river (Mahoning River Consortium 2001). Recently described as “one of the most polluted of any stream or river in Ohio” (Ohio EPA 1994) the most polluted stretch lies just downstream of Youngstown, Ohio. Dilution of the polynuclear aromatic hydrocarbons (PAH’s) and other organic compounds makes the Pennsylvania section a little less polluted but the sediment still remains more contaminated than that found in Presque Isle Bay of Lake Erie. The Mahoning River’s pollution and poor water quality spread downstream into the Beaver River (see Beaver River description).



Figure 4. Mahoning River at Edinburg, PA

Geology and Physical characteristics

The Mahoning River drains 1,147 square miles and has a length of 108 miles (WQ study of Mahoning Basin). The mainstem starts at an elevation of 1,197 feet in Columbiana County, Ohio and over its course drops to 795 feet at the juncture with the Shenango River in Lawrence County. Classified as a warm-water stream, the Mahoning River flows through Pennsylvania sandstone over a river bottom of gravel, sand and silt with a noticeable absence of rubble or larger stones (Billingsley and Johns 2000).

Tributaries

Coffee Run is a major tributary to the Mahoning River in Lawrence County include Coffee Run, flowing from the north and receiving Hickory Run, joining the Mahoning very near to its confluence with the Shenango River. In 1997 the stream was found to have a high biological productivity (Billingsley and Johns 1997)

Coffee Run drains 4.3 square miles, originates at King's Lake in Mahoning County, Ohio, and is classified as a warm-water fishery. Lands uses are rural in nature with agriculture,

woodlands, single-family dwellings and some strip mines representing the predominate uses.

Another major tributary is Hickory Run which drains 27.0 square miles, its headwaters originating in heavily strip-mined lands near the Ohio border. Land uses are similar to Coffee Run. Historically the Bessemer Cement Company contributed heavy siltation in the stream but a 1997 survey of the stream showed that this problem had abated (Billingsley and Johns 1997).

Land Use

Only 13% of the watershed has any forest cover within 300 feet of the river (Ohio EPA 1994). Watershed land uses range from agricultural in the upper watershed to urban in the lower watershed. Urban land uses account for 54 river miles and impoundments cover 19 miles.

Pollution and Issues in the Watershed

In Ohio only the two upstream-most sampling stations were in full attainment of their designation (Ohio EPA 1994). All of the sites below Warren Consolidated Industries in Warren, Ohio were in non-attainment. The sediments of the Mahoning River are contaminated with high levels of chromium, copper, iron, manganese, nickel, lead, zinc, and mercury (Billingsley and Johns 2000). Polynuclear aromatic hydrocarbons (PAH's) are also a problem in the river and do not readily biodegrade. These contaminants are the result of the accumulation over the years of the pollution of the steel and electrical industry in Youngstown and Warren, Ohio.

The decline of the Mahoning River can be divided into two periods. From 1850 to 1900, the river received effluents from the steel mills present in the Youngstown and Warren areas of Ohio. These effluents collected in the river sediment and raised the temperature of the water sufficiently to require Youngstown to build a meander channel to buffer the temperature. At this time "more than 70,000 pounds of oil and grease were released daily-enough oil to heat nearly 30,000 average homes" (Kuehner 2000). The Beaver River suffered the same effects to a lesser degree due to dilution and settling of the contaminants.

From 1900 to 1950, the strip-mining that occurred along the tributaries of the river added to the siltation of the river. Construction of dams in the headwaters helped to remediate the problem of siltation and abandoned mine drainage somewhat by settling out the metals and nutrients in the water.

Since 1950 the overall water quality has improved. Pollutants such as PAH's take a long time to biodegrade and therefore remain suspended in sediments long after the cessation of the primary source of pollution. Improvement in municipal sewage treatment and control of abandoned mine drainage has improved the surface waters of the watershed. This improvement is relative as the water quality still remains poor in the Mahoning, Beaver and lower Shenango Rivers. During the period of 1950 to 1964 there were 37 fish kills on

the Mahoning River (Rice 1993). Robert Davic of the Ohio EPA “noted that fish in the river swam like snakes” in the 1970’s because chemicals in the water had eaten away their fins” (Schnaars 1999). No living organisms could be found in the sediment.

Efforts to nurse the river back to some level of health are currently underway. In 1999 a study by the Army Corps of Engineers recommended a cleanup of more than a million tons of material from the Ohio portion of the river (Schnaars 1999). A similar study was completed for the Pennsylvania part of the river the same year (USACOE 1999). The goal is to “remediate the Mahoning River within the study area to restore the aquatic eco-system to the biotic integrity existing in a model reach of Hickory Creek of the adjacent watershed” (USACOE 1999). This will involve using dredging to remove the polluted sediment from the river bottom. The dredging process will take about 12 years and 113 million dollars to complete (Siff 2000). The first attempt in 1978 stalled due to lack of funding (Siff 2000).

Several groups are active in the conservation of the Mahoning River watershed. The Blackbrook Conservancy District and Clean Water for Future Generations work in the upper watershed. The Mahoning River Consortium, a group of private businesses, governmental agencies and citizens, works mainly in the Youngstown-Warren Ohio area. The Western Pennsylvania Conservancy Watershed Assistance Center and PA Cleanways work in the Pennsylvania section of the watershed

Shenango River

General Overview and History

The Shenango River has its origin in Conneaut Township, Crawford County and flows more than 87 miles to its confluence with the Mahoning River to form the Beaver River. The drainage area is 1,062 square miles, of which 283 square miles (180,916 acres) are in Ohio and 779 square miles (498, 000 acres) are in Pennsylvania. It can be divided into three distinct regions: upper, middle and lower (Shenango River Report 2001). The upper section, from the headwaters to Pymatuning Dam, is considered to be in good health. The Middle section, from Pymatuning to Shenango Dam, has a combination of water quality impacts. The lower section, from Shenango Lake to the Mahoning River confluence, is considered to be the worse section. This section, in addition to receiving the pollutants from further upstream, receives effluents from industry, wastewater treatment plants and urban development. A canoe trip in the lower section from Nashua Bridge to Harbor Bridge in Lawrence County revealed nutrient enrichment, siltation and erosional problems. The stream throughout is classified as a warm-water fishery. The bulk of major discharges into the river come from Sharon, PA and include industrial waste, sewage and urban runoff. These combined effluents produce a nutrient enrichment problem and toxic levels of both iron and cyanide. The aquatic life here is limited due to the above pollutants. Pollution problems on the river are exacerbated by the low stream gradient.



Figure 5. Shenango River downstream of the PA 18 bridge.

Geology of the Watershed

The two most prominent geologic formations present in the watershed include sandstones from the Pocono and Pottsville groups. Both of these groups were deposited during the Paleozoic Era about 300 to 400 million years ago and eventually cut through by a north flowing river. Glacial deposits dammed many of the drainages in northwestern Pennsylvania and forced streams to run south in their present course towards the Ohio River. The Pocono sandstone group presents itself on the bottom of the river. The Pottsville Group underlies the higher parts of the watershed. Keel Ridge at 1,270 feet marks the highest point in the watershed while the confluence with the Mahoning River at 795 feet marks the lowest giving an average stream gradient of 3.3 feet per mile. Two dams impound the river; Pymatuning Lake and Shenango Lake.

The soils in the watershed are derived from glacial till. The most common associations include the Ravenna-Canfield-Frenchtown Association and the Venango-Frenchtown-Cambridge Association. The most common in Lawrence County include the former plus the Canfield-Ravenna-Loudonville Association and the Conotton-Chili-Holly Association.

The percentage of hydric soils on the Pennsylvania portion of the watershed is unknown, but in Ohio hydric soils cover 21 percent (37,594 acres) of the watershed. Common hydric soils in Lawrence County within the Shenango watershed are

Tributaries

Major tributaries of the Shenango River in Lawrence County include: Neshannock Creek, Hottenbaugh Run, Big Run and Deer Creek. Neshannock Creek is discussed in its own section.

Hottenbaugh Run is a stocked trout stream with a drainage area of 13.9 square miles. Much of the surrounding land is either in agriculture or occupied by strip mines. Many of the abandoned strip mines still have a negative effect on the water quality in the creek (Billingsley and Johns 1996).

Big Run is warm-water fishery with a drainage area of 11.2 square miles. Land use includes agriculture, urban areas and heavy industry including scrap metal recycling yards and a small railroad yard (Johns and Billingsley 2000). A survey in 1974 indicates chronic pollution problems attributable to raw sewage and industrial waste (Weirich et al., 1974).

Deer Creek is considered to be a productive waterway that is transitional from a warm-water to a cold-water fishery (Johns and Billingsley 1993). The only source of pollution to this creek may be periodic runoff from a golf course (Johns and Billingsley 1998).

Land Uses

Major land uses in the watershed include: industrial, urban, low density residential development and agriculture. About 49% or 333,928 acres of the watershed is undeveloped land. The most prominent coverage is deciduous forest with 36% or 248,763 acres of the total watershed. About 46% or 318,925 acres of the watershed is in agricultural use. The remaining 5% or 33,388 acres is developed land.

By county, 38% of the watershed is in Lawrence County, 39% in Mercer and 32% in Crawford. The majority of farms raise either dairy or beef cattle with average farm size 104 acres and herd size of 35-40 cattle. Agricultural erosion is less than 5 tons per acre per year on about 90 percent of the land. On a small number of farms, erosional rates are more than 10 tons per year.

As mentioned above, developed land makes up a surprisingly small portion of the total land use, but it is increasing with most growth coming from residential development. The commercial/industrial/transportation category constitutes about 1% of the total developed land in the watershed. Along with mining, this small constituent of land use poses the largest threat to the water quality. The cities of Sharon and Hermitage, with their large populations contribute the most effluent to the watershed. Other land uses include extraction of natural gas, oil, coal and gravel. Most of the natural gas comes from the

Sharon deep pool. At the present time there are no coal or gravel extraction sites in the watershed.

Population in the Watershed

The population of the Shenango Watershed is estimated to be 232,226 people. A little more than half of the people (126,226) are in rural areas and the remaining 106,000 people are in urban areas. Major cities include Sharon, Greenville, Hermitage and New Castle. Most of the townships in the watersheds have less than 2,000 people. Overall population has declined between 1980 and 1990, with a currently stable population.

The largest municipalities in Crawford County are Sadsbury Township at 2,586 people and Summit Township at 1,879 people. This county has seen an increase of 4,278 housing units and a decrease of 45,703 acres of farmland. Most development in this area has taken place around Pymatuning Reservoir in and North and South Shenango Townships. The Meadville area is just outside of the watershed and is poised to grow outward into this watershed.

In Mercer County the largest population center is the Sharon metropolitan area, with 17,493 people living in the City of Sharon. The adjoining cities of Hermitage (15,300 people) and Farrell (6,481 people) have a combined population of 21,781. Mercer County has seen a population decrease of 6,254. Most decreases were in the northwest and southwest. A general trend is the movement of the population from Sharon into neighboring Hermitage. Farmland has decreased by 19,950 acres. Based on the density of the Sharon metro area, Mercer County went from a rural to an urban classification in 1990.

The largest municipality in Lawrence County is the City of New Castle with a population of 28,334. Two townships in the New Castle vicinity follow with 8,373 people in Neshannock Township and 7,187 people in Shenango Township. Lawrence County experienced a population decrease of 6,254 people from 1978 to 1997 and saw the construction of 4,213 new houses. Like Sharon and Hermitage, there is a trend of people moving from New Castle into Neshannock Township. Decrease in farmland is 6,133 acres. Major subdivisions are occurring in Union, Shenango, and Wayne townships. Public water and sewer improvements are underway in Pulaski Township. The new infrastructure could induce development pressure, especially since this township is about equidistant from both Sharon and New Castle.

Pollution and Issues in the Watershed

Water chemistry data of the Shenango River shows the river to be acting as an organic and nutrient oxidation zone (place where the chemicals in the river are changed to more benign forms). Reduced river bottom productivity is due to oil residue, large boulder-rubble substrate that inhibits colonization, and the high level of free cyanide. This is shown by the decrease in dissolved oxygen, biochemical oxygen demand (BOD) and reduced forms of oxygen. Subsequent studies have shown an improvement in the water quality overall as time progresses. Below are some of the pollutants or water quality issues present in the tributaries to the Shenango River.

Little Yankee Run (OH): Metals, Chlorine, Nutrients and flow alteration
Little Deer Creek (OH): Organic, Enrichment/Low dissolved oxygen, flow alteration, habitat alterations
Yankee Run (OH): Unknown, metals, Chlorine, nutrients, others from above
Pymatuning Creek (OH): Organic, enrichment/low dissolved oxygen, flow alteration, habitat alterations, pathogens
Shenango River (PA): Organic, enrichment/low dissolved oxygen, pesticides (Chlordane), priority organics (PCBS)
Neshannock Creek (PA): Siltation

The Shenango River above Shenango River Lake is in fairly good health and has significant riparian buffers which are wide and intercept runoff from adjacent land uses. Below Shenango Lake, the river flows through Sharon and has few buffers while receiving the runoff and effluents of the Sharon area. To a lesser extent Sharon and its industries and land uses introduce similar pollutants as Youngstown, OH into the Shenango River. In Lawrence County these effluents such as sewage waste water, urban runoff and agricultural runoff combine to produce poor water quality.

As with other rivers in Lawrence County, several groups are active in Shenango River conservation. The Shenango Conservancy is concerned with the entire river and has projects in the Mercer County sections of the river. The Shenango River Project is coalition of Conservation Districts that is working on an assessment of the Shenango River. This group is administered through the Trumbull County, OH Conservation District. The Shenango River Watchers is a new group that formed in January 2001 and has already completed projects in the Sharpsville and Sharon areas (Pinchot 2001).

Slippery Rock Creek

General Overview and History

Slippery Rock Creek starts in Butler County, drains 836 square miles and flows for forty-seven miles to Connoquenessing Creek. It is classified as a warm-water fishery. Major land uses include agriculture and forest land. Tributaries to the creek include Wolf Creek, Muddy Creek, Skunk Run, Grindstone Run, Hell Run and Taylor Run.



Figure 6. Slippy Rock Creek downstream of Kennedy Mill Bridge

Geology and Physical Characteristics

The Allegheny and Pottsville Groups underlie this watershed. Pre-Cambrian sandstone from the Canadian Shield carried by the glaciers can also occur in the area. The highest point at 1,621 feet is located in Mercer Creek along Wolf Creek, a tributary to Slippy Rock Creek. The lowest elevation is located at the confluence with Connoquenessing Creek at 800 feet. This equates to an average gradient of 13 feet per mile with the highest gradient in the lower reaches.

Tributaries

The major tributaries to Slippy Rock Creek in Lawrence County are: Muddy Creek, Hell Run, Skunk Run, Grindstone Run and Taylor Run.

Muddy Creek joins Slippy Rock Creek at the upper end of the gorge and originates as many of the other tributaries in a heavily strip-mined area of Concord Township in Butler County. Classified as a low-gradient warmwater stream, Muddy Creek land uses include

agriculture, strip mining and recreation (Billingsley and Johns 1996). An impoundment, Lake Arthur, lies upstream of Muddy Creek Falls.

Hell Run is the only exceptional value (EV) stream in the county. It begins in Shenango Township of Lawrence County, drains 6 square miles and runs 4.7 miles. Hell Run drains the highest point in Lawrence County. McConnell's Mill State Park covers most of the watershed of this stream. A localized threat of mine drainage (AMD) and septic system problems impact the uppermost section outside of the park boundary.

Skunk Run, like Hell Run, has its origins in Shenango Township of Lawrence County. Skunk Run is smaller than Hell Run draining only 1.83 square miles and is classified as a coldwater fishery. As recorded in 1975, strip-mining and silt affected Skunk Run (Wierich 1975). In 1993, Billingsley and Johns found four species of fish living in the stream and noted a substrate of bedrock, boulders, rubble and gravel (Billingsley and Johns 1993).

Land Uses

Land uses in the watershed range from agriculture, forestry, industrial and light residential. The largest city in the watershed is Slippery Rock. In 1990 the population of the watershed was 189,087.

Pollution and Issues in the Watershed

The upper sections of the creek are affected by mine drainage, but current efforts by the Slippery Rock Watershed Coalition are underway to remediate the AMD. This is helping to improve the water in Lawrence County. Other problems include non-point pollution in the form of siltation from light bank erosion.

Conservation groups working in the Slippery Rock Creek watershed include the Slippery Rock Watershed Coalition, Slippery Rock Streamkeepers and Friends of McConnell's Mill State Park.

North Fork Little Beaver Creek

General Overview and History

North Fork Little Beaver Creek originates just north of New Springfield, OH, approximately 4.6 miles west of the Ohio-Pennsylvania border. As a high quality-coldwater fishery, Little Beaver Creek flows for 30.6 miles to the Ohio River. In Ohio, Little Beaver Creek is designated as a National Wild and Scenic River. North Fork Little Beaver Creek follows a meandering course crossing state lines before reaching the Ohio River, at which point being known as Little Beaver Creek.



Figure 7. North Fork Little Beaver Creek just south of the PA Turnpike

In 1974 the stream had a fair habitat and was considered to be a warm-water fishery. At that time fifteen percent of the watershed was wooded, 35% brushy, 35% pasture and 15% as crops (Wierich 1974). Noted in 1979, siltation problems plagued the North Fork Little Beaver Creek (Arway 1984). We noted similar problems during inventory work in Lawrence County.

Geology and Physical Characteristics

North Fork Little Beaver Creek flows through coal-bearing shale and sandstone of the Pennsylvanian Period. Water pH ranges from 7.6 to 7.9 (Arway 1984).

Tributaries

Honey Creek, the only major tributary to North Fork Little Beaver Creek in Lawrence County, joins upstream of Enon Valley, PA. For more discussion see the description for Honey Creek BDA in Little Beaver Township.

Land Uses

Land uses in the watershed include agriculture, rural residential and strip mines. Most of the population of the Lawrence County portion of the watershed lives in Enon Valley Borough or nearby.

Pollution and Issues in the Watershed

Numerous strip mines surround this stream in its upper reaches. Most of the mine drainage into the stream is alkaline since it and its tributaries flows through abandoned limestone mines. This drainage combined with the farm runoff contributes to water that has a high hardness and conductivity. Some industrial and municipal sewage discharges also affect water quality.

On April 10-12, 1984 a 1,200 gallon liquid ammonium nitrate spill from an Ohio farm impacted this stream (Ehmann 1982). Biological studies done after the spill showed that the spill almost eliminated all of the native fish species and about 95% of the stocked trout and all of the free-living invertebrates above the Honey Creek confluence (Wierich 1982). Downstream of Honey Creek spill impacts grew less through dilution (Proch 1982).

RESULTS BY MUNICIPALITY

Introduction

Twenty-seven municipalities cover the study area (Figure 1). Maps are arranged alphabetically by municipality. Biological Diversity Areas, Dedicated Areas, and Landscape Conservation Areas are indicated on the municipality maps and are labeled with bold print upper case letters. Managed Lands are labeled with bold upper and lower case letters.

Each municipality map has Natural Heritage Areas mapped by the following conventions:

- Biological Diversity Areas are mapped using **solid lines** (■■■■■■) which include both the site core (natural community or species of special concern habitat) and critical buffer lands surrounding the core.
- Landscape Conservation Areas are mapped using **large dotted lines** (•••••).
- Dedicated Areas and Managed Lands are a **dashed line** (■■■■ ■■■■ ■■).

A summary table of sites precedes each map and lists identified Biological Diversity Areas, Dedicated Areas and Landscape Conservation Areas. Managed lands are listed after the Natural Heritage Areas. Following each site name is the site's relative significance. Table 1 summarizes sites by significance rank and Appendix I defines the four ranks. Listed under each site name are state significant natural communities and species of special concern, specified by an alphanumeric code, that are within the area (see Appendix IV for a list of Natural Communities recognized in Pennsylvania). Also included for each community and species is a PNDI (Pennsylvania Natural Diversity Inventory) rank and the current legal status of special (detailed in Appendix Va and Vb). The text that follows each table discusses the natural qualities of the site and includes descriptions, potential threats, and recommendations for protection.

The summary tables do not specify the names of the animal elements in order to avoid the possible consequences that heavy visitation, collection or intentional disturbance might have to the animal populations. Specific communities are identified in the text. This report does not intend to encourage visitation. However, if visitation is necessary, it must be only by permission from the landowners. Also, the report is not burdened with detailed information required to manage the species of special concern. If more information is needed, ecological professionals at the Western Pennsylvania Conservancy or at the state natural resource agencies should be contacted. Hopefully, this report will encourage communication between ecological professionals at the Conservancy and within state natural resource agencies with municipalities, organizations, and individuals.

Figure 9, which precedes the municipal maps, shows the approximate locations and extents of the LCA's contained within Lawrence County. Because LCA's stretch across a number

of municipalities, it can be difficult to envision how the sections relate to one another and to the county as a whole. Hopefully, this figure will clarify the shape, size and location of the LCA's within the county and provide a quick reference for finding other municipalities containing the LCA's of interest. This same figure shows the BDA's as well.

Figure 8.
Lawrence County
Physiographic Provinces and Hillshade

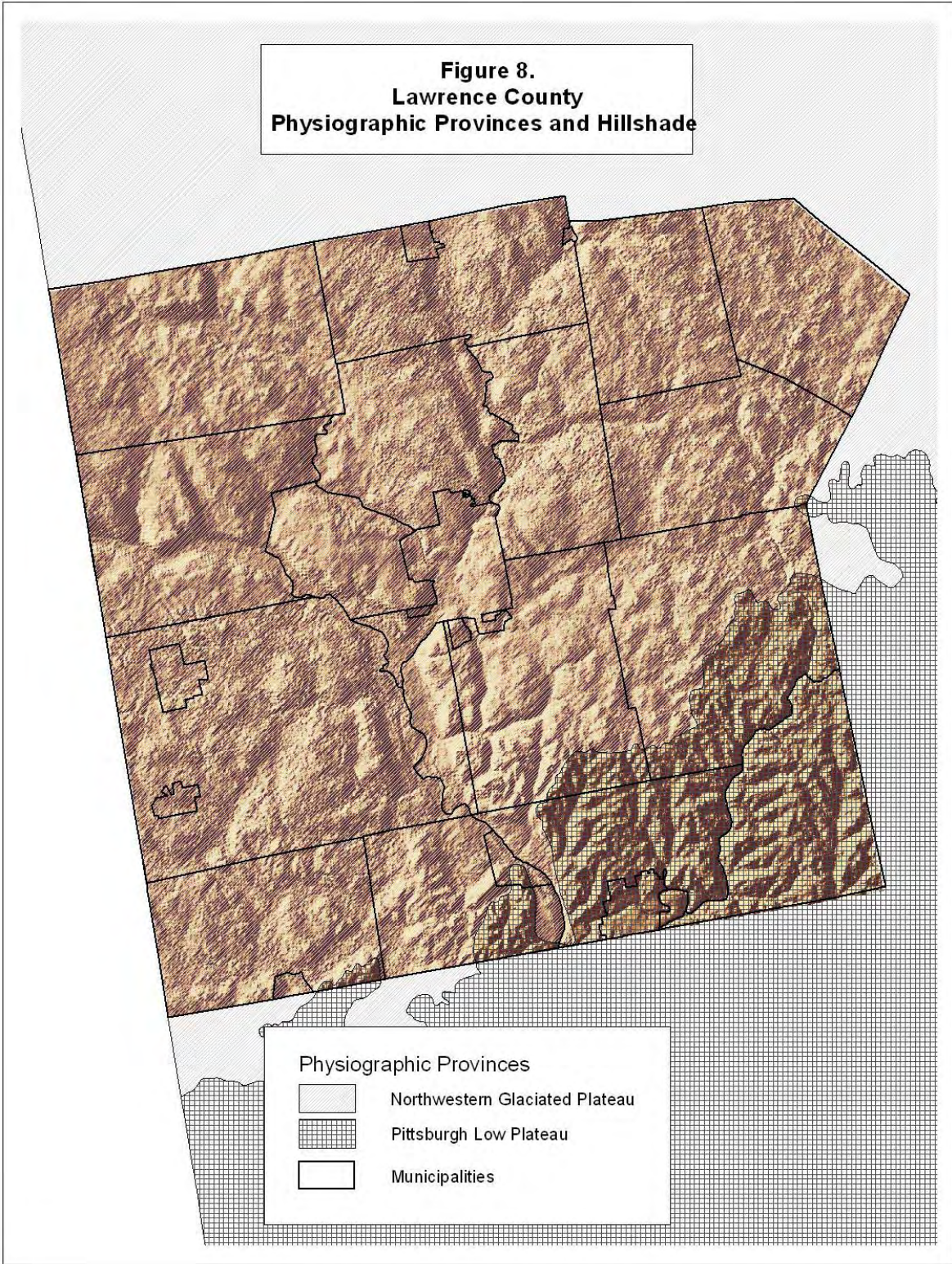
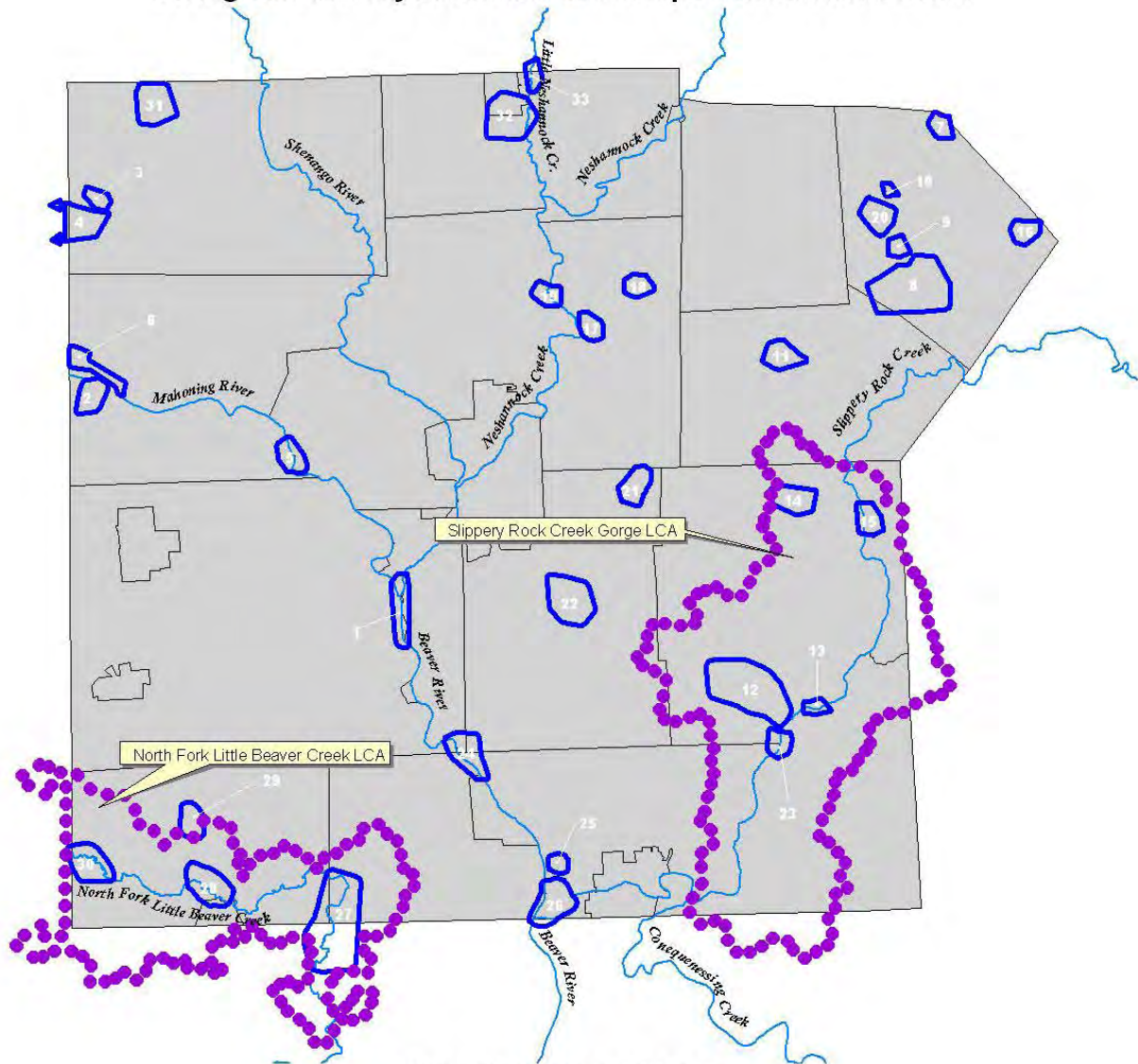


Figure 9.
Lawrence County
Biological Diversity Areas and Landscape Conservation Areas



Biological Diversity Areas

1. Beaver River Islands	12. Hell Run	23. Harris Bridge Slopes
2. Quaker Falls	13. Grindstone Confluence	24. Beaver River Floodplain
3. Maryvale Swamp	14. Brush Run	25. CS and M Mine
4. Upper Coffee Run	15. Muddy Creek Falls	26. Rock Point
5. Edinburg Swamp	16. Triangle Woods	27. County Line Wetlands
6. Soap City Slopes	17. Briar Hill	28. Enon Valley
7. Brent	18. Hawk Marsh	29. Honey Creek
8. Plain Grove	19. Sunset Valley Floodplain	30. State Line Floodplain
9. Grange Hall	20. Taylor Run Marsh	31. Deer Creek Confluence
10. McConahy Road Wetland	21. Fringed Gentian	32. Westminster College
11. Harlansburg Swamp	22. Shenango Township Marsh	33. Little Neshannock Creek

HICKORY TOWNSHIP

<u>PNDI Rank</u>		<u>Legal Status</u>	
Global	State	Fed.	State

NATURAL HERITAGE AREAS:

BRIAR HILL BDA

County Significance

Buttonbush Wetland

G?	S3	N	N
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HAWK MARSH BDA

Notable Significance

Tussock Sedge Marsh

G?	S3	N	N
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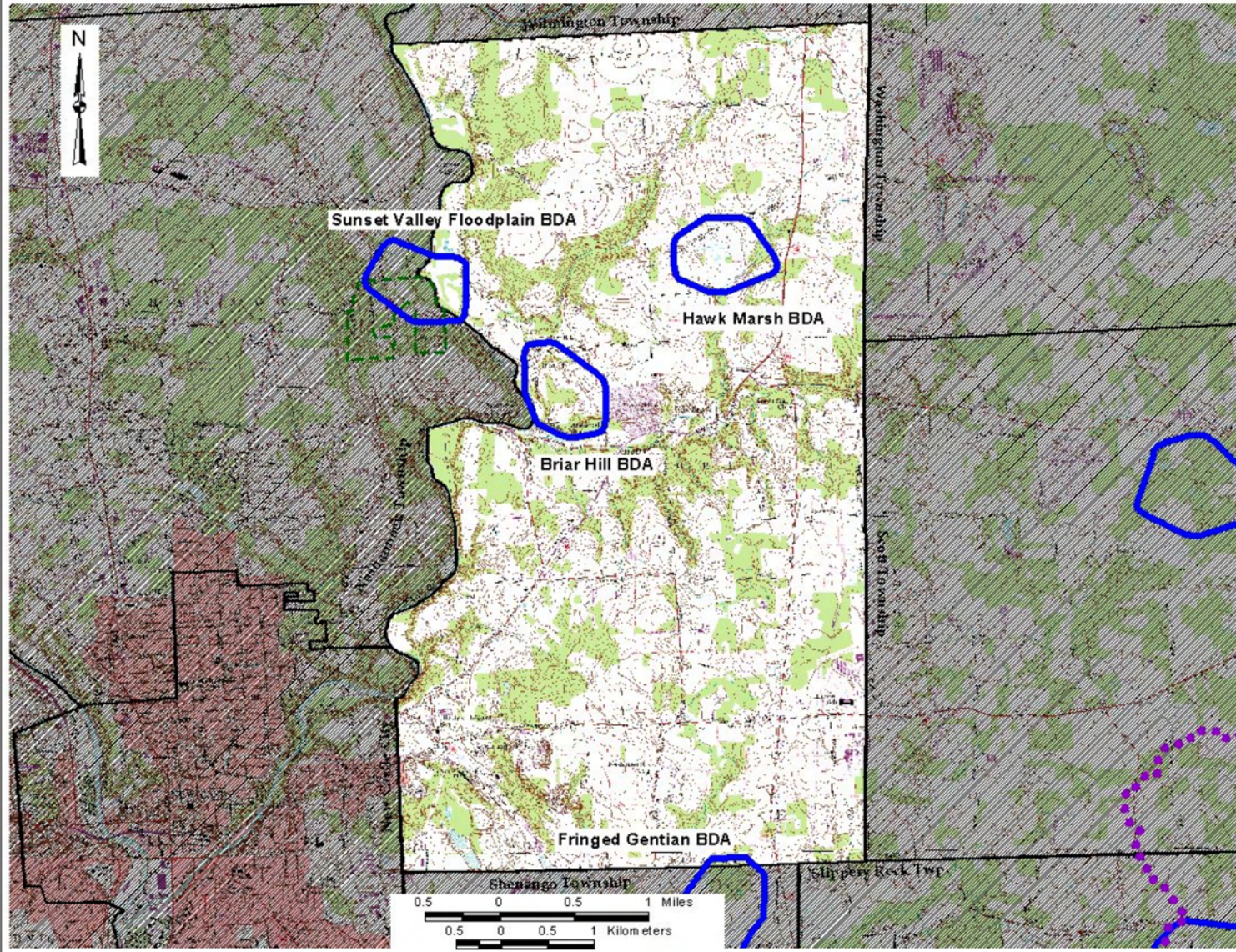
SUNSET VALLEY FLOODPLAIN BDA

Wild Hyacinth (*Camassia scilloides*)

G4G5	S1	N	PT
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MANAGED LANDS: None

Hickory Township



Hickory Township

Lawrence County Natural Heritage Inventory

Biological Diversity Areas:

Briar Hill
Hawk Marsh
Sunset Valley Floodplain

Landscape Conservation Areas:

None

Managed Areas:

None



Map Legend

-  Biological Diversity Area (BDA)
-  Landscape Conservation Area (LCA)
-  Managed Area (MA)
-  Municipality Boundary

HICKORY TOWNSHIP

Hickory Township is located northeast of the City of New Castle. Hottenbaugh Run and Neshannock Creek to the west are the prominent drainages and natural features. There are also many headwater wetlands within the township. There are two Natural Heritage Areas and no managed lands located in Hickory Township.

Briar Hill BDA

Near the top of a hill to the southeast of Briar Hill is a **buttonbush wetland** that is the probable location of a grass-of-parnassus record found in 1929 by O.E. Jennings of the Carnegie Museum. The buttonbush wetland is about two acres in size and has apparently succeeded from a former more open wetland. As buttonbush and other shrubs became more frequent the increased shading may have lead to declines in plant populations that require more open situations to survive such as grass-of-parnassus. The wetland now holds a mixture of shrubs including buttonbush (*Cephalanthus occidentalis*), sandbar willow (*Salix interior*) and spicebush (*Lindera benzoin*), and open areas with interrupted fern (*Osmunda claytoniana*), jewelweed (*Impatiens capensis*), false nettle (*Boehmeria cylindrica*), rice cut grass (*Leersia oryzoides*), nodding sedge (*Carex gynandra*), tussock sedge (*Carex stricta*) and northern water-horehound (*Lycopus uniflorus*). Grass-of-parnassus was not found in the wetland. Some exotic species growing in the wetland include ground ivy (*Glechoma hederacea*) and burdock (*Arctium minus*).

The wetland is surrounded by woodland and pasture. A recently cut wooded area occupies the adjacent area west of the wetland. An area of uncut forest sits to the north. The remaining areas adjacent to the wetland are largely hay fields and inactive pasture. Common plant species within the pastured areas include garden cornflower (*Centaurea cyanus*), sulphur cinquefoil (*Potentilla recta*), wild carrot (*Daucus carota*), bull thistle (*Cirsium vulgare*) and ironweed (*Vernonia novaboracensis*). Scattered about in the pasture are some black locust (*Robinia pseudoacacia*). Across the pasture from the wetland is a disturbed forested area. The disturbed wooded area is dominated by sugar maple (*Acer saccharum*), red maple (*Acer rubrum*) and sycamore (*Platanus occidentalis*). Basswood (*Tilia americana*), slippery elm (*Ulmus rubra*), alternate-leaved dogwood (*Cornus alternifolia*) and flowering dogwood (*Cornus florida*) compose the main understory species. The shrub layer includes elderberry (*Sambucus canadensis*) and winterberry (*Ilex verticillata*). Common herbaceous species are intermediate log fern (*Dryopteris intermedia*), false solomon's seal (*Smilacina racemosa*) and Christmas fern (*Polystichum acrostichioides*).



Figure 10. Briar Hill Swamp

Threats and Stresses

A heavily cut area surrounds the wetland to the west, south and east leaving the wetland with a canopy edge on the northside. The removal of the canopy may have increased the water levels within the wetland due to runoff from the previous forested area. Through the years, this community has apparently changed to include more buttonbush, making the wetland unsuitable for the species found here previously. The amount of moisture present and the open areas make this an ideal place for invasive species such as purple loosestrife (*Lythrum salicaria*) and common reed (*Phragmites australis*) to colonize although neither of these species are here currently.

Recommendations

Activities that would further alter the hydrology of the wetland are not recommended. The community here relies on an ample supply of ground water and decreases in water may allow other species to outcompete the species presently here. The recharge area of the wetland is currently a pasture and cutover area with a thin buffer of forest on the northside. It is not known how the removal of surrounding forest will affect the site. Additional research needs to be done to determine what the best course of action is for management of the wetland. Strategies may be employed to maintain a more open habitat through removal of shrubs. Monitoring of exotic invasive species would help to limit problems stemming from many of these species.

Fringed Gentian BDA

Fringed Gentian BDA is discussed in Shenango Township.

Hawk Marsh BDA

Hawk Marsh is located next to Hottenbaugh Run in an area of low relief constricted by adjacent uplands in such a way as to slow water exiting from the site. To the east is a wooded upland, while the south, west and northern edges are either open and possibly in pasture. Groundwater seepage provides a constant source of water to the wetland. Most of the wetland is a **tussock sedge marsh** bordered by a wooded upland. The main part of the marsh has scattered red maple (*Acer rubrum*) and slippery elm (*Ulmus rubra*), which are also dominant in the adjoining woodland. Dominant herbaceous species include tussock sedge (*Carex stricta*), reedtop (*Agrostis alba*), sallow sedge (*Carex lurida*), stalk-grain sedge (*Carex stipata*), and needlerush (*Juncus effusus*). Scattered among these are swamp rose (*Rosa palustris*), white meadowsweet (*Spiraea alba*) and silky dogwood (*Cornus amomum*).

Adjacent wooded areas contain a thick understory of hawthorn (*Crataegus* spp.). Jacob's ladder (*Polemonium reptans*) prominently dominates the herbaceous layer with associates of brome sedge (*Carex bromoides*), marginal log fern (*Dryopteris marginalis*) and melic manna grass (*Glyceria melicaria*).

Threats and Stresses

The natural community here depends on the ground water flows. Changes in the water quality and quantity feeding the area could affect the wetlands making them less suitable to the present flora. Addition of nutrients into the wetland system could alter the community and increase susceptibility to aggressive wetland exotic species such as common reed (*Phragmites australis*) and purple loosestrife (*Lythrum salicaria*). Changes in pasturing, increases in herd size utilizing the pasture or other agricultural activities within the immediate watershed of the wetland could also impact the marsh.

Recommendations

Informing the landowner of the significance of the wetland would be a good first step in the conservation of this area. Activities that lead to changes in hydrology of the wetlands including draining, ditching or upstream development should be carefully evaluated. Impacts of upstream development projects on the hydrology and nutrient loads of these sensitive communities should be analyzed.

Additionally checking any invasion by aggressive exotics would be an important component of stewardship at this site. Further work with the landowner may provide opportunities to monitor invasive plants.

Sunset Valley Floodplain BDA

Sunset Valley Floodplain BDA is discussed in Neshannock Township.

LITTLE BEAVER TOWNSHIP AND ENON VALLEY BOROUGH

<u>PNDI Rank</u>		<u>Legal Status</u>	
Global	State	Fed.	State

NATURAL HERITAGE AREAS:

COUNTY LINE WETLANDS BDA

High Significance

Special Animal 1

G5 S2S3 N ?

ENON VALLEY BDA

Notable Significance

Special Animal 1

G5 S2S3 N ?

HONEY CREEK BDA

Notable Significance

Special Animal 1

G5 S2S3 N ?

NORTH FORK LITTLE BEAVER CREEK LCA

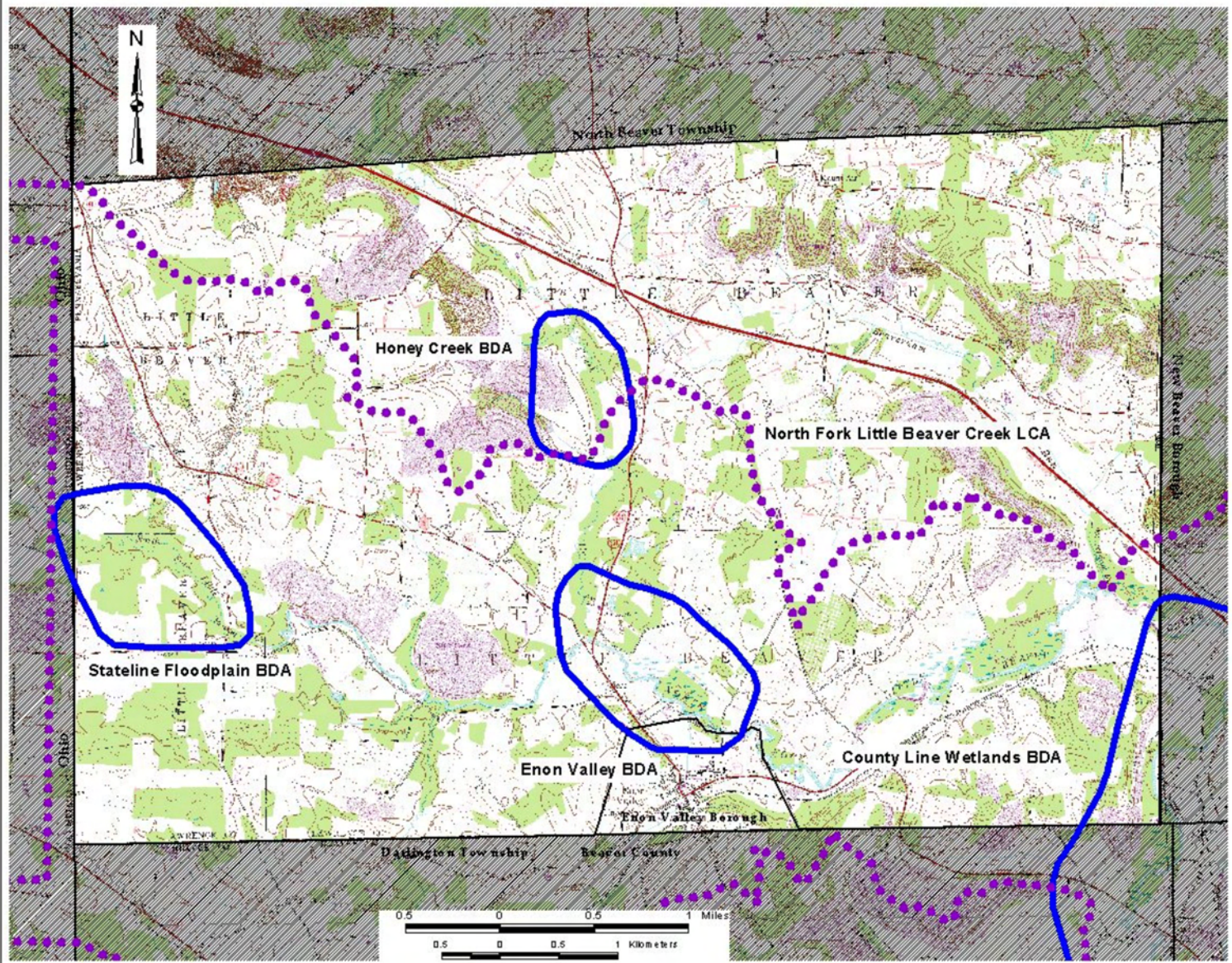
High Significance

STATELINE FLOODPLAIN BDA

Notable Significance

MANAGED LANDS: None

Little Beaver Township and Enon Valley Borough



Little Beaver Township and Enon Valley Borough

Lawrence County Natural Heritage Inventory

Biological Diversity Areas:

- County Line Wetlands
- Enon Valley
- Honey Creek
- Stateline Floodplain

Landscape Conservation Areas:

- North Fork Little Beaver Creek

Managed Areas:

- None



Map Legend

- Biological Diversity Area (BDA)
- Landscape Conservation Area (LCA)
- Managed Area (MA)
- Municipality Boundary

LITTLE BEAVER TOWNSHIP

Little Beaver Township is in the southwestern corner of Lawrence County. It is drained entirely by North Fork Little Beaver Creek and the main tributary to that creek, Honey Creek. Many strip mines are present within the township. There are five Natural Heritage Areas and no managed lands located in Little Beaver Township.

County Line Wetlands BDA

County Line Wetlands BDA is discussed in New Beaver Borough.

Enon Valley BDA

The floodplain of North Fork Little Beaver Creek, below its confluence with Honey Creek is composed of mature forest dominated by silver maple (*Acer saccharum*), shagbark hickory (*Carya ovata*), black cherry (*Prunus serotina*), box-elder (*Acer negundo*), shingle oak (*Quercus imbricaria*) and swamp white oak (*Quercus bicolor*). The thick understory includes such species as hawthorn (*Crataegus* spp.), spicebush (*Lindera benzoin*) and green ash (*Fraxinus pennsylvanica*). Scattered about are thick stands of multiflora rose (*Rosa multiflora*), an exotic invasive species, contributing to the thickness of the understory. The herbaceous layer is equally thick and is dominated by jewelweed (*Impatiens* spp.), woodland violet (*Viola septentrionalis*), skunk cabbage (*Symplocarpus foetidus*), stinging nettle (*Urtica dioica*), Gray's sedge (*Carex grayii*), moneywort (*Lysimachia nummularia*), wild geranium (*Geranium maculatum*) and garlic mustard (*Alliaria petiolata*). At the time of the visit, the eastern section of the floodplain was being timbered.

North Fork Little Beaver Creek has an average width of about 15 to 25 meters in its course through this BDA. In the northwestern part of the BDA is the confluence of a major tributary-Honey Creek. At this point the creek roughly doubles in width. Both of the streams have siltation problems from adjacent pasturelands and drainage from abandoned mines located in the upper reaches of both systems. An animal species of special concern in Pennsylvania (**Special Animal 1**) lives in the creek and depends upon high water quality and appropriate habitat, particularly shallow riffle sections of the creek, for its continued survival.

Threats and Stresses

North Fork of Little Beaver Creek has historically been affected by abandoned mine drainage from strip mines in the headwaters. Like Honey Creek, it is affected by siltation from development and farming activity such as pasturing and row cropping. Two exotic invasive species are listed above. These species and others that could colonize, such as Japanese knotweed (*Polygonum cuspidatum*), would be aided through opening of the canopy and disturbance to the habitats and would stand to become more of a problem in the floodplain.



Figure 11. North Fork Little Beaver Creek at Enon Valley

Recommendations

Impacts of upstream development projects on the hydrology and nutrient loads of North Fork Little Beaver Creek and Honey Creek should be analyzed and tied together with the land use plans for this area. Streamside fencing should be used to reduce the impacts of siltation by cattle in the stream, which is a problem, particularly in Honey Creek.

Additionally, checking any invasion by aggressive exotics would be an important component of stewardship at this site. Monitoring of invasive species would ensure that new species do not establish in the floodplain and the existing invasive population do not spread. Numerous control methods exist for multiflora rose (*Rosa multiflora*). Appendix 7 supplies information on the other invasive exotic species.

Honey Creek BDA

Honey creek joins North Fork Little Beaver Creek upstream of Enon Valley. Downstream of the confluence, North Fork Little Beaver Creek roughly doubles in volume. Honey Creek is a warm-water fishery and drains 52.9 square miles, beginning in an area of heavy strip-mined area near Evans Lake, OH. Land uses in the watershed include pasture, wooded areas and strip mines. Siltation from mining and agriculture, in particular, has impacted the creek, although conditions in the creek have apparently improved since a 1974 survey (Billingsley and Johns 1996) in spite of the siltation. A later survey in 1999 found siltation originating from strip mine runoff among the problems listed for the stream.

This same survey found that the number of fish species in the stream had increased from eleven in 1974 (Weirich et al., 1974) to 20 in 1998 (Johns and Billingsley 1999). Currently the stream provides habitat for a Pennsylvania animal species of special concern (**Special Animal 1**).

The immediate habitat surrounding the stream is active pasture. Cattle are using numerous stream crossings contributing to the silt load in the stream. Only a very small wooded buffer is present along the stream to the west. The east side is completely without a buffer.



Figure 12. Honey Creek

Threats and Stresses

Siltation presents the greatest threat to this site. Farms that include cattle grazing can lead to the production of silt from livestock use of banks and stream crossings. In 1999, discharge from an upstream quarry resulted in an excess of 1 million gallons limestone silt flowing into a field adjacent to the creek. The creek was discolored all the way to the North Fork Little Beaver Creek (EPA Enforcement Action database 1999).

A proposed pipeline projected through the BDA may impact the creek and perhaps numerous aquatic organisms including Special Animal 1. The plan for the pipeline right-of-way considers impacts for the animal species present. Disturbance during the laying of the pipeline and subsequent application of herbicides could impact water quality.

Recommendations

Cattle activity and runoff from upstream strip-mines account for most of the excess silt present in the stream. Streambank fencing programs aimed at streamside pastures and fields would help to reduce impacts due to siltation. Strip-mine reclamation can further reduce the siltation and allow the stream to recover. Plans for the pipeline project should

strive to reduce impacts to the stream by either suspending the pipe above the stream or by burying the pipeline. Efforts to minimize the size of the staging area would be a positive contribution to maintaining buffers and reducing non-point pollution sources. Use of herbicides in the area should be kept to a minimum near the creek.

North Fork Little Beaver Creek LCA

North Fork of Little Beaver Creek starts in Ohio, flows into Pennsylvania and then flows back into Ohio to join with Little Beaver Creek at Fredricktown, OH. Little Beaver Creek then flows south into the Ohio River just east of the PA-OH stateline. The upper reaches of the watershed in Ohio are impacted by abandoned mine drainage but are recovering. This LCA contains four BDA's: Stateline BDA, Enon Valley BDA, Honey Creek BDA and County Line Wetlands BDA.

As recognition of a minimally developed landscape with a concentration of important ecological areas within the North Fork Little Beaver Creek watershed, a landscape conservation area was designated as part of the Beaver County Natural Heritage Inventory to cover the stream's entire watershed in Pennsylvania and Ohio. The LCA includes the stream supporting the animal species of concern and a buffer for the protection of adjacent wetlands and floodplain forest communities. The intact landscape of the watershed contributed to the designation of Little Beaver Creek by the Ohio Department of Natural Resources as a Wild and Scenic River. Protection of the stream requires careful evaluation of any land use activities or proposed activities that occur within this watershed.

Threats and Stresses

The most immediate threat to the stream ecosystem is sedimentation from agriculture and strip mines in the upper sections of North Fork Little Beaver Creek and Honey Creek. Excessive sedimentation alters the substrate necessary for these animals. Increased turbidity compromises the ability of these animals and their hosts to respire and flourish in the stream.

Recommendations

Careful planning within this LCA would benefit both the ecological resources and the people living on the land. Non-point sources of pollution including siltation and nutrient inputs will need to be addressed and development, road construction and continued agricultural use better planned to limit inputs to waterways.

Streambank fencing programs are important management tools for reducing cattle contact with waterways and for better assuring healthy streamside buffers. Stream reach assessments and a better inventory of non-point pollution sources will be important in prioritizing projects within this watershed. The Lawrence County Conservation District is working to fence some of the pastures to help reduce the nutrients flowing into the stream.

Stateline Floodplain BDA

There are three natural communities present in Stateline Floodplain BDA: sycamore (river birch) box-elder floodplain forest in the floodplain adjacent to North Fork Little Beaver creek, a tuliptree-beech-maple forest on the slopes and bottomland oak-hardwood palustrine swamp forests. Bottomland oak-hardwood palustrine swamp forests, on the higher plateau south of the floodplain.

A sycamore (river birch)- box elder floodplain forest is dominated by sugar maple (*Acer saccharum*), sycamore (*Platanus occidentalis*), green ash (*Fraxinus pennsylvanica*), box-elder (*Acer negundo*), black cherry (*Prunus serotina*) and slippery elm (*Ulmus rubra*). The wetlands and old oxbows contain swamp white oak (*Quercus bicolor*) as a co-dominant with shingle oak (*Quercus imbricaria*). The understory contains silky dogwood (*Cornus amomum*), hawthorn (*Crataegus* spp.) and American hornbeam (*Carpinus caroliniana*). Common herbaceous species include jewelweed (*Impatiens* spp.), appendaged water-leaf (*Hydrophyllum appendiculatum*), wingstem (*Verbesina alternifolia*), violet (*Viola* spp.), stinging nettle (*Urtica dioica*), skunk cabbage (*Symplocarpus foetidus*) and golden saxifrage (*Chrysosplenium americanum*).

Adjacent to the floodplain are north-facing slopes holding many of the above species with the prominent addition of beech (*Fagus grandifolia*), as a co-dominant tree. The community on the slopes would be considered a tuliptree-beech-maple forest. Eastern hop-hornbeam (*Ostrya virginiana*) and witch-hazel (*Hamamelis virginiana*) dominate the understory making this community distinct from that in the floodplain. Herbaceous species include intermediate log fern (*Dryopteris intermedia*), mayapple (*Podophyllum peltatum*), doll's eyes (*Actaea pachypoda*) and false solomon's seal (*Smilacina racemosa*).

The bottomland oak-hardwood palustrine forest overstory is dominated by pin oak (*Quercus palustris*) and shingle oak (*Quercus imbricaria*). Other associates include slippery elm (*Ulmus rubra*) and red maple (*Acer rubrum*). Understory species include highbush blueberry (*Vaccinium corymbosum*) and silky dogwood (*Cornus amomum*). Herbaceous species are few in this community with skunk cabbage (*Symplocarpus foetidus*), golden saxifrage (*Chrysosplenium americanum*) and gray's sedge (*Carex grayii*) as prominent.

Throughout the site a number of invasive species grow in moderate numbers. Especially prominent are dame's rocket (*Hesperis matronalis*), garlic mustard (*Alliaria petiolata*), Japanese barberry (*Berberis thunbergii*) and multiflora rose (*Rosa multiflora*).



Figure 13. North Fork Little Beaver Creek at Stateline Floodplain

Threats and Stresses

This site is relatively undisturbed and not immediately under stress or threat from activity in the area. As for many sites the possibility of invasion by exotic species and the possibility of timber removal are the main threats in the floodplain. Dame's rocket (*Hesperis matronalis*), garlic mustard (*Alliaria petiolata*), Japanese barberry (*Berberis thunbergii*) and multi-flora rose (*Rosa multiflora*) comprise the invasive species already at the site.

Removal of the canopy resulting in increased light levels would make the site more susceptible to the species above. Invasive species thrive in disturbed situations such as this and are where they outcompete the native vegetation. Excessive deer browsing was not in evidence.

Recommendations

This site is well buffered along the creek and the canopy is mature. Maintaining the current status of the woods would be most beneficial to the site. If there is disturbance to the canopy then invasive species may become a problem.

Invasive species within the BDA need to be kept in check and prevented from spreading. Due to the coverage of these species, eradication is unlikely but further infestations should be prevented. If the invasive species are allowed to fully take over they will affect the natural processes of the natural communities and start affect their integrity. Removal of the canopy is not recommended given the invasive species presence.

ENON VALLEY BOROUGH

Enon Valley Borough is located in southwestern Lawrence County just to the south of North Fork Little Beaver Creek. Enon Valley has a high hill to the south and lies in the floodplain of the creek to the north. There is one Natural Heritage Area and no managed lands in Enon Valley Borough.

MAHONING TOWNSHIP

<u>PNDI Rank</u>		<u>Legal Status</u>	
Global	State	Fed.	State

NATURAL HERITAGE AREAS:

EDINBURG SWAMP BDA

County Significance

Water willow (*Decodon verticillatus*)
shrub wetland

G? S2 N N

QUAKER FALLS BDA

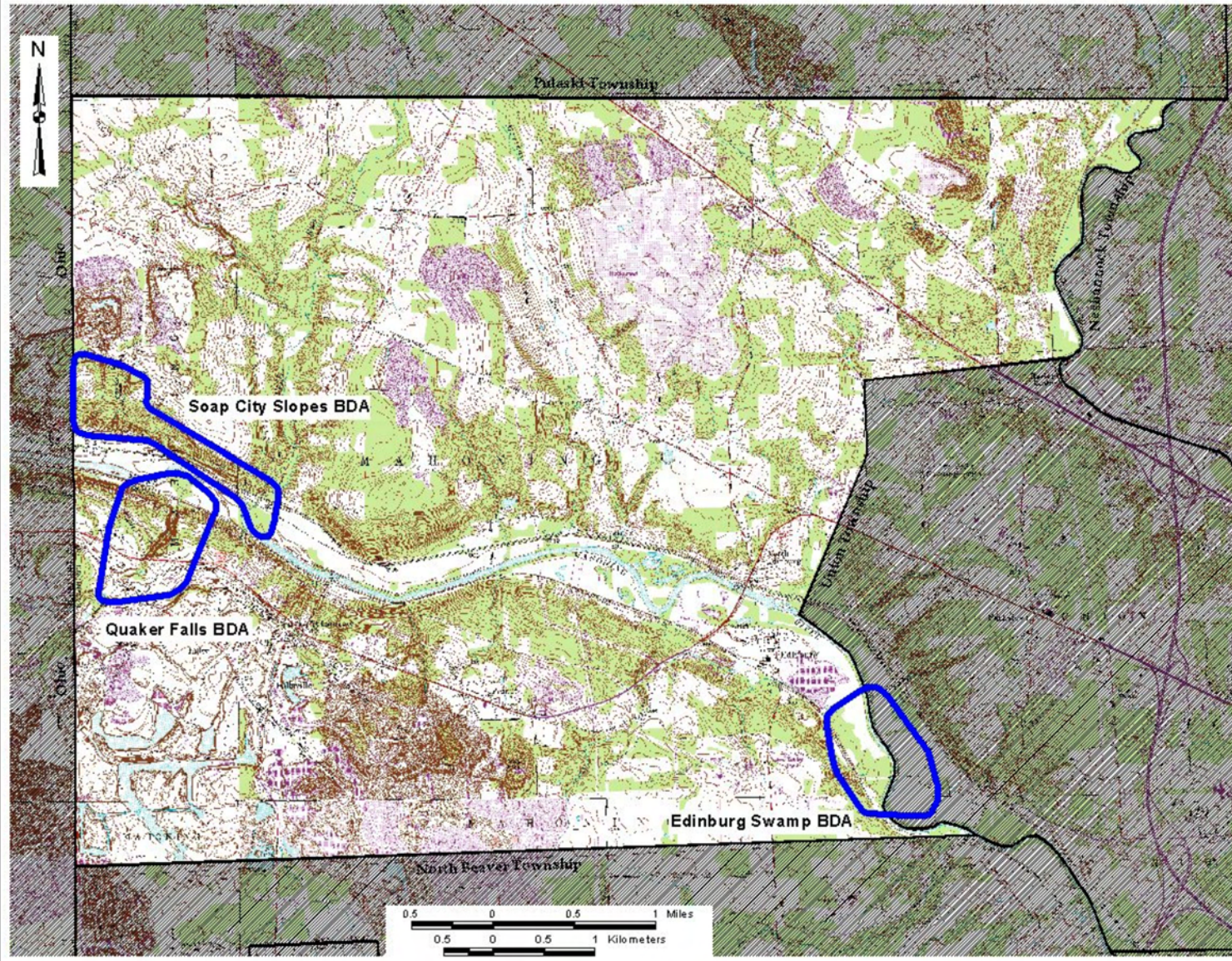
Notable Significance

SOAP CITY SLOPES BDA

County Significance

MANAGED LANDS: None

Mahoning Township



Mahoning Township

Lawrence County Natural Heritage Inventory

Biological Diversity Areas:

Edinburg Swamp
Quaker Falls
Soap City Slopes

Landscape Conservation Areas:

None

Managed Areas:

None



Map Legend

-  Biological Diversity Area (BDA)
-  Landscape Conservation Area (LCA)
-  Managed Area (MA)
-  Municipality Boundary

MAHONING TOWNSHIP

Mahoning Township is located in the west-central part of Lawrence County. The Mahoning River is the major natural feature flowing east through the middle of the township and joining the Shenango River to form the Beaver River on the east boundary. Population centers in the township include Edinburg and Hillsville. There are three Natural Heritage Areas and no managed lands located in Mahoning Township.

Edinburg Swamp BDA

Vegetated floodplains along the Mahoning River are rare. Only 13% of the river has a forested buffer within 300 feet of the shoreline (Ohio EPA 1996). Edinburg BDA represents one of these areas and is the site of the only water-willow swamp seen in Lawrence County. These floodplains serve as a place for the river to deposit sediments and lower the velocity of floodwaters as they spread out across the floodplain. The above factors are important since the Mahoning has a history of being polluted and is currently still polluted on the bottom. The US Army Corps of Engineers is planning to dredge out the polluted sediment so the river can once again support life on the bottom.

Edinburg Swamp has one of these wooded floodplains rare on the Mahoning River. The floodplain is dominated by silver maple (*Acer saccharinum*), sycamore (*Platanus occidentalis*), tuliptree (*Liriodendron tulipifera*), slippery elm (*Ulmus rubra*) and black locust (*Robinia pseudoacacia*). Understory associates include black willow (*Salix nigra*), silky dogwood (*Cornus amomum*) and on elevated areas multiflora rose (*Rosa multiflora*) which is thick in places. Common herbaceous species are wingstem (*Verbesina alternifolia*), garlic mustard (*Alliaria petiolata*), blue vervain (*Verbena hastata*), spotted jewelweed (*Impatiens capensis*) and dame's rocket (*Hesperis matronalis*).

A **water willow (*Decodon verticillatus*) shrub wetland** is located in the center of the floodplain between the river and an active railroad. The northside is wooded along the river and is open along the railroad to the east. The opposing side of the river is bordered by a thin buffer of about 5 to 10 meters behind which is a gravel quarry. The floodplain upstream is bordered by an abandoned strip mine and the Village of Edinburg. Downstream the floodplain is reduced to a slope where a bridge crosses. The swamp was inundated with water on two visits during the summer and spring. Water willow occurs in other locations in Lawrence County but is uncommon and reaches the limit of its geographic range. This species forms very thick, often homogenous masses. Other species in the swamp include both red maple (*Acer rubrum*) and green ash (*Fraxinus pennsylvanica*).

Threats and Stresses

Water-willow (*Decodon verticillatus*) needs a constantly wet environment in order to thrive. Hydrologic alteration of the wetland would change the structure of the community and allow other species adapted less wet conditions to invade. Vegetation changes or other earth moving activities would reduce the buffer here. Pollution from urban runoff

upstream could flow into the swamp during flooding events and concentrate in the intervening dry periods making a toxic environment for the plants and natural community in the swamp.

Given the available moisture and nutrients at the site, invasive species such as common reed (*Phragmites australis*), Japanese knotweed (*Polygonum cuspidatum*) threaten the floodplain and bank of the river and purple loosestrife (*Lythrum salicaria*) threatens the water willow swamp.

Recommendations

Alterations in the hydrology of the wetland or the flood regime of the river could negatively impact the natural communities. The swamp receives water from the high water table present near the river and also is replenished from occasional flooding along the river. Additional wooded buffer along the river would help remediate some of the non-point pollution sources impacting the area.

Exotic invasive species should be monitored at this site. These species are easier to control before full establishment with early detection being a preferred strategy. Activities that alter the hydrology or flooding regime should be avoided in order to maintain the high water table level needed by the water-willow. Additional forested buffer around the wetland and along the river would greatly improve the function of the wetland and help reduce nutrient inputs to the river.

Quaker Falls BDA

Falling Spring Creek drains strip-mined lands south of US 224 and as such is impacted by abandoned mine drainage. Just north of US 224 the creek flows through a steep gorge on its way to the Mahoning River. Falling Spring Creek gorge is similar in structure and vegetation to Hells Hollow in McConnell's Mill State Park. Unlike Hell Run, this gorge has a northern exposure creating a cool microclimate suitable for the gorge community within. Falling Spring Run Gorge begins narrowly upstream and widens considerably downstream. Two right-of-ways—a powerline and a railroad—are located at the middle and the bottom, respectively, of the gorge. On its journey north, the run cascades over two waterfalls, Quaker Falls being the most notable. Quaker Falls is similar in elevation and geology to other falls in the area including Hell Run Falls and Springfield Falls in Mercer County.

Eastern hemlock (*Tsuga canadensis*), red oak (*Quercus rubra*), red maple (*Acer rubrum*), basswood (*Tilia americana*), white ash (*Fraxinus americana*) and black cherry (*Prunus serotina*) make up the canopy in the Falling Spring Creek Gorge. Understory associates include cucumber tree (*Magnolia accuminata*), witch-hazel (*Hamamelis virginiana*), slippery elm (*Ulmus rubra*) and spicebush (*Lindera benzoin*). Shrubs include Hazelnut (*Corylus* spp.) and showy raspberry (*Rubus odoratus*). Profuse herbaceous vegetation composed of wingstem (*Verbesina alternifolia*), selfheal (*Prunella vulgaris*), blue lobelia (*Lobelia siphilitica*), black cohosh (*Cimicifuga racemosa*), yellow jewelweed (*Impatiens*

pallida), and white thoroughwort (*Eupatorium album*) covers the forest floor. Mountain maple (*Acer spicatum*) and marginal log fern (*Dryopteris marginalis*), both species not often seen in Lawrence County, were seen here and at Hells Run during the inventory of the county. Some exotic invasive plant species were seen in scattered places about the gorge. These include multiflora rose (*Rosa multiflora*), Japanese knotweed (*Polygonum cuspidatum*), tree-of-heaven (*Ailanthus altissima*) and day-lily (*Hemerocallis fulva*).



Figure 14. Quaker Falls

Threats and Stresses

The area surrounding the gorge is mostly abandoned mines and other industrial land uses associated with the mines. Both of these land uses serve to fragment the natural communities in the gorge and serve as a corridors for the movement of invasive species. In addition the two rights-of-way present in the gorge further fragment the natural community. All of these factors provide issues for the viability of the forest community in the gorge.

Recommendations

Informing the land owner of the significance of the gorge and the natural community within would be a good first step in the protection of this natural resource. The sheltered slopes provide a moist and cool environment for the species that live in the gorge. Activities that further fragment the gorge such as road construction or rights-of-way establishment should be avoided. If possible, additional buffer should be added to the gorge to improve the viability and enhance the microclimate of the gorge community. Invasive species already present in the gorge should be monitored and action taken to prevent their further spread and impact on the natural communities.

Soap City Slopes BDA

Soap City Slopes is located across the Mahoning River from Quaker Falls BDA on a south-facing slope and just east of the Ohio stateline. Like the Quaker Falls side most of the surrounding area has been strip-mined. Therefore any mature forests remaining in the area would be of note, as is this one. Where the north-facing slopes of the Mahoning are cool and moist the south-facing slopes are dry and warm. The slope forests at this are fairly mature with diameters of trees ranging from 1 to about 2.5 feet in diameter at breast height although the majority of the forest, like most of the surrounding area is disturbed and successional with little definition between the overstory and understory. Glacial erratics or rocks brought south from the Canadian Shield by the glaciers are present in the ravines of the tributaries.

Canopy species include white oak (*Quercus alba*), white ash (*Fraxinus americana*), sugar maple (*Acer saccharum*), sassafras (*Sassafras albidum*) and American beech (*Fagus grandifolia*). In some places along a tributary there was tuliptree (*Liriodendron tulipifera*) and slippery elm (*Ulmus rubra*) were found growing. The understory is quite diverse with species such as spicebush (*Lindera benzoin*), bladdernut (*Staphylea trifoliata*), blackhaw viburnum (*Viburnum prunifolium*), witch-hazel (*Hamamelis virginiana*) and flowering dogwood (*Cornus florida*). Common herbaceous species are white snakeroot (*Eupatorium rugosum*), farewell-summer (*Aster lateriflorus*), Christmas fern (*Polystichum acrostichoides*), indian pipes (*Monotropa uniflora*), large-flowered trillium (*Trillium grandiflorum*) and many others.

As in most disturbed situations there is substantial coverage of invasive species. Species present at this site include multiflora rose (*Rosa multiflora*), garlic mustard (*Alliaria petiolata*), common privet (*Ligustrum vulgare*) and Japanese barberry (*Berberis thunbergii*). Some deer browsing of seedlings and understory species was noticed during the site visit.

Threats and Stresses

Threats to this site include the small size of the forested area, invasive species and to a lesser extent deer browsing. The small size of the site affects the viability of the forest community and allows the second threat, invasive species, to gain a foothold in the area.

The shade and well established soils and herb layers of large, mature forests tend to slow the distribution of exotic species. Deer browsing was observed during the site visit it could be an important factor in the long-term viability of this forest.

Recommendations

To maintain the viability of this site, greater buffers are needed as well as full canopy conditions. Activities that promote additional fragmentation are not recommended. Efforts should be made to combat the invasive species already present and prevent new exotic species to colonize. Deer populations should be kept at a level compatible with the ecological integrity of the forest community.

NESHANNOCK TOWNSHIP

<u>PNDI Rank</u>		<u>Legal Status</u>	
Global	State	Fed.	State

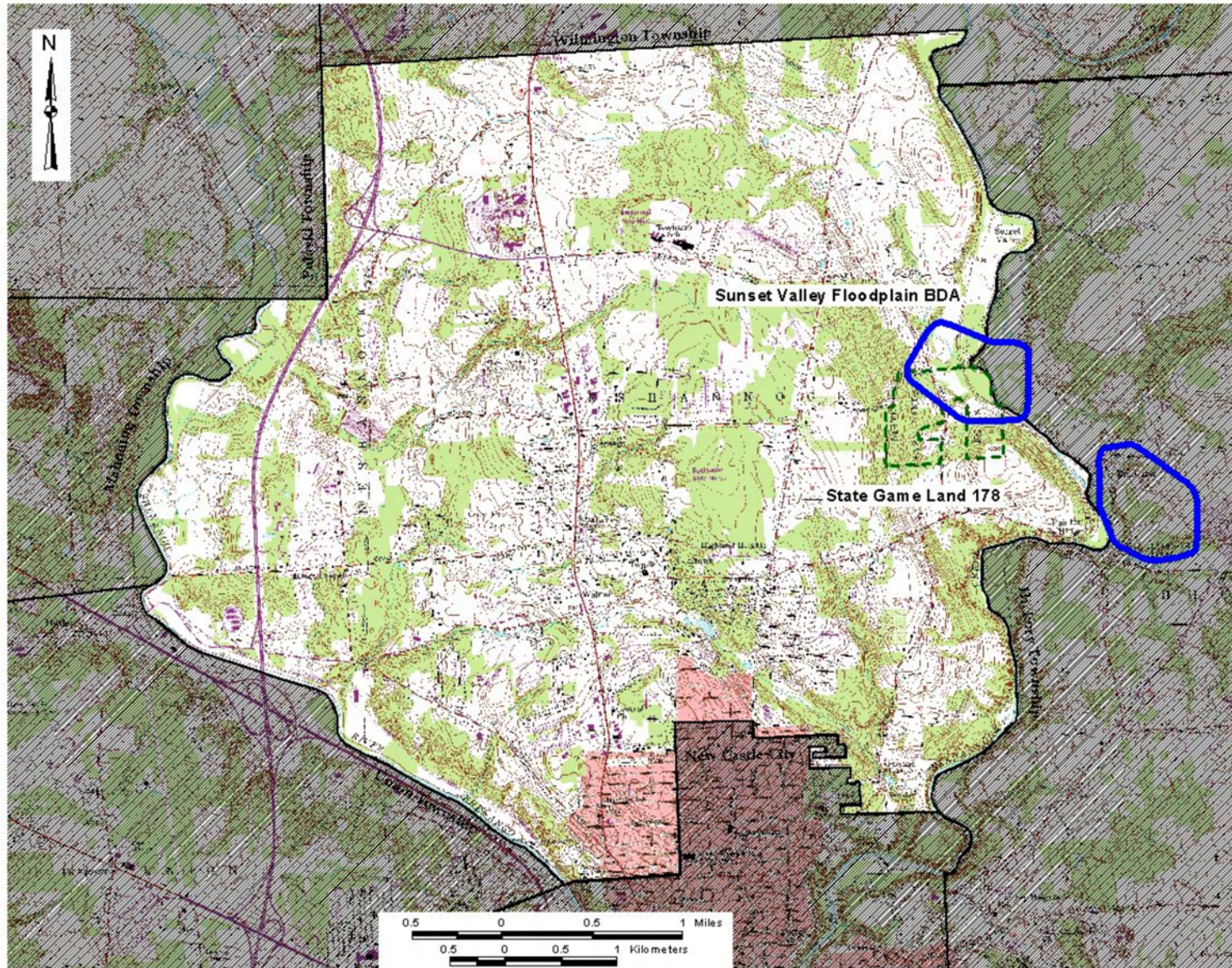
NATURAL HERITAGE AREAS:

SUNSET VALLEY FLOODPLAIN BDA *Notable Significance*

Wild Hyacinth (<i>Camassia scilloides</i>)	G4G5 S1	N	PT
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MANAGED LANDS: State Game Lands #178

Neshannock Township



Neshannock Township

Lawrence County Natural Heritage Inventory

Biological Diversity Areas:

Sunset Valley Floodplain

Landscape Conservation Areas:

None

Managed Areas:

State Game Land 178



Map Legend

-  Biological Diversity Area (BDA)
-  Landscape Conservation Area (LCA)
-  Managed Area (MA)
-  Municipality Boundary

NESHANNOCK TOWNSHIP

Neshannock Township is located to the north of the City of New Castle and one of the fastest growing townships in the county. The township extends from the Shenango River on the west to Neshannock Creek on the east. There is one Natural Heritage Area and one managed land – **State Game Lands #178** located in Neshannock Township.

Sunset Valley Floodplain BDA

Sunset Valley Floodplain BDA is located on a slight bend to the southeast of Neshannock Creek and is the location of an island in the creek. A sycamore (river birch) box elder floodplain forest occupies the floodplain of Neshannock Creek and an island in the creek across from the floodplain. This natural community supports **wild hyacinth (*Camassia scilloides*)**, a Pennsylvania plant species of special concern. Dominant canopy species on the floodplain and island include sycamore (*Platanus occidentalis*), silver maple (*Acer saccharinum*), green ash (*Fraxinus pennsylvanica*), red maple (*Acer rubrum*) and box elder (*Acer negundo*). On slopes adjacent to the floodplain red oak (*Quercus rubra*), black cherry (*Prunus serotina*) and American beech (*Fagus grandifolia*) join the dominant species. Understory associates are hawthorn (*Crataegus* spp.), silky dogwood (*Cornus amomum*) and arrow-wood (*Viburnum acerifolium*). Herbaceous species include Virginia blue-bells (*Mertensia virginica*), false hellebore (*Veratrum viride*), trout lily (*Erythronium americanum*), skunk cabbage (*Symplocarpus foetidus*), spring beauty (*Claytonia virginica*), wingstem (*Verbesina alternifolia*) and cut-leaved toothwort (*Cardamine concatenata*). A red oak-mixed hardwoods forest can be found on the slopes to the west of the floodplain. While the understory and herbaceous cover is similar to that in the floodplain the canopy has red oak (*Quercus rubra*), black cherry (*Prunus serotina*) and American Beech (*Fagus grandifolia*). Invasive species such as multiflora rose (*Rosa multiflora*), privet (*Ligustrum vulgare*) and wild garlic (*Alliaria petiolata*) are present throughout the floodplain and the island.

Threats and Stresses

This BDA is within State Game Lands #178 and is managed by the Pennsylvania Game Commission. There are no imminent threats to this site although invasive species such as multiflora rose (*Rosa multiflora*), of which there is already a heavy coverage, represent a threat to the integrity of this site. Opening of the canopy would be detrimental to the native species here and would provide opportunities for quicker establishment of exotic invasive species.

Recommendations

Assure that the Pennsylvania Game Commission is aware of the presence of these plants would be a good first step in the protection of this site. A simple management plan could be developed to maintain habitat and track the special plant populations over time. This management plan could include provisions for invasive species management and monitoring. Activities such as canopy removal within the site should take into consideration the potential impacts on the species of special concern and the invasive species present.

NEW BEAVER BOROUGH AND WAMPUM BOROUGH

<u>PNDI Rank</u>		<u>Legal Status</u>	
Global	State	Fed.	State

NATURAL HERITAGE AREAS:

BEAVER RIVER FLOODPLAIN BDA *Notable Significance*

Sycamore (river birch) boxelder floodplain forest G? S2 N N

COUNTY LINE WETLANDS BDA *High Significance*

Special Animal 1 G5 S2S3 N ?

NORTH FORK LITTLE BEAVER CREEK LCA *High Significance*

ROCK POINT BDA *County Significance*

MANAGED LANDS: State Game Lands #148

NEW BEAVER BOROUGH

New Beaver Borough is located in south-central Lawrence County. The eastern boundary of the borough is formed by the Beaver River. Strip mines and agricultural fields are prominent features in this borough. There is one Natural Heritage Area and one managed land – **State Game Lands #148** located within this borough.

Beaver River Floodplain BDA

Beaver River Floodplain BDA is discussed in Taylor Township.

County Line Wetlands BDA

County Line Wetlands BDA was originally delineated as part of the Beaver County Natural Heritage Inventory and spans north across the county line into Lawrence County. This site was recognized in Beaver County for wetlands lying within the floodplain. A sycamore- (river birch) box-elder floodplain forest, dominated by sycamore (*Platanus occidentalis*), silver maple (*Acer saccharinum*), American elm (*Ulmus americana*), black cherry (*Prunus serotina*) bitternut hickory (*Carya cordiformis*) and green ash (*Fraxinus pensylvanica*) covers the floodplain of the creek. Patches of silky dogwood (*Cornus amomum*) and dense stands of jewelweed (*Impatiens capensis*) along with wingstem (*Verbesina alternifolia*), Oswego tea (*Monarda didyma*) and stinging nettle (*Urtica dioica*) populate the understory (Smith et al., 1993). The Lawrence County side of the creek has a similar overall habitat but includes a trailer park. The creek here is classified as a medium-gradient clearwater creek. A special concern animal (**Special Animal 1**) in Pennsylvania lives on the Lawrence County side of the BDA.

Threats and Stresses

The trailer park and its infrastructure sits within the floodplain. Its affect on the creek and management of adjacent riparian habitat are not known. This site is directly impacted a trailer park next to North Fork Little Beaver Creek at this site. As discussed in other BDA's present along the creek siltation and abandoned mine drainage are issues in this watershed and are threats to this BDA.

Recommendations

The stream in this section is the recipient of accumulated nutrient and siltation inputs to the watershed. Pastures and strip-mines are the main source of impacts to the stream. Active pastures throughout the watershed would benefit from increased riparian buffers and where cattle activity and crossings are issues, from stream bank fencing programs. Strip-mines, where possible, should be reclaimed to reduce the amount of the silt and allow the stream to recover.

Invasive species should be monitored at the site and establishment prevented. Native species such as alder (*Alnus serrulata*), black willow (*Salix nigra*) and silver maple (*Acer saccharinum*) should be planted along the streambanks to prevent erosion and invasive species from gaining a foothold and to prevent erosion along the stream. Restoration of streambanks and riparian buffers would help to limit erosion and create more favorable stream side conditions. For information on streambank restoration contact the Watershed Assistance Center at the Western Pennsylvania Conservancy.

North Fork Little Beaver Creek LCA

North Fork Little Beaver Creek LCA is discussed in Little Beaver Township.

Rock Point BDA

Rock Point BDA is discussed in Wayne Township.

WAMPUM BOROUGH

Wampum Borough is located in the south central part of Lawrence County along the Beaver River. The borough lies on a floodplain on the western bank of the Beaver River. Most of the land around the borough has been strip-mined. There are no Natural Heritage Areas and no managed lands located in Wampum Borough.

CITY OF NEW CASTLE

<u>PNDI Rank</u>		<u>Legal Status</u>	
Global	State	Fed.	State

NATURAL HERITAGE AREAS:

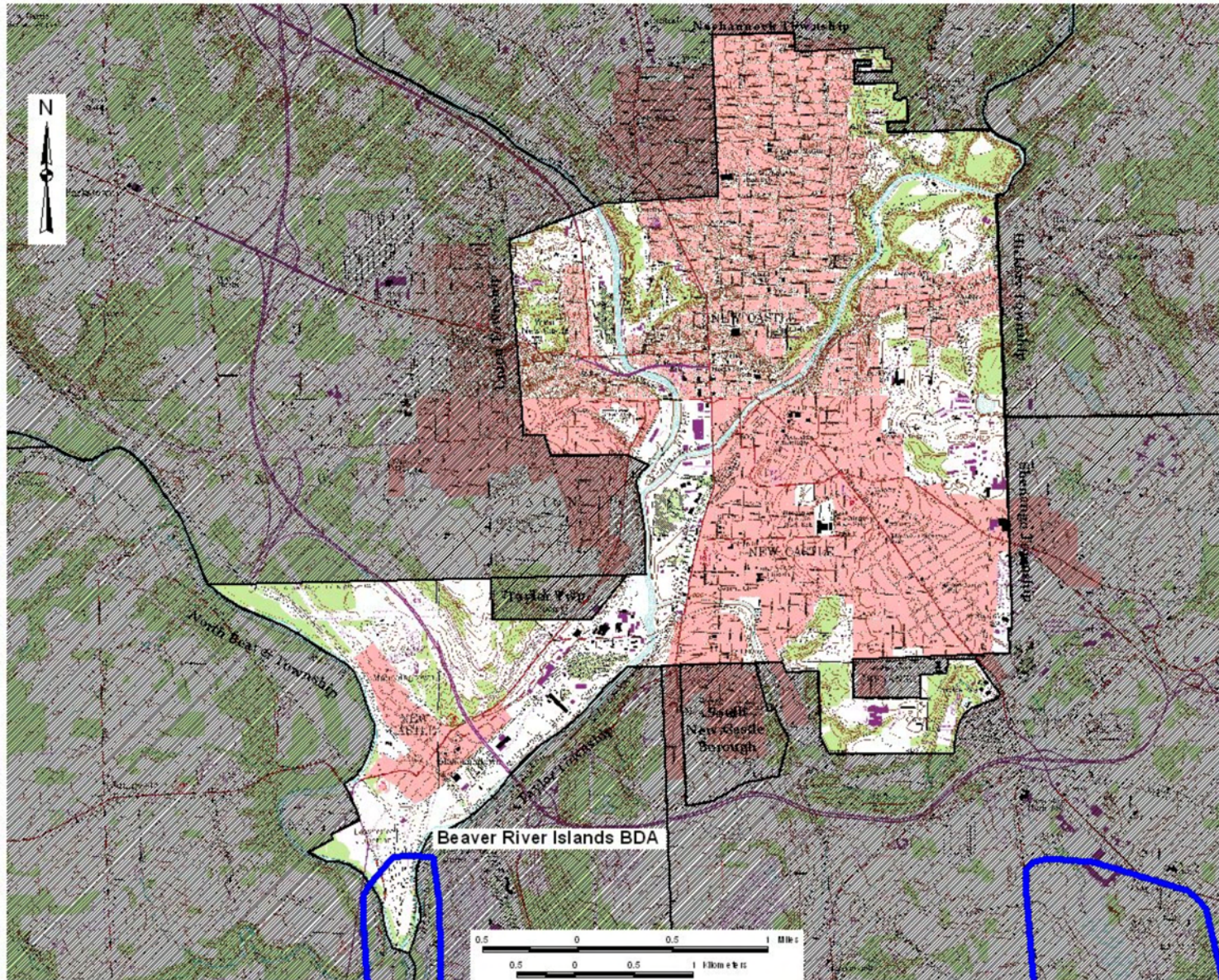
BEAVER RIVER ISLANDS BDA

Notable Significance

Sycamore (river birch) boxelder floodplain forest	G?	S3	N	N
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MANAGED LANDS: None

New Castle City



New Castle City

Lawrence County Natural Heritage Inventory

Biological Diversity Areas:

Beaver River Islands

Landscape Conservation Areas:





None

Managed Areas:

None



Map Legend

-  Biological Diversity Area (BDA)
-  Landscape Conservation Area (LCA)
-  Managed Area (MA)
-  Municipality Boundary

CITY OF NEW CASTLE

The City of New Castle is the county seat and largest city in Lawrence County. John Carlisle Stewart first laid out New Castle in 1798 at the confluence of the Shenango River and Neshannock Creek. These two drainages comprise very prominent natural features in the city. Hottenbaugh Run flows through the southern sections of the city and is the location of Cascade Park. There is one Natural Heritage Area and no managed lands located in the City of New Castle.

Beaver River Islands BDA

Beaver River Islands BDA is discussed in North Beaver Township.

NORTH BEAVER TOWNSHIP, BESSEMER BOROUGH AND SNPJ BOROUGH

<u>PNDI Rank</u>		<u>Legal Status</u>	
Global	State	Fed.	State

NATURAL HERITAGE AREAS:

BEAVER RIVER FLOODPLAIN BDA

Notable Significance

Sycamore (river birch) boxelder floodplain forest	G?	S3	N	N
---	----	----	---	---

BEAVER RIVER ISLANDS BDA

Notable Significance

Sycamore (river birch) boxelder floodplain forest	G?	S3	N	N
---	----	----	---	---

NORTH FORK LITTLE BEAVER CREEK LCA

High Significance

MANAGED LANDS: None

North Beaver Township, Bessemer Borough and SNPJ Borough

North Beaver Township
 Bessemer Borough
 SNPJ Borough

Lawrence County Natural Heritage Inventory

Biological Diversity Areas:

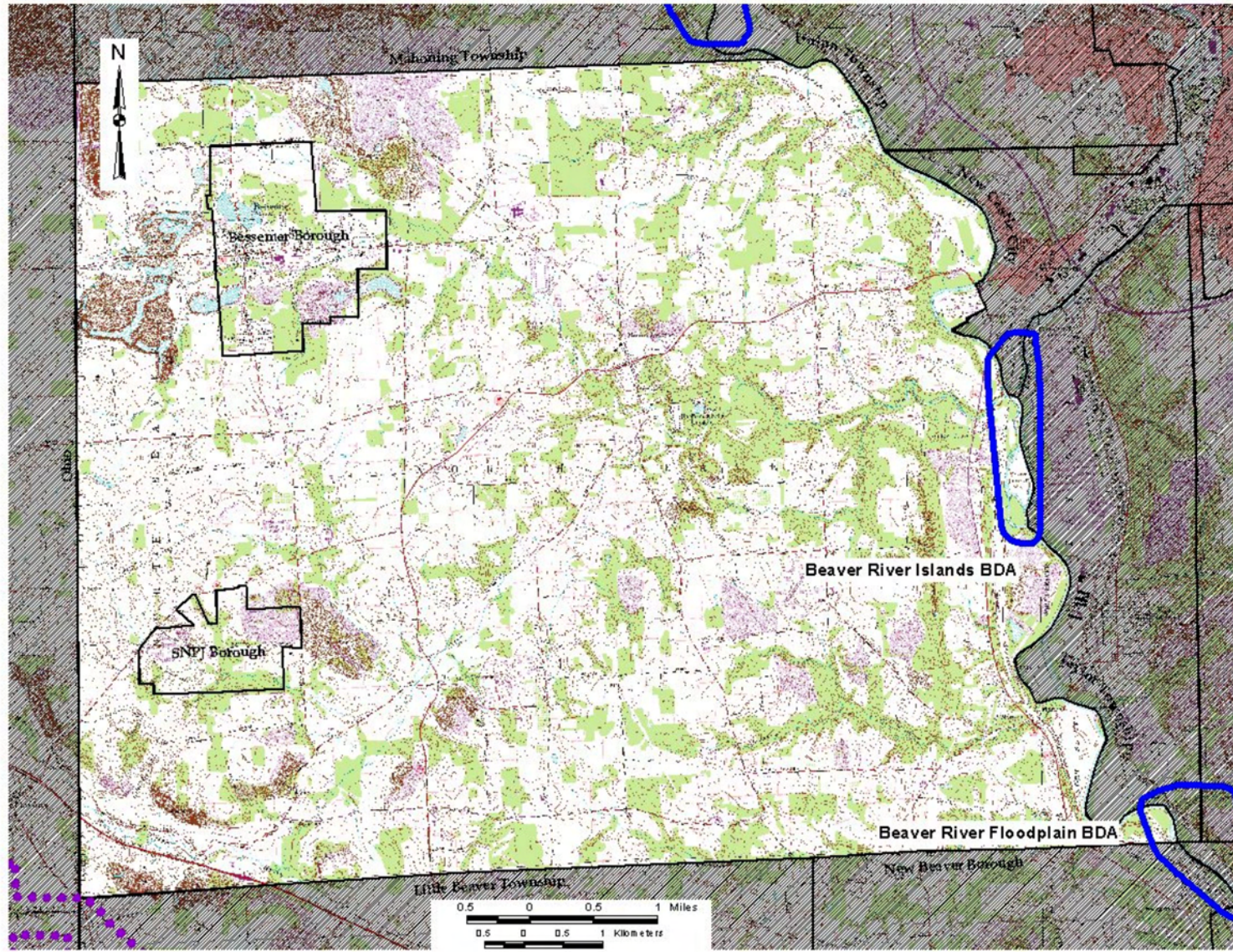
- Beaver River Islands
- Beaver River Floodplain

Landscape Conservation Areas:

None

Managed Areas:

None



Map Legend

- Biological Diversity Area (BDA)
- Landscape Conservation Area (LCA)
- Managed Area (MA)
- Municipality Boundary

NORTH BEAVER TOWNSHIP

North Beaver Township is the largest township in Lawrence County. It extends from the Ohio state line on the west to the Beaver River on the east. Three watersheds drain this township; the Beaver River on the east, the Mahoning River on the north and North Fork Little Beaver Creek on the south. Occasional strip mines dot the landscape of the township. There is one Natural Heritage Area and no managed lands located in North Beaver Township.

Beaver River Floodplain BDA

Beaver River Floodplain BDA is discussed in Taylor Township.

Beaver River Islands BDA

Beaver River Islands BDA includes a complex of three islands and adjacent floodplain along the Beaver River just below the confluence of the Shenango and Mahoning Rivers and one island upstream on the Shenango River. The islands range in size from about two acres to twenty acres. Recent forestry activity disturbed the lowermost island and it is now recovering. The remaining islands and floodplains are forested with a **sycamore- (river birch) box-elder floodplain forest** predominating.

Shaw Island, located in the middle of the BDA, is the largest of the islands. Several large scour channels are present along the edges of the island but the interior seems to escape flood events. Overstory trees on Shaw Island range from two to four feet in diameter and include sycamore (*Platanus occidentalis*), slippery elm (*Ulmus rubra*), box-elder (*Acer negundo*), silver maple (*Acer saccharinum*), sugar maple (*Acer saccharum*), red maple (*Acer rubrum*), occasional cottonwood (*Populus deltoides*) and yellow buckeye (*Aesculus flava*). Understory species include silky dogwood (*Cornus amomum*), hawthorn (*Crataegus spp.*), elderberry (*Sambucus canadensis*) and winterberry (*Ilex verticillata*). On Shaw Island proper, two herbaceous species, ostrich fern (*Matteuccia struthiopteris*) and green head coneflower (*Rudbeckia laciniata*), compete for dominance. Other herbaceous species included touch-me-not (*Impatiens spp.*), Virginia bluebells (*Mertensia virginica*), turk's cap lily (*Lilium superbum*) and wild ginger (*Asarum canadense*).

The second largest island lies downstream of Shaw Island (lower island in Figure 15). Forestry activity on the island has resulted in canopy loss and a scrubby habitat. An overturned tractor-trailer, presumably used to carry equipment to the island, remains in one of the channels of the river. Because of high levels of disturbance, this island was not investigated further.

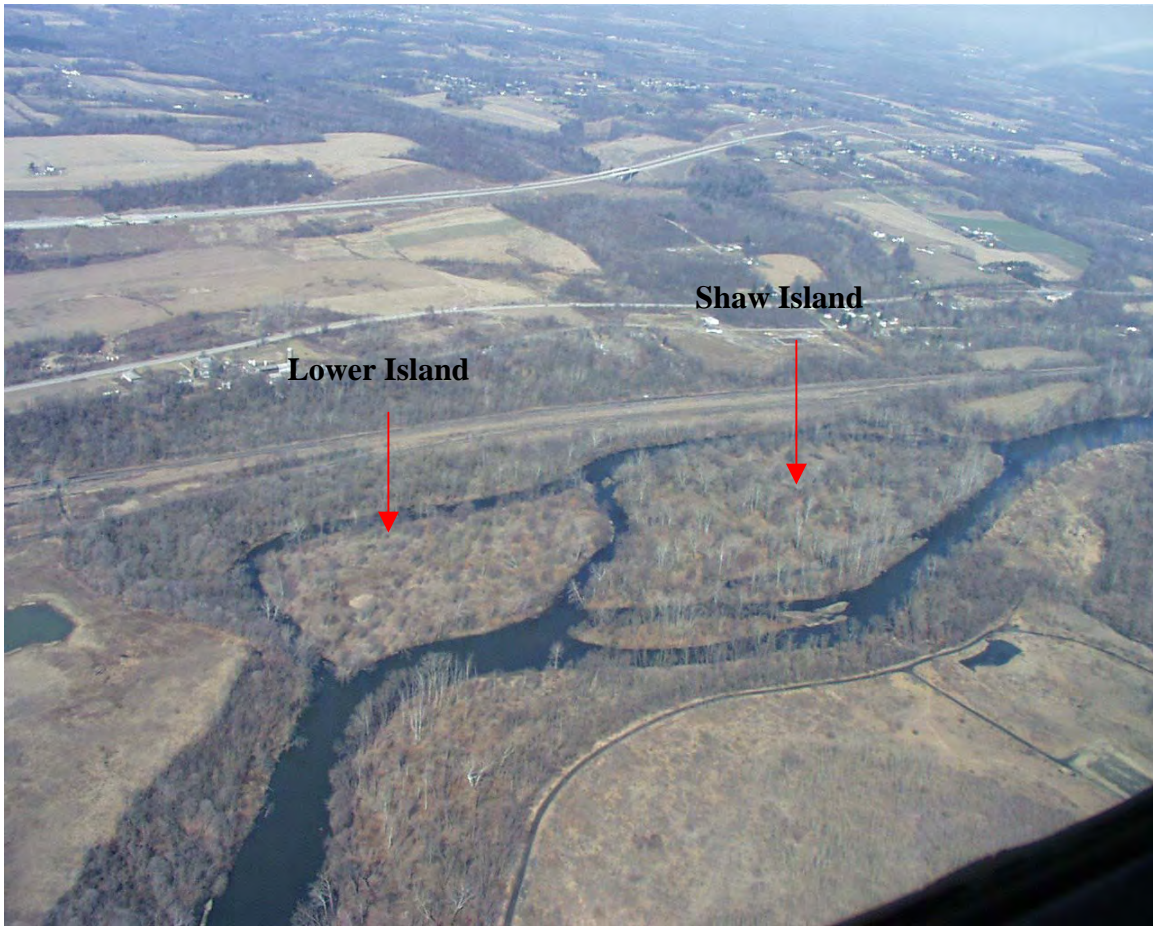


Figure 15. Aerial View of the Beaver River Islands

The smallest island on the Beaver River section of the BDA lies upstream of Shaw Island and just downstream of the junction of the Mahoning and Shenango Rivers (not shown in Figure 15). Essentially a smaller version of Shaw Island, this island is also sycamore dominated. A few deep channels exist where skunk cabbage (*Symplocarpus foetidus*), stinging nettle (*Urtica dioica*) and red trillium (*Trillium erectum*) live. Several large yellow buckeye (*Aesculus flava*) trees reside on the island.

The island in the Shenango River is the smallest of any of the islands and apparently represents the northernmost extent of yellow buckeye (*Aesculus flava*) in Pennsylvania and perhaps in North America. Otherwise this island is very similar to Shaw Island and the other islands.

Flooding cycles are very important in maintaining the dynamic nature of these communities. Regeneration of many of the overstory species require exposed soils that result from flooding. Unfortunately, a number of exotic species, especially Japanese knotweed (*Polygonum cuspidatum*) and multiflora rose (*Rosa multiflora*) thrive on the disturbance and are present on the islands.



Figure 16. Mahoningtown Island on the Shenango River



Figure 17. Mahoningtown Island (Interior View)

Disturbance by industrial activities and cutting characterize the east side of the river. The west side is dominated by a railroad right-of-way. Because of high levels of disturbance, invasive species are a significant issue here.

Threats and Stresses

Because of disturbance on the islands due to river flooding and fragmentation on the adjacent floodplains from industrial activity, many invasive species are establishing. Two species, multiflora rose (*Rosa multiflora*) and Japanese knotweed (*Polygonum cuspidatum*) are present on the islands and stand as major threats to the viability of the natural communities.

Significant loss of canopy could be a serious threat to the natural communities on the islands. The island downstream of Shaw Island is succeeding to a more mature forest after previous timber removal while the other islands still have mature forests. Increased light levels would most likely result in the increase of invasive species. Deer browsing could compound regeneration problems.

Recommendations

Invasive species need to be monitored and their spread into other areas prevented. Owing to the narrow floodplain and the small size of the islands, the integrity of the riparian zone is dependent on controlling these species. Activities that result in removal of the canopy should be avoided. Expanding the forested section of the floodplain would provide a larger context for these communities and increase their habitat value, particularly for birds and other animals potentially traveling along the river corridor. As with all island habitats, alterations in the natural flooding regime need to be taken into account.

Deer populations should be maintained at a level compatible with the ecological health of the forest. Large numbers of deer stand to reduce the regeneration capacity of the forest and alter the species composition of the forests.

North Fork Little Beaver Creek LCA

North Fork Little Beaver Creek LCA is discussed in Little Beaver Township.

BESSEMER BOROUGH

Bessemer Borough is located in west-central Lawrence County. The main industry is cement production. The borough is surrounded by strip mines in what was at the turn of the century the largest limestone mine in the world. There are no Natural Heritage Areas and no managed lands located in Bessemer Borough.

SNPJ BOROUGH

SNPJ borough is located in the west central part of Lawrence County. It is the smallest municipality in the county and stands for “Slovenska Narodna Podporna Jednota”. There are no Natural Heritage Areas or managed lands located in SNPJ Borough.

PERRY TOWNSHIP

<u>PNDI Rank</u>		<u>Legal Status</u>	
Global	State	Fed.	State

NATURAL HERITAGE AREAS:

GRINDSTONE CONFLUENCE BDA

County Significance

River birch-sycamore floodplain scrub

G?	S3	N	N
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HARRIS BRIDGE SLOPES BDA

Notable Significance

Hemlock-tuliptree-birch forest

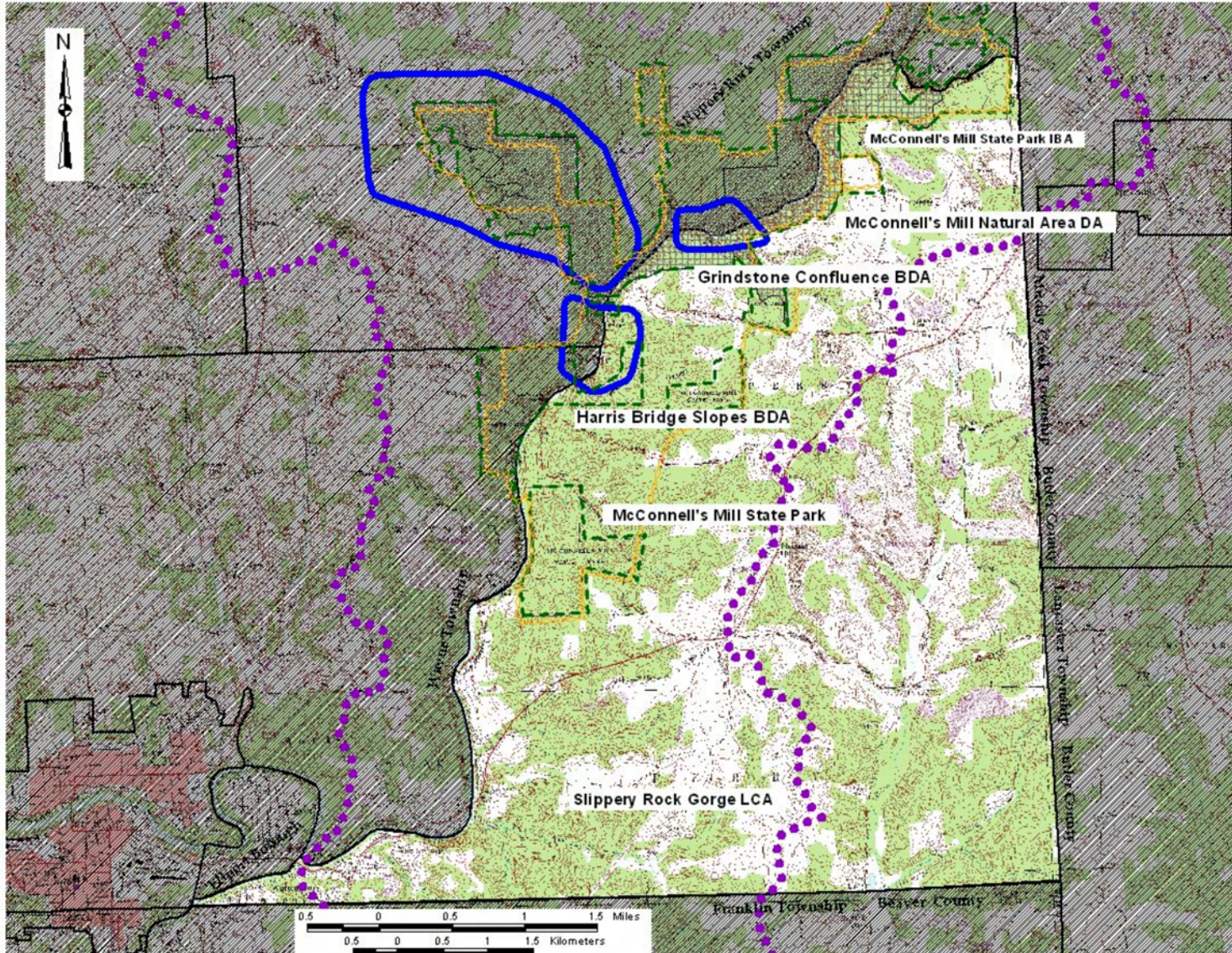
G?	S5	N	N
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SLIPPERY ROCK GORGE LCA

Exceptional Significance

MANAGED LANDS: McConnell’s Mill State Park
 McConnell’s Mill Natural Area DA

Perry Township



Perry Township

Lawrence County Natural Heritage Inventory

Biological Diversity Areas:

Grindstone Confluence
Harris Bridge Slopes

Landscape Conservation Areas:

Slippy Rock Gorge

Managed Areas:

McConnell's Mill State Park
McConnell's Mill Natural Area DA



Map Legend

-  Biological Diversity Area (BDA)
-  Landscape Conservation Area (LCA)
-  Managed Area (MA)
-  Audubon Society Important Bird Area (IBA)
-  McConnell's Mill State Park Natural Area (DA)
-  Municipality Boundary

PERRY TOWNSHIP

Perry Township is located in the southeastern corner of Lawrence County. Its borders essentially mark the southernmost extent of glaciation in Lawrence County and relief in this township is more extreme than for other parts of the county. Slippery Rock Creek Gorge defines the township's northwest border. Wurtemberg is the main population center in the township. There are two Natural Heritage Areas and one managed land -- **McConnell's Mill State Park**, located in Perry Township.

Grindstone Confluence BDA

Grindstone Confluence BDA, situated at the confluence of Slippery Rock Creek and Grindstone Run, is located within the Slippery Rock Creek Gorge. Above the site, Grindstone Run cuts a gorge on the east side of the larger Slippery Rock Creek similar to and nearly opposite Hell Run. Grindstone Run does not have the high water quality of Hell Run as it receives more impacts from abandoned mine drainage. The forests in the Grindstone Run gorge are also younger and with a less developed understory than the larger Slippery Rock Gorge. At the confluence of this stream with Slippery Rock Creek there is a cobbly island populated with a **river birch-sycamore floodplain scrub** community. Dominant woody species in this community include sycamore (*Platanus occidentalis*), black willow (*Salix nigra*), green ash (*Fraxinus pennsylvanica*) and smooth alder (*Alnus serrulata*). Herbaceous species include tussock sedge (*Carex stricta*), moneywort (*Lysimachia nummularia*), thimbleweed (*Anemone canadensis*) and cow-parsnip (*Heracleum maximum*). The shore and island are populated with dense Japanese knotweed (*Polygonum cuspidatum*) and dame's rocket (*Hesperis matronalis*) as well as other exotics listed below.

Threats and Stresses

Many exotic invasive species are present in this area. The heaviest concentration of Japanese knotweed (*Polygonum cuspidatum*) seen in the Slippery Rock Gorge was noted here. Other invasive species such as yellow iris (*Iris pseudacorus*), shrubby honeysuckle (*Lonicera maackii*) and oriental bittersweet (*Celastrus orbiculatus*) were seen in the gorge only within this area. Additional exotic species here and in the other places around the gorge include colt's foot (*Tussilago farfara*), dame's rocket (*Hesperis matronalis*) and moneywort (*Lysimachia nummularia*).

Recommendations

This area has the most serious exotic invasive species problems in the Slippery Rock Gorge and a serious monitoring and eradication effort in this area would be worthwhile. Assuring that the staff of McConnell's Mill State Park are aware of the extent of the infestation would be a good first step in this effort. Control in this area would be critical given the high concentration of these exotics. The natural community depends on disturbance from floods and a number of the exotics respond favorably to the same natural disturbance. Additionally these same species could, as they spread, compromise native

plant species decreasing the ecological viability of the community. Other than exotic species invasion, there are no other immediate threats to the BDA.

Harris Bridge Slopes BDA

The Sarah Heinz Camp, included in this BDA, is an in-holding within McConnell's Mill State Park. This BDA is the farthest downstream of those in the Slippery Rock gorge LCA. The site is divided roughly by Slippery Rock Creek and is bounded by Armstrong Bridge to the south and Harris Bridge on the north. Athletic fields and structures associated with the camp sit within part of the site but most of the area is forested. Along Slippery Rock Creek there is a small overflow dam that impounds about half of the stream footage between the two bridges.

A **hemlock-tuliptree-birch forest** grows on the eastern slopes. Canopy species in this forest include eastern hemlock (*Tsuga canadensis*), red oak (*Quercus rubra*), American beech (*Fagus grandifolia*), yellow birch (*Betula allegheniensis*) and white oak (*Quercus alba*). Among the understory species are American hornbeam (*Carpinus caroliniana*) and white ash (*Fraxinus americana*). Common herbaceous species include intermediate log fern (*Dryopteris intermedia*), Christmas fern (*Polystichum acrostichoides*), false solomon's seal (*Smilacina racemosa*) and large-flowered trillium (*Trillium grandiflorum*). Invasive species present include multiflora rose (*Rosa multiflora*) and Japanese barberry (*Berberis thunbergii*).

Threats and Stresses

Most of the site is under the protection of McConnell's Mill State Park. The Sarah Heinz Camp is interested in preserving the site as well. As such, there are no immediate threats to the natural community. If possible additional areas of forest contiguous with this BDA to the already protected areas of the gorge would help enhance the unfragmented character of the gorge between Connoquenessing Creek and the upper parts of Slippery Rock Creek. Some parts of the site showed signs of deer browsing. While not excessive now, increases in deer population would be detrimental to forest health. Invasive species are present and represent a threat if not monitored and controlled.



Figure 18. Forest near Harris Bridge

Recommendations

Informing the Sarah Heinz house of the significance of the site would be a good first step in the protection of natural communities here. Further inventory of the site should be conducted to better describe the community and survey for unique plants and animals that may exist here and to better understand how animals may be using the corridor for movement. Management of deer populations to keep them in balance with the carrying capacity of the forest community would benefit this BDA. Additionally, monitoring of invasive species needs to be included in any management plan for the property. Management plans for the site need to consider the attributes of the gorge as a whole. These include maintaining the unfragmented corridor, water quality of the creek and a substantial riparian buffer.

McConnell's Mill Natural Area DA

McConnell's Mill Natural Area DA is discussed in Slippery Rock Township.

Slippery Rock Gorge LCA

Slippery Rock Gorge LCA is discussed in Slippery Rock Township

PLAIN GROVE TOWNSHIP

<u>PNDI Rank</u>		<u>Legal Status</u>	
Global	State	Fed.	State

NATURAL HERITAGE AREAS:

BRENT BDA

Notable Significance

Special Animal 1	G5	S1S2	N	PT
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GRANGE HALL FEN BDA

Exceptional Significance

American Globeflower (<i>Trollius laxus</i>)	G3Q	S1	PE	PE
Open sedge (<i>Carex stricta</i> , <i>C. prairea</i> , <i>C. lacustris</i>) fen	G?	S1	N	N

MCCONAHY ROAD WETLAND BDA

Notable Significance

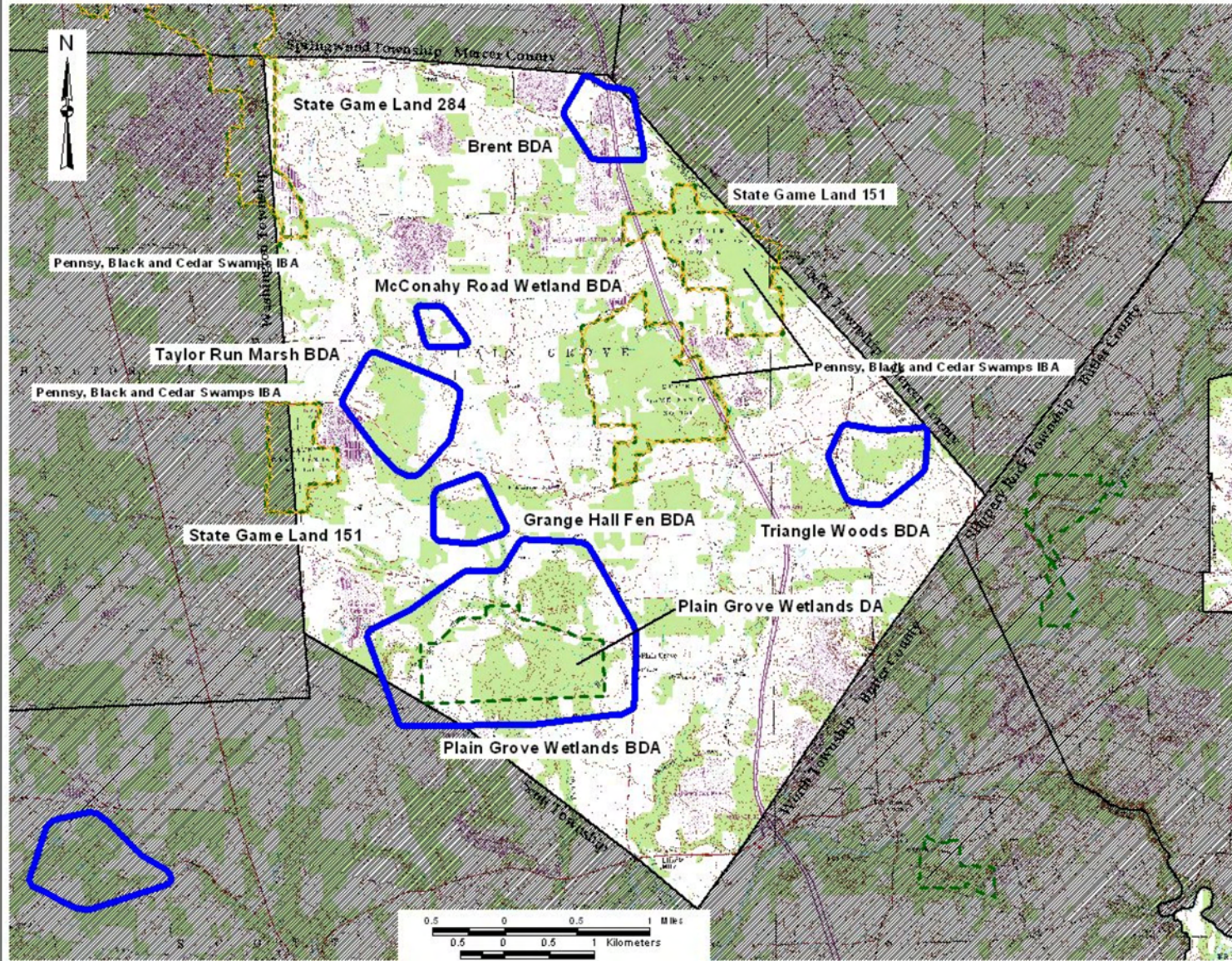
Autumn Willow (<i>Salix serissima</i>)	G4	S2	PT	PT
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PLAIN GROVE WETLANDS BDA

Exceptional Significance

Slender Sedge (<i>Carex lasiocarpa</i>)	G5	S3	PR	PR
Prairie Sedge (<i>Carex prairea</i>)	G5	S2	N	PT
Sterile Sedge (<i>Carex sterilis</i>)	G4	S1	N	PE
Rigid Sedge (<i>Carex tetanica</i>)	G4G5	S2	N	PT
Showy Lady's Slipper (<i>Cypripedium reginae</i>)	G4	S2	PT	PT
Slender Spike Rush (<i>Eleocharis elliptica</i>)	G5	S2	N	PE
Tassel Cotton-Grass (<i>Eriophorum viridicarinatum</i>)	G5	S2	N	PT
American-Columbo (<i>Frasera caroliniensis</i>)	G5	S1	N	PE
Virginia Bunchflower (<i>Melanthium virginicum</i>)	G5	SU	N	TU
Grass-of-Parnassas (<i>Parnassia glauca</i>)	G5	S2	N	PE
Drooping Bluegrass (<i>Poa languida</i>)	G3G4	S2	N	PT
Hard-Stem Bulrush (<i>Schoenoplectus acutus</i>)	G5	S2	PE	PE
Shining Ladies' Tresses (<i>Spiranthes lucida</i>)	G5	S3	N	TU
American Globeflower (<i>Trollius laxus</i>)	G3Q	S1	PE	PE
Open sedge (<i>Carex stricta</i> , <i>C. prairea</i> , <i>C. lacustris</i>) fen	G?	S1	N	N

Plain Grove Township



Plain Grove Township

Lawrence County Natural Heritage Inventory

Biological Diversity Areas:

- Brent
- Grange Hall Fen
- McConahy Road Wetland
- Plain Grove Wetlands
- Taylor Run Marsh
- Triangle Woods

Landscape Conservation Areas:

None

Managed Areas:

- Plain Grove Wetlands DA
- State Game Land 151
- State Game Land 284



Map Legend

- Biological Diversity Area (BDA)
- Landscape Conservation Area (LCA)
- Managed Area (MA)
- Audubon Society Important Bird Area (IBA)
- Municipality Boundary

TAYLOR RUN MARSH BDA

Wet meadow

G? S3

N N

TRIANGLE WOODS BDA

County Significance

MANAGED LANDS: Plain Grove Wetlands DA
State Game Lands #151
State Game Lands #284

PLAIN GROVE TOWNSHIP

Plain Grove Township is located in the northeast corner of Lawrence County. The gentle relief of the township and the myriad of wetlands that dot the landscape are the result of the glaciers that once covered the area. Many tributaries to Slippery Rock Creek including Jamison Run and Taylor Run drain township lands. There are six Natural Heritage Areas and three managed lands -- **State Game Lands # 151**, **State Game Lands #284** and **Plain Grove DA** located in Plain Grove Township.

Brent BDA

Brent BDA is located in the midst of some reclaimed strip mines in the very northeastern edge of Lawrence County. The strip mines are now largely reclaimed in grassland and are used as hay fields. A cell tower sits along the road going through the site. Dominant species in the fields include red clover (*Trifolium pratense*), Kentucky tall-fescue (*Festuca rubra*), Timothy (*Phleum pratense*) and Queen Anne's lace (*Daucus carota*). It is the location of a Pennsylvania animal species of special concern (**Special Animal 1**). This species was once restricted to the Great Plains but was able to colonize in the eastern states with clearing of the forests (Carter 1992). This animal is migratory and present in Pennsylvania from about April to August.

Threats and Stresses

These newly established grasslands provide nesting habitat for the animal species of special concern which inhabits areas more typical of the mid-western grasslands. Reforestation or succession of the grasslands threatens to eliminate the habitat that this species is using. Application of herbicides or pesticides and excessive human visitation during the nesting period could negatively impact this animal.

Recommendations

Reclaiming a strip mine involves returning the overburden to the place where the minerals were removed and then returning the contours of the land to predevelopment levels. Once the overburden is replaced the area should ideally be planted in warm-season and other native grasses to furnish appropriate habitat for numerous species including the animal of concern. This habitat can be managed as a grassland through prescribed burns, haying or mowing. The animal of concern prefers grassland areas that are larger than 150 acres in size. Activities in the area should be evaluated to limit disturbance to the foraging and nesting areas of these animals. Restrictions on human visitation during the spring nesting season would help assure nesting success of the animals. Application of herbicides and pesticides would be detrimental to the animals and should not be applied.

Grange Hall Fen BDA

Grange Hall Fen is located within the floodplain of Taylor Run. Home to an **open sedge** (*Carex stricta*, *C. prairea*, *C. lacustris*) **fen**, this BDA includes both the fen and an adjacent forested area. Common canopy species include black cherry (*Prunus serotina*), red maple (*Acer rubrum*), white oak (*Quercus alba*), and shagbark hickory (*Carya ovata*). Shrubs are common hazelnut (*Corylus americana*), arrowwood (*Viburnum recognitum*), elderberry (*Sambucus canadensis*), speckled alder (*Alnus rugosa*) and nannyberry (*Viburnum lentago*). Herbs are numerous and include northwest territory sedge (*Carex utriculata*), tussock sedge (*Carex stricta*), slender loose-flower sedge (*Carex gracillescens*), rosy sedge (*Carex rosea*), limestone meadow sedge (*Carex granularis*) and common spike rush (*Eleocharis palustris*). **American globeflower** (*Trollius laxus*), a Pennsylvania endangered plant, resides in Grange Hall Fen.

Threats and Stresses

A permit to mine the fen for peat in the mid-1980's was denied by the Pennsylvania Department of Environmental Resources after an evaluation of the wetland, which is home to numerous plants of special concern. At the request of the landowner, we did not visit this site to update information obtained in the 1980's. Therefore, changes in the community and species present are not known. This fen community, as for others throughout the state, is dependent upon groundwater discharge to maintain the conditions necessary for the species and community present. Direct disturbance, removal of substrate or changes in the local hydrology could negatively impact the fen and associated species.

Recommendations

Although there have been past conflicts regarding proposed uses for the natural communities with this BDA, there are possibilities to provide stewardship to the resources that are consistent with the landowners vision for the site. Working with the landowner to better evaluate the resources present and to discuss possible management options would be a good first step. Any management plan should consider activities that lead to changes in the hydrology of the wetlands. Impacts of upstream development and development within the recharge zone of the wetland need to be evaluated as to their effect on the hydrology. Further inventory of the community and research regarding its history and changes will be needed to develop good management strategies for the community and important species.

McConahy Road Wetland BDA

Along McConahy Road in the northeastern Lawrence County is a wetland includes an open graminoid (grass-like species) area and a wooded area. Open areas are present on both sides of a wooded wetland through which runs a small tributary to Taylor Run. The east side holds the graminoid wetland and the west side serves as pasture. The graminoid wetland is dominated by rice-cut grass (*Leersia virginica*) and halbeard-leaved tearthumb (*Polygonum sagittatum*) with spotted joe-pye-weed (*Eupatorium maculatum*), tall goldenrod (*Solidago altissima*), melic manna grass (*Glyceria melicaria*) and culver's root

(*Veronicastrum virginicum*) as associates. The pastured west side harbors a small population of multiflora rose (*Rosa multiflora*) that could spread within the site.



Figure 19. McConahy Road Wetland

Black ash (*Fraxinus nigra*) dominates the wooded area with green ash (*Fraxinus pennsylvanica*), slippery elm (*Ulmus rubra*), sugar maple (*Acer saccharum*) and black cherry (*Prunus serotina*) co-dominating. Understory associates are poison sumac (*Toxicodendron vernix*), alder (*Alnus incana* ssp. *rugosa*), silky dogwood (*Cornus amomum*), and arrowwood (*Viburnum recognitum*). Multiflora rose (*Rosa multiflora*) is present in small numbers in the wetland. **Autumn Willow (*Salix serissima*)**, a Pennsylvania plant species of special concern, is also present on the edge of the wooded area. Common herbaceous species in the wooded area include tussock sedge (*Carex stricta*), blue vervain (*Verbena hastata*), early meadow rue (*Thalictrum dioica*), sensitive fern (*Onoclea sensibilis*) and wingstem (*Verbesina alternifolia*).

Threats and Stresses

Multiflora rose (*Rosa multiflora*) was the only invasive species noted in the area. Left unchecked this species could invade and dominate the wetland. Common reed (*Phragmites australis*) is known nearby (an area along I-79) and poses a potential threat to any wetland in the area. Changes in hydrology due to reduced surface or groundwater flow could threaten the ecological integrity of the site and decrease the ability of the habitat to support the plant species of special concern present.

Recommendations

Activities within the recharge zone that change the hydrology of the wetlands or change the overall character of the wetlands need to be fully assessed. Research aimed at

determining the best approach toward managing these communities is certainly needed. Invasive species need to be monitored to prevent them from spreading and taking over the wetland.

Plain Grove DA

Plain Grove DA includes part of the wetlands listed in Plain Grove BDA. The Western Pennsylvania Conservancy owns and manages this area for its ecological values and hence the conferred status of a Dedicated Area.

Threats and Stresses

As a Dedicated Area, this area and the natural communities within are protected from direct disturbances. Not all of the natural communities present are within the DA. Changes in the hydrology caused by disturbance to the recharge zones can change the community structure and affect the species living within the wetland. Activities such as gravel mining and nutrient inputs from agriculture could affect the ground water quality and quantity and ultimately change the character of the fen.

Recommendations

A management plan for the entire watershed of the wetlands that takes into account both the wetlands and the ecological resources present would help define goals and management approaches for the long-term protection of this area. Better researched site history and changes over time, landscape-level evaluation and monitoring focusing on specific species and habitats would be needed to develop a management plan. Extending the boundaries of the DA to include the all of the wetlands and preferably the watershed of the wetlands would create an ecological unit and allow more comprehensive management to take place. Agreements between the landowners within the watershed could help to establish a management program that would meet the needs of the parties involved.

Plain Grove Wetlands BDA

Plain Grove wetland rates as one of the most significant wetlands in Lawrence County both in terms of its rarity and overall quality. The wetland area hosts a complex of seepages and fens with fourteen plant species of special concern, including a globally rare plant species. These include Thickets of ninebark (*Physocarpus opulifolius*) are present in the boggy areas. Common herbaceous species in the bog include skunk cabbage (*Symplocarpus foetidus*), false hellebore (*Veratrum viride*), marsh marigold (*Caltha palustris*) and trout lily (*Erythronium americanum*).

Calcareous wetlands with slightly differing vegetation are scattered about the property. One natural community, an open sedge (*Carex stricta*, *C. prairea*, *C. lacustris*) fen is recognized in the BDA. Mostly it is an area of perennial seeps and springs coalescing into a broader more circumneutral wetland, some which is in young forest/shrub cover some of

which is at least partially pasture. Plain Grove Fen provides habitat for many Pennsylvania plant species of species concern as shown on the summary. Common species in the fen include spotted joe-pye-weed (*Eupatorium maculatum*), inland sedge (*Carex interior*), prairie sedge (*Carex prairea*), tussock sedge (*Carex stricta*) speckled alder (*Alnus incana*), starry false solomon's seal (*Smilacina stellatum*), Virginia mountain mint (*Pycnanthemum virginiana*), purple-stem aster (*Aster puniceus*), nodding burr marigold (*Bidens cernua*), spotted jewelweed (*Impatiens capensis*), rice cut-grass (*Leersia oryzoides*) and marsh marigold (*Caltha palustris*).



Figure 20. Plain Grove Wetlands

Surrounding uplands feature young forests with canopy species typically including white oak (*Quercus alba*) and red oak (*Quercus rubra*) with young black cherry (*Prunus serotina*), hawthorn (*Crataegus* spp.) and an understory of American hornbeam (*Carpinus caroliniana*) and dogwood (*Cornus florida*). Other low abundance species present are red maple (*Acer rubrum*), black gum (*Nyssa sylvatica*) and green ash (*Fraxinus pennsylvanica*).

Threats and Stresses

The communities and species of special concern here depend on groundwater discharge. Seepages braid through the site and represent groundwater discharge into the larger basin.

The fens especially rely on water that has percolated through glacial till containing significant amounts of limestone that create a high pH environment. Changes in the water table and disturbance to the recharge zones could alter groundwater flows and consequently lead to changes in overall habitat within the wetlands. Multiflora rose (*Rosa multiflora*) already constitutes a threat in the wetland. Pasturing may be an issue for some sections of the wetland although the affects of grazing are not known and may actually be of some benefit.

Recommendations

Maintaining ground water flow and quality are the most critical factors in keeping the populations intact. Activities that lead to changes in the hydrology of the wetlands including ditching, draining or upstream development should be carefully evaluated. A hydrologic model of the wetlands has been developed and will need to be utilized for monitoring of long-term changes in wetland hydrology. Also, any hydrologic changes that lead to increased nutrients should be carefully examined for impacts on the fen community. Stewardship of the wetlands should involve monitoring of species compositional changes as well as basic hydrology in the wetland.

Taylor Run Marsh BDA

Taylor Run Marsh is located along Taylor Run between McConahy Road and Lake Road and is upstream of Plain Grove Fen and Grange Hall Fen. The site consists of a **wet meadow** on the east side of Taylor Run and a wooded floodplain on the west side. About a quarter mile upstream of Lake Road the site is flooded by a beaver impoundment.

The east side of Taylor Run is a wet meadow dominated by needlerush (*Juncus effusus*), smooth shed sedge (*Carex laevivaginata*), sallow sedge (*Carex lurida*), red top (*Agrostis alba*), tussock sedge (*Carex stricta*) and fowl manna grass (*Glyceria striata*). Closer to the beaver impoundment, a higher density of shrubs grow that includes meadowsweet (*Spiraea alba*), silky dogwood (*Cornus amomum*), arrow-wood (*Viburnum dentatum*) and nannyberry (*Viburnum lentago*). Tree cover is sparse and includes slippery elm (*Ulmus rubra*), red maple (*Acer rubrum*) and green ash (*Fraxinus pennsylvanica*).

The west side of Taylor Run is wooded. Canopy species include black willow (*Salix nigra*), slippery elm (*Ulmus rubra*), swamp white oak (*Quercus bicolor*), red maple (*Acer rubrum*), sugar maple (*Acer saccharum*) and green ash (*Fraxinus pennsylvanica*). Understory species include arrow-wood (*Viburnum dentatum*), highbush blueberry (*Vaccinium corymbosum*), silky dogwood (*Cornus amomum*) and speckled alder (*Alnus incana*). Common herbaceous species are brome sedge (*Carex bromoides*), crested log fern (*Dryopteris cristata*), Canada mayflower (*Maianthemum canadense*), skunk cabbage (*Symplocarpus foetidus*), cinnamon fern (*Osmunda cinnamomea*) and sensitive fern (*Onoclea sensibilis*).

Threats and Stresses

The extent of beaver impoundment has apparently increased since a survey was conducted in the 1980's. Although beaver activity is a natural part of the landscape, the effects of inundation due to beaver on populations of specific species is hard to predict and requires a case by case evaluation. Additionally changes in hydrology due to impoundment, disruption of groundwater or channelization of the water could adversely affect the wet meadow habitat.

The natural community here depends on groundwater and surface water for the creation of riparian wetlands along Taylor Run. Changes in the water table could affect the wetlands, making them less suitable to the present flora. Parts of the wetland are used as pasture. Loss of vegetation and disturbance to the soil can encourage invasion of aggressive exotic plants since these plants often take advantage of open areas and disturbance.

Recommendations

Informing the landowner of the significance of the natural community would be a good first step in the protection of the area. Also, tracking use of the area by beaver would help to provide perspective on succession and habitat changes. Use of the land for pasture could be compatible with the protection of the community; maintaining the open area and preventing succession to a shrub swamp. Activities that lead to changes in the hydrology of the wetlands including ditching, draining or upstream development in the recharge zone should be carefully evaluated. Impacts of upstream mining on the hydrology and nutrient loads should be analyzed for their effect on these communities.

Triangle Woods BDA

Triangle Woods BDA is the location of a mature forest with a well-defined overstory and understory in a flat low-lying area of Plain Grove Township. This area is very fragmented by agricultural fields and strip mines and the presence of a fairly large wooded area is fairly significant in this part of the county. The overall community can be described as northern hardwoods forest with some inclusions of bottomland oak-hardwood palustrine forest. The northern hardwoods are dominated by black cherry (*Prunus serotina*), red maple (*Acer rubrum*), yellow birch (*Betula allegheniensis*) and red oak (*Quercus rubra*). Understory components are green ash (*Fraxinus pensylvanica*), black gum (*Nyssa sylvatica*), American hornbeam (*Carpinus caroliniana*), shagbark hickory (*Carya ovata*) and slippery elm (*Ulmus rubra*). A sparse shrub layer is populated by deer berry (*Vaccinium stamineum*), arrowwood viburnum (*Viburnum dentatum*) and alternate-leaved dogwood (*Cornus alternifolia*). Common herbs are bluestem goldenrod (*Solidago caesia*), Virginia smartweed (*Polygonum virginianum*), tearthumb (*Polygonum arifolium*), New York fern (*Thelypteris novaboracensis*), sensitive fern (*Onoclea sensibilis*), jack-in-the-pulpit (*Arisaema triphyllum*), bottlebrush grass (*Elymus hystrix*) and common blue violet (*Viola sororia*).

Small depressions are dominated by swamp white oak (*Quercus bicolor*) and pin oak (*Quercus palustris*). Silky dogwood (*Cornus amomum*) and buttonbush (*Cephalanthus occidentalis*) make up the shrub layer below the oak canopy.

Two branches of Jameson Run meet within this BDA and then flow south out of the BDA. The slopes above the floodplain of Jameson Run provide a habitat for beech (*Fagus grandifolia*) and basswood (*Tilia americana*). Spicebush (*Lindera benzoin*) and cucumber tree (*Magnolia accuminata*) grow on the floodplain of the stream. Herbaceous communities grow on sandbars in the stream with riparian species like monkeyflower (*Mimulus ringens*) and cardinal flower (*Lobelia cardinalis*) grow on sandbars in the stream.

Threats and Stresses

There are no immediate threats to this site as the landowner is interested in keeping the property intact. Because of the maturity of the trees there may be pressure to timber the forest. The biggest threat to this site may be invasive species. Multiflora rose (*Rosa multiflora*), Japanese barberry (*Berberis thunbergii*) and privet (*Ligustrum vulgare*) are already present. There is the potential of others, namely Japanese knotweed (*Polygonum cuspidatum*) and garlic mustard (*Alliaria petiolata*) to infest this area since they present in the nearby area.

Deer browsing is another potential problem. Excessive deer populations disrupt the regeneration of the canopy layer and can eliminate many of the herbaceous species in a forest.

Recommendations

The landowner is aware of the significance of their property and is interested in preserving it. Any activity that may eliminate the canopy or disturb the forest would be detrimental to the structure of this community and would fragment the contiguousness of the forest. Expanding the acreage in forest would help provide a buffer for the community within. Monitoring of invasive species should be conducted at some regular frequency.

PULASKI TOWNSHIP

<u>PNDI Rank</u>		<u>Legal Status</u>	
Global	State	Fed.	State

NATURAL HERITAGE AREAS:

DEER CREEK CONFLUENCE BDA

Notable Significance

Skunk cabbage-golden saxifrage seep	G?	S3	N	N
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MARYVALE SWAMP BDA

Notable Significance

Bottomland oak-hardwood palustrine forest	G5	S2	N	N
Buttonbush wetland	G?	S4	N	N

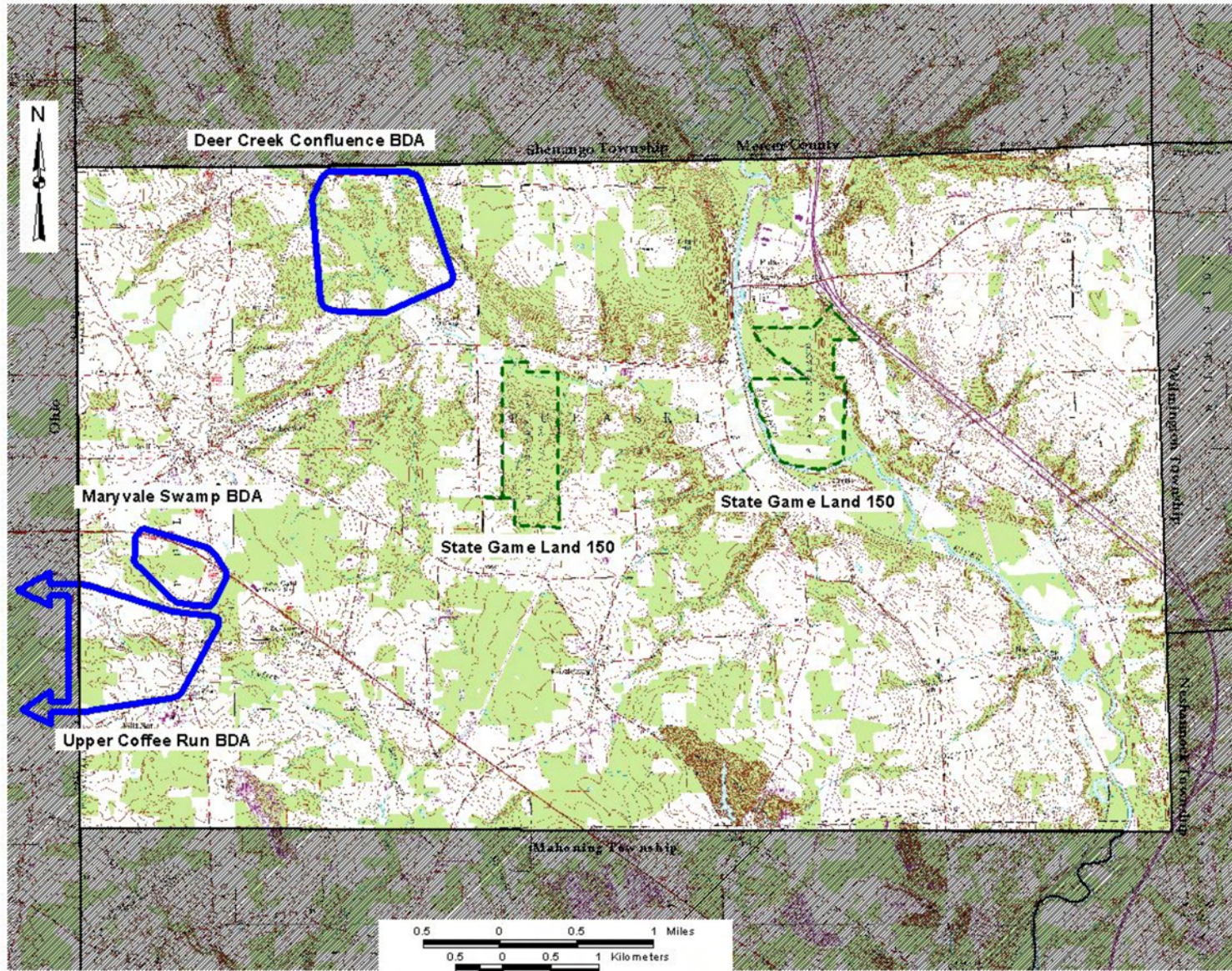
UPPER COFFEE RUN BDA

Notable Significance

Stiff Cowbane (<i>Oxypolis rigidior</i>)	G5	S3S4	N	PT
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MANAGED LANDS: State Game Lands #150

Pulaski Township



Pulaski Township

Lawrence County Natural Heritage Inventory

Biological Diversity Areas:

- Deer Creek Confluence
- Maryvale Swamp
- Upper Coffee Run

Landscape Conservation Areas:

None

Managed Areas:

- State Game Land 150



Map Legend

- Biological Diversity Area (BDA)
- Landscape Conservation Area (LCA)
- Managed Area (MA)
- Municipality Boundary

PULASKI TOWNSHIP

Pulaski Township is located in the northwestern corner of Lawrence County. The Shenango River drains the eastern part of the township while Coffee Run, a tributary to the Mahoning River, drains the southwest. There are three Natural Heritage Areas and one managed land -- **State Game Lands # 150** located in Pulaski Township.

Deer Creek Confluence BDA

Deer Creek Confluence BDA supports a number of natural communities, one of which, a **skunk cabbage-golden saxifrage seep**, is notable for the area due to its size. The skunk-cabbage-golden saxifrage seep is located in the floodplain and along tributaries of Deer Creek. Dominant canopy species include pin oak (*Quercus palustris*), swamp white oak (*Quercus bicolor*), red maple (*Acer rubrum*), slippery elm (*Ulmus rubra*) and shagbark hickory (*Carya ovata*). Understory species include American hornbeam (*Carpinus caroliniana*), green ash (*Fraxinus pennsylvanica*) and black haw viburnum (*Viburnum prunifolium*). In open areas grow shrub swamps composed of alder (*Alnus serrulata*), white meadowsweet (*Spiraea alba*) and black willow (*Salix nigra*). Herbaceous species are many but common ones include skunk cabbage (*Symplocarpus foetidus*), golden saxifrage (*Chrysosplenium americanum*), cinnamon fern (*Osmunda cinnamomea*), crested log fern (*Dryopteris cristata*), marsh marigold (*Caltha palustris*) and sensitive fern (*Onoclea sensibilis*).

The slopes above floodplain are covered by a red oak-mixed hardwood forest dominated by red oak (*Quercus rubra*), white oak (*Quercus alba*), black cherry (*Prunus serotina*), sugar maple (*Acer saccharum*) and red maple (*Acer rubrum*). Understory species include witch-hazel (*Hamamelis virginiana*), flowering dogwood (*Cornus florida*), American hornbeam (*Carpinus caroliniana*) and hop-hornbeam (*Ostrya virginiana*). Herbaceous species include intermediate log fern (*Dryopteris intermedia*), partridge berry (*Mitchella repens*), hay-scented fern (*Dennstedtia punctilobula*), wild geranium (*Geranium maculatum*) and mayapple (*Podophyllum peltatum*). Multiflora rose (*Rosa multiflora*), an exotic invasive species, is also present on the slopes. As well as in downstream sections associated with Rolling Hills Golf Course.

Threats and Stresses

This natural community depends on groundwater discharges on the lower slopes of Deer Creek and its tributaries. Changes in the water table level could affect the wetlands, making them less suitable to the present flora. Of concern are nearby populations of multiflora rose including those within nearby wetlands. Although multiflora rose is not a typical wetland species it is capable of thriving in some wetlands environments. Given the right conditions this plant could take over the entire wetland. Removal of the overstory as well as numerous other development activities could cause changes in the recharge zone to the wetlands and could impact the ecological integrity of the wetland.

Recommendations

Informing the landowner of the significance of the wetland and the presence of the natural community would be a first step in its protection. Monitoring the wetland for general condition, ecological health of the natural community and for possible spread of the invasive species would help in developing a future plan for conservation of this site. Activities that lead to changes in hydrology of the wetland including canopy removal, ditching, draining or upstream development should be carefully evaluated. Impacts of upstream development projects on the hydrology of the natural community should be analyzed and tied together with the land use plans for the area.

Maryvale Swamp BDA

A good and mature example of a **bottomland oak-hardwood palustrine forest** with an interior buttonbush wetland lies within this BDA. Both natural communities are considered wetland communities and saturated soils and seasonally standing water are typical of these areas. The community is minimally invaded by exotic species but multiflora rose (*Rosa multiflora*) is present on the drier uplands nearby to the wetland. Canopy species include pin oak (*Quercus palustris*), red maple (*Acer rubrum*) and slippery elm (*Ulmus rubra*). The understory is composed primarily of black gum (*Nyssa sylvatica*). There is a dense shrub layer of deerberry (*Vaccinium stamineum*), silky dogwood (*Cornus amomum*), white meadowsweet (*Spiraea alba*) and arrow-wood (*Viburnum dentatum*). Black willow (*Salix nigra*) grows in the center of the wetland with a surrounding “ring” of buttonbush (*Cephalanthus occidentalis*). This section is a good example of a buttonbush wetland. Associated herbaceous species include sensitive fern (*Onoclea sensibilis*) and eastern marsh fern (*Thelypteris palustris*).

Threats and Stresses

The swamp community is confined to a small patch of hardwood forest surrounded by land cleared for a variety of uses (Figure 21). The viability of this community is compromised by small buffers and may be vulnerable given the condition of nearby land uses. Species such as purple loosestrife (*Lythrum salicaria*), common reed (*Phragmites australis*) and multiflora rose (*Rosa multiflora*) can thrive in these types of environments.



Figure 21. Maryvale Swamp

Recommendations

This community relies on groundwater discharge. Activities that could alter the hydrology of the wetlands by reducing quantity or quality of water, especially through the addition of nutrients or pollutants should be carefully considered. Direct disturbance such as draining and ditching should be avoided. The impact of salt-fortified runoff and spray from the adjacent roads would need to be evaluated to determine if steps are needed to reduce impacts. Allowing some of the adjacent land to revert to forest would provide a larger buffer which would enhance the viability of the community and help it fend off invasions of exotic species. Exotic invasive species, while not currently an issue within in the wetland, need to be monitored to prevent them from establishing and dominating the wetland.

Upper Coffee Run BDA

Flat topography with low swampy depressions describe the headwaters of Coffee Run. The forest at the headwaters is mature although some disturbance and tree removal has recently occurred, especially in the understory. Common canopy species include red maple (*Acer rubrum*), green ash (*Fraxinus pennsylvanica*), tuliptree (*Liriodendron*

tulipifera) and shagbark hickory (*Carya ovata*). The slopes support abundant beech (*Fagus grandifolia*) and cucumber tree (*Magnolia accuminata*) and the understory holds numerous species including spicebush (*Lindera benzoin*), black gum (*Nyssa sylvatica*), slippery elm (*Ulmus rubra*), and Sassafras (*Sassafras albidum*). Herbaceous species such as spotted jewelweed (*Impatiens capensis*), snakeroot (*Sanicula* spp.), sensitive fern (*Onoclea sensibilis*), halbeard-leaved tearthumb (*Polygonum sagittatum*) and intermediate log fern (*Dryopteris intermedia*) occupy the forest floor. Multiflora rose (*Rosa multiflora*) grows in dense patches throughout the site.

The eastern side of the BDA supports a seepage area containing **stiff cowbane (*Oxypolis rigidior*)** -- a plant species of special concern in PA. Associates include cut-leaf grape fern (*Botrychium dissectum*), dark green bulrush (*Scirpus atrovirens*), yellow fruit sedge (*Carex annectens*), cottongrass bulrush (*Scirpus cyperinus*) and broad-leaved cat-tail (*Typha latifolia*).

Threats and Stresses

The plant species of special concern relies on a constant source of groundwater seepage. The recharge zone contains a variety of land uses ranging from forestland to agriculture to scattered residences. Intense use of herbicides or fertilizer on the agricultural fields may add nutrients to surface and subsurface waters and negatively impact the seepage.

Deer browsing and invasive species intrusion are the main threats for this BDA. A high amount of deer browsing was obvious in the forested areas of the site. The intense browsing threatens the diversity of the community by limiting the reproduction of herbaceous and woody plants and preventing the recruitment of overstory species. Invasive species already pose a threat and given the disturbance already present they stand to become much more of a problem.

Recommendations

Working with the landowner to establish larger and better buffers and control invasive species would be good first step in the protection of the area. The landowner is interested in protecting the site and understands its value. Activities that change the hydrology or add nutrients to the seepage need to be curtailed or carefully considered with respect to their impacts on the seepage. Deer populations need to be kept at a level compatible with the ecological health of the natural communities.

SCOTT TOWNSHIP

<u>PNDI Rank</u>		<u>Legal Status</u>	
Global	State	Fed.	State

NATURAL HERITAGE AREAS:

HARLANSBURG SWAMP BDA

County Significance

PLAIN GROVE WETLANDS BDA

Exceptional Significance

Slender Sedge (<i>Carex lasiocarpa</i>)	G5	S3	PR	PR
Prairie Sedge (<i>Carex prairea</i>)	G5	S2	N	PT
Sterile Sedge (<i>Carex sterilis</i>)	G4	S1	N	PE
Rigid Sedge (<i>Carex tetanica</i>)	G4G5	S2	N	PT
Showy Lady's Slipper (<i>Cypripedium reginae</i>)	G4	S2	PT	PT
Slender Spike Rush (<i>Eleocharis elliptica</i>)	G5	S2	N	PE
Tassel Cotton-Grass (<i>Eriophorum viridicarinum</i>)	G5	S2	N	PT
American-Columbo (<i>Frasera caroliniensis</i>)	G5	S1	N	PE
Virginia Bunchflower (<i>Melanthium virginicum</i>)	G5	SU	N	TU
Grass-of-Parnassas (<i>Parnassia glauca</i>)	G5	S2	N	PE
Drooping Bluegrass (<i>Poa languida</i>)	G3G4	S2	N	PT
Hard-Stem Bulrush (<i>Schoenoplectus acutus</i>)	G5	S2	PE	PE
Shining Ladies' Tresses (<i>Spiranthes lucida</i>)	G5	S3	N	TU
American Globeflower (<i>Trollius laxus</i>)	G3Q	S1	PE	PE
Open sedge (<i>Carex stricta</i> , <i>C. prairea</i> , <i>C. lacustris</i>) fen	G?	S1	N	N

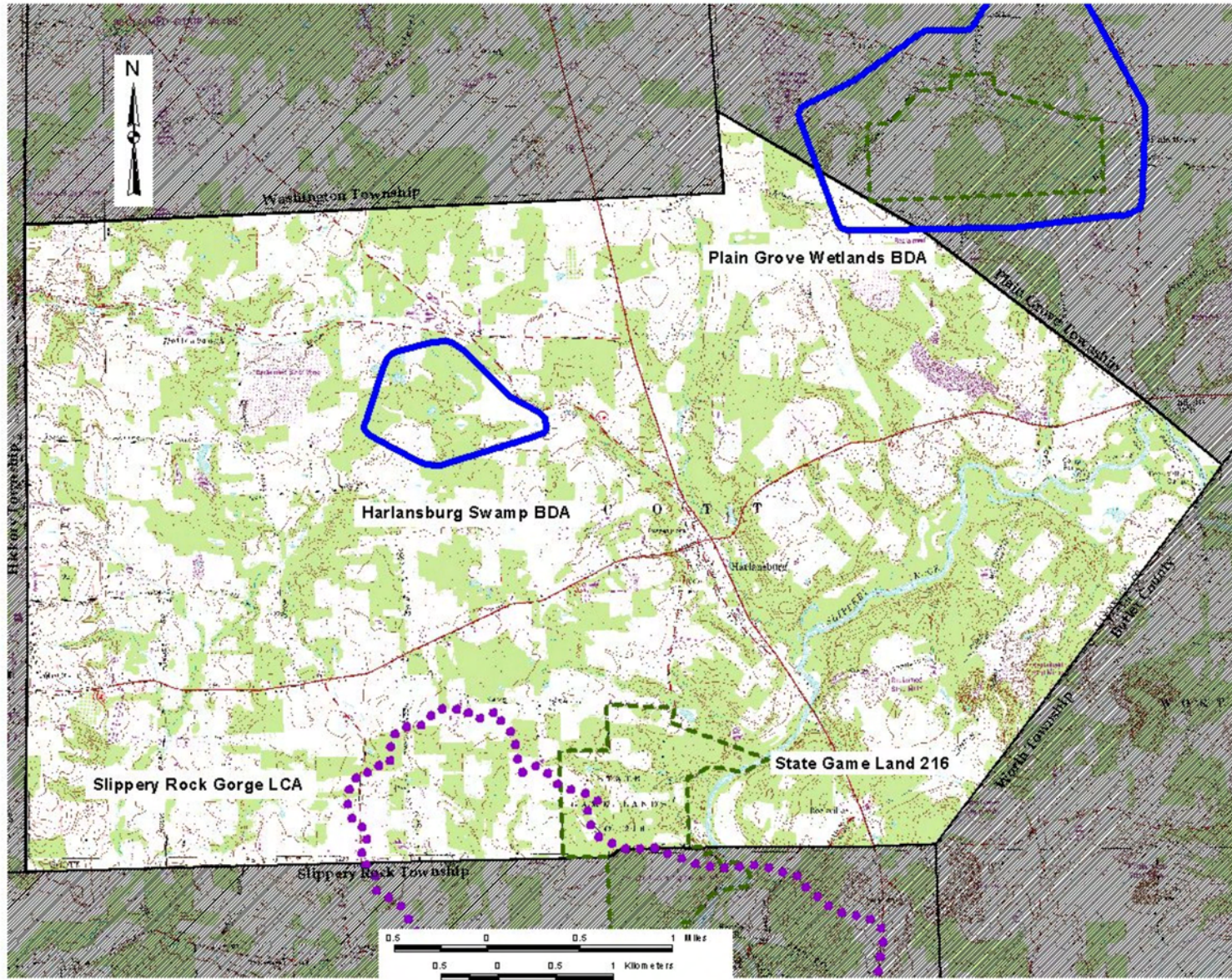
SLIPPERY ROCK GORGE LCA

Exceptional Significance

MANAGED LANDS: State Game Lands #216

Geologic Feature: Harlansburg Cave

Scott Township



Scott Township

Lawrence County Natural Heritage Inventory

Biological Diversity Areas:

Harlansburg Swamp
Plain Grove Wetlands

Landscape Conservation Areas:


Slippery Rock Gorge LCA

Managed Areas:

State Game Land 216



Map Legend

-  Biological Diversity Area (BDA)
-  Landscape Conservation Area (LCA)
-  Managed Area (MA)
-  Municipality Boundary

SCOTT TOWNSHIP

Scott Township is located in the northeast part of Lawrence County. The village of Harlansburg is the main population center in the township. The eastern part of the township is drained by Slippery Rock Creek, while tributaries to Neshannock Creek drain the western part. There are three Natural Heritage Areas and one managed land -- **State Game Lands #150** located in Scott Township.

Brush Run BDA

Brush Run BDA is discussed in Slippery Rock Township.

Harlansburg Swamp BDA

A shrub swamp, which is located at the headwaters of Hottenbaugh Run, serves as the focus of this BDA. Surrounded by a tuliptree-beech-maple forest on the uplands, the swamp contains species common to shrub dominated wetlands including silky dogwood (*Cornus amomum*), white meadowsweet (*Spiraea alba*), buttonbush (*Cephalanthus occidentalis*), speckled alder (*Alnus incana* ssp. *rugosa*) and elderberry (*Sambucus canadensis*). The forested edges provide habitat for swamp white oak (*Quercus bicolor*), pin oak (*Quercus palustris*), red maple (*Acer rubrum*) and winged elm (*Ulmus rubra*). Common herbaceous species include skunk cabbage (*Symplocarpus foetidus*), bee-balm (*Monarda didyma*), climbing nightshade (*Solanum dulcamara*), royal fern (*Osmunda regalis* var. *spectabilis*), wrinkle-leaf goldenrod (*Solidago rugosa*), jack-in-the-pulpit (*Arisaema triphyllum*) and marsh marigold (*Caltha palustris*).

Canopy species of the tuliptree-beech-maple forest include tuliptree (*Liriodendron tulipifera*), white ash (*Fraxinus americana*), slippery elm (*Ulmus rubra*), black cherry (*Prunus serotina*), and red oak (*Quercus rubra*). Understory species include cucumber tree (*Magnolia accuminata*) and flowering dogwood (*Cornus florida*). Shrub species include arrowwood (*Viburnum dentatum*), spicebush (*Lindera benzoin*) and maple-leaf viburnum (*Viburnum acerifolium*). Common herbaceous species include selfheal (*Prunella vulgaris*), violet (*Viola* spp.), common cinquefoil (*Potentilla simplex*), yarrow (*Achillea millefolium*), snakeroot (*Sanicula* spp.), Virginia creeper (*Parthenocissus quinquefolia*), sensitive fern (*Onoclea sensibilis*), and white rattlesnake root (*Prenanthes alba*).

The uplands to the north and west of the site have been mined and timbered. To the south is a large lawn that is part of a residential area. These areas closely abut and supply little buffer to the wetland.

Threats and Stresses

Hydrologic changes due to impoundment, disruption of groundwater or ditching of the wetland could adversely affect the wetland habitat. Loss of woodland buffer due to mining

or canopy removal could adversely impact the viability of the forest community. Land uses in the area include residential, agriculture, logging and gravel mining. This BDA is remarkably free of exotic species that prove particularly detrimental to wetlands but that may change without aggressive monitoring.

Recommendations

Working with the landowner to protect the wetland would be a good first step in the protection of this area. The owner is aware of the significance of the site. Removal of the canopy trees should be avoided and if possible some of the surrounding uplands should be allowed to revert back to woodland to provide a more sufficient buffer. Hydrologic disruptions such as damming, ditching and draining should be avoided. Monitoring the wetland for infestations of exotic invasive species would help to prevent future impacts to the native vegetation of the wetland. An evaluation of the condition of this wetland that is part of any monitoring or future visits to this site should note the presence of new species, particularly purple loosestrife (*Lythrum salicaria*) and common reed (*Phragmites australis*).

Harlansburg Cave

Harlansburg Cave goes through the Van Port limestone and is considered to be the largest cave in Pennsylvania (Fawley and Long 1997). This cave was recognized more prominently when PA 108 was cut through the middle of the cave in 1950. A few bats use the cave in the winter but they are too few to consider this cave as a hibernacula.

Plain Grove Wetlands BDA

Plain Grove BDA is discussed in Plain Grove Township.

Slippery Rock Gorge LCA

Slippery Rock Gorge LCA is discussed in Slippery Rock Township.

SHENANGO TOWNSHIP AND SOUTH NEWCASTLE BOROUGH

<u>PNDI Rank</u>		<u>Legal Status</u>	
Global	State	Fed.	State

NATURAL HERITAGE AREAS:

BEAVER RIVER FLOODPLAIN BDA

Sycamore (river birch) boxelder floodplain forest	G?	S2	N	N
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FRINGED GENTIAN FEN BDA

Exceptional Significance

Broad-Winged Sedge (<i>Carex alata</i>)	G5	S2	N	PT
Slender Sedge (<i>Carex lasiocarpa</i>)	G5	S3	PR	PR
Prairie Sedge (<i>Carex prairea</i>)	G5	S2	N	PT
Sterile Sedge (<i>Carex sterilis</i>)	G4	S1	N	PE
Rigid Sedge (<i>Carex tetanica</i>)	G4G5	S2	N	PT
<i>Slender Spike Rush (Eleocharis elliptica)</i>	G5	S2	N	PE
<i>Beaked Spike Rush (Eleocharis rostellata)</i>	G5	S1	N	PE
<i>Vanilla Sweet-grass (Hierochloa hirta ssp. arctica)</i>	G5	S1	N	PE
<i>Stiff Cowbane (Oxypolis rigidior)</i>	G5	S3S4	N	PT
<i>Grass-of-Parnassas (Parnassia glauca)</i>	G5	S2	N	PE
<i>Swamp Lousewort (Pedicularis lanceolata)</i>	G5	S1S2	N	PE
Special Animal 1				
Open sedge (<i>Carex stricta</i> , <i>C. prairea</i> , <i>C. lacustris</i>) fen	G?	S1	N	N

GARDNER SWAMP BDA

Notable Significance

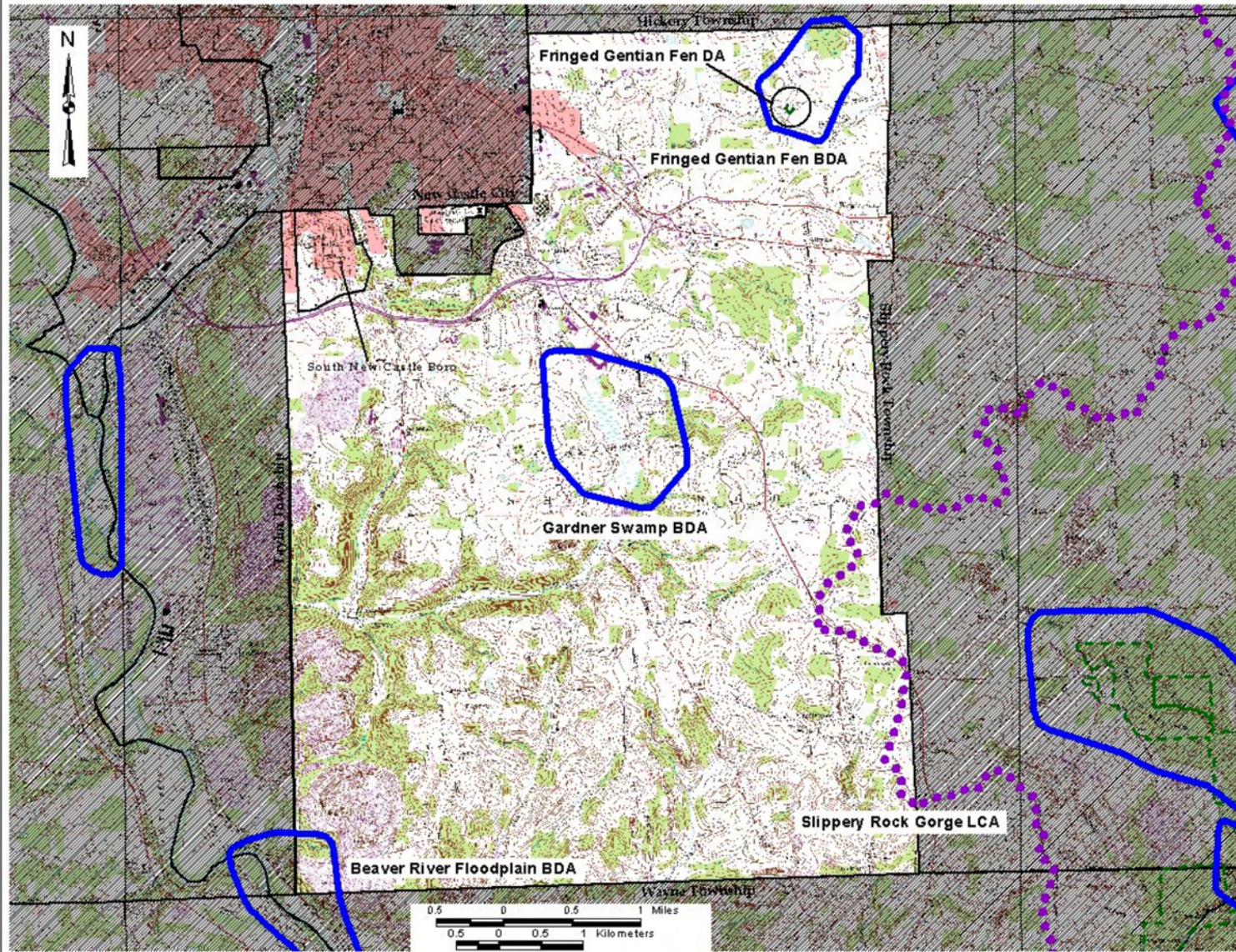
Torrey's Rush (<i>Juncus torreyi</i>)	G5	S2	N	PE
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SLIPPERY ROCK GORGE LCA

Exceptional Significance

MANAGED LANDS: Fringed Gentian Fen DA

Shenango Township and South New Castle Borough



Shenango Township South New Castle Borough

Lawrence County Natural Heritage Inventory

Biological Diversity Areas:

Beaver River Floodplain
Fringed Gentian Fen
Gardner Swamp

Landscape Conservation Areas:

Slippy Rock Gorge

Managed Areas:

Fringed Gentian Fen DA



Map Legend

- Biological Diversity Area (BDA)
- Landscape Conservation Area (LCA)
- Managed Area (MA)
- Municipality Boundary

SHENANGO TOWNSHIP

Shenango Township is located in the central part of Lawrence County just to the east of New Castle, PA. The proximity to New Castle contributes to development and fragmentation of habitats in this township. The eastern part of the township contains the headwaters of tributaries to Slippery Rock Creek while the western part is drained by the Beaver River. There are two Natural Heritage Areas and no managed lands located in Shenango Township.

Beaver River Floodplain BDA

Beaver River Floodplain BDA is discussed in Taylor Township.

Fringed Gentian Fen BDA

Fringed Gentian Fen BDA contains eleven plant species of special concern growing within an **open sedge (*Carex stricta*, *C. prairea*, *C. lacustris*) fen** and also holds a population of an animal species of special concern in PA (**Special Animal 1**). The BDA also includes a shrub swamp.

Fringed Gentian Fen is an alkaline wet meadow occupying the mid-slope portion of a tributary to Big Run. In addition to a host of rare and unique species, tussock sedge (*Carex stricta*), wide-leaved cattail (*Typha latifolia*), knotted rush (*Juncus nodosus*), yellow indian grass (*Sorghastrum nutans*), spiked muhly (*Muhlenbergia glomerata*) and the fen's namesake - fringed gentian (*Gentianopsis crinita*) - grow abundantly in this wetland. Some shrubs and tree saplings such as silky dogwood (*Cornus amomum*), sugar maple (*Acer saccharum*) and green ash (*Fraxinus pennsylvanica*) grow throughout the fen possibly providing shade and competition for some of the species that require high levels of light.

The shrub swamp is about two acres in size and is dominated by arrow-wood (*Viburnum dentatum*), meadowsweet (*Spiraea alba*), black willow (*Salix nigra*), swamp rose (*Rosa palustris*) and poison sumac (*Toxicodendron vernix*). Common herbaceous species in the swamp area are floating manna grass (*Glyceria septentrionalis*), crested log fern (*Dryopteris cristata*), fowl manna grass (*Glyceria striata*), cinnamon fern (*Osmunda cinnamomea*), hemlock water-parsnip (*Sium suave*) and halbeard-leaf tearthumb (*Polygonum arifolium*). A young wooded area surrounds the shrub swamp. Common canopy species include white oak (*Quercus alba*), black cherry (*Prunus serotina*), Sassafras (*Sassafras albidum*), red maple (*Acer rubrum*), shagbark hickory (*Carya ovata*) and black walnut (*Juglans nigra*). Understory species include cucumber tree (*Magnolia accuminata*), black gum (*Nyssa sylvatica*), spicebush (*Lindera benzoin*) and American hornbeam (*Carpinus caroliniana*). Some shrubs are present, including nannyberry (*Viburnum lentago*), arrow-wood (*Viburnum dentatum*) and highbush blueberry (*Vaccinium corymbosum*). Common herbaceous species are skunk cabbage (*Symplocarpus foetidus*), sensitive fern (*Onoclea sensibilis*), deer tongue grass (*Panicum clandestinum*),

big-leaf aster (*Aster macrophyllus*), wingstem (*Verbesina alternifolia*) and intermediate log fern (*Dryopteris intermedia*). Most notable in these young forests is the presence of a large amount of wild coffee (*Triosteum perfoliatum*), a plant not often encountered in Lawrence County.



Figure 22. Fringed Gentian Fen

Threats and Stresses

The Western Pennsylvania Conservancy protects a very small portion of the fen. The fen itself is small and is isolated within the surrounding landscape, which is mostly pasture. Succession of the fen to a more shrub or tree dominated community raises management questions. Hydrologic changes and land use changes could threaten the integrity of the fen habitat. Invasive species have the potential to affect the species composition of the fen if allowed to establish.

The special animal population within the BDA has existed at the site for some years. The relatively quiet and isolated area where the animals breed has remained unchanged. However, these animals are sensitive to disturbance, including casual visitation, that occurs within a few hundred meters from their location. Any activities that occur frequently or continuously with the stream corridor within this BDA stand to impact these animals. Removal of trees, living or dead, could remove valuable habitat essential to these animals.

Recommendations

Maintaining ground water flow and quality are the most critical factors in keeping the natural communities present within the BDA intact. Activities that lead to changes in the hydrology of the wetlands including ditching, draining or upstream development should be carefully evaluated. A better understanding of the land uses and likely land use changes would help to predict better the affects to the fen. Any land use changes that lead to increased nutrient loading should be carefully examined for its potential impact on the fen community. Impacts of development in the recharge zone should be carefully evaluated. Also stewardship of the fen should include monitoring for species composition changes.

Given the presence of the animal species of concern within this BDA, current levels of activity and disturbance are likely compatible with their needs. Assuring that landowners within the corridor are aware of the natural history and needs of the animals would confer added protection.

Fringed Gentian Fen DA

Fringed Gentian Fen is a small dedicated area owned by the Western Pennsylvania Conservancy. The DA includes most of the fen but very little of the wetland's watershed. The Western Pennsylvania Conservancy intends to manage the fen with the site's ecological values in mind, hence the status of a Dedicated Area.

Threats and Stresses

The Western Pennsylvania Conservancy owns a small portion of the Fringed Gentian Fen BDA, but only the immediate fen community. The fen itself is small and depends on ground water seeping through glacial till containing significant amounts of limestone hence creating a high pH environment. The likely recharge zone of the fen is small and occupied by two primary land uses of agriculture and light residential. Changes in the water table and disturbance to the recharge zones could affect the wetlands by altering or contaminating groundwater flows. The lack of a buffer of the fen from other land uses is a serious issue when considering the conservation of the fen. Additionally the fen is undergoing succession from a relatively open condition to one dominated by woody vegetation, particularly shrubs like silky dogwood (*Cornus amomum*) and arrowwood (*Viburnum dentatum*).

Recommendations

Maintaining ground water flow and quality are the most critical factors in keeping the fen community intact. Activities the lead to changes in the recharge zone, such as additional development, need to be carefully evaluated as to their affects on the fen. A model of the watershed needs to be completed in order to better understand the hydrologic conditions related to the fen. Any hydrologic or land use changes that lead to increased nutrients should be carefully examined for impacts on the fen community. Further research to help

in defining the history, successional direction, and overall needs of the wetland community will be important in the long-term conservation of these areas. Maintaining open conditions within all or part of the wetland may require control of woody vegetation through grazing or cutting or some other means. Working with adjacent landowners within the context of a management plan to increase buffers and maintain hydrologic and vegetative conditions will also be important.

Gardner Swamp BDA

This BDA is part of Shenango Township Park. Most of the area is wooded with a small area containing athletic fields. A fitness trail runs through the wooded area in which sassafras (*Sassafras albidum*), black cherry (*Prunus serotina*), red maple (*Acer rubrum*), sugar maple (*Acer saccharum*) and shagbark hickory (*Carya tomentosa*) dominate the canopy. Understory associates include spicebush (*Lindera benzoin*), witch-hazel (*Hamamelis virginiana*), silky dogwood (*Cornus amomum*) and American hornbeam (*Carpinus caroliniana*). Common herbaceous species are false solomon's seal (*Smilacina racemosa*), mayapple (*Podophyllum peltatum*), waterleaf (*Hydrophyllum virginianum*), sensitive fern (*Onoclea sensibilis*) and wingstem (*Verbesina alternifolia*). Also growing in the woodland are multiflora rose (*Rosa multiflora*) and dame's rocket (*Hesperis matronalis*), both of which are invasive species. Near to the wooded area is a beaver impounded wetland that is the location of a Pennsylvania threatened plant; **Torrey's Rush** (*Juncus torreyi*). This plant was seen in 1997, but was not seen during the inventory survey. However, this plant is likely still here and will require visitation during the right time of the growing season to better evaluate its status. Other species in the wetland include black willow (*Salix nigra*), arrow-wood (*Viburnum dentatum*), blue vervain (*Verbena hastata*), swamp rose (*Rosa palustris*), silky dogwood (*Cornus amomum*), buttonbush (*Cephalanthus occidentalis*), tussock sedge (*Carex stricta*), sallow sedge (*Carex lurida*) and porcupine sedge (*Carex hystericina*).

The wetland is isolated by numerous intensive land uses: to the west is a small reclaimed strip mine, to the east is a residential area, to the north is a strip mall and to the south is Gardner Road.

Threats and Stresses

The integrity of this wetland is dependent on groundwater discharge and surface water influx. Beaver have created changes in the wetland and may have created, historically, habitat for numerous species of special concern. Certainly beaver will continue to influence this wetland. How fluctuating water levels may affect this particular species is not known. Additionally invasive species such as multiflora rose (*Rosa multiflora*) and dame's rocket (*Hesperis matronalis*) have the potential to reduce plant diversity in the wetland. Filling and runoff from abandoned reclaimed strip mines and residential development may negatively impact the wetland by adding nutrients to the system.

Recommendations

Beaver have been active in this wetland for a long time. Monitoring of their activity in combination with monitoring of changes in the wetland community, including the plant species of special concern, would provide the most valuable information for developing a management strategy for this BDA. If beaver activity is deemed as detrimental to this relatively isolated wetland, steps to discourage or remove them could be necessary. Invasive species need to be monitored and controlled so that they do not disrupt the ecological integrity of the nearby forest community and the wetland.

Slippery Rock Gorge LCA

Slippery Rock Gorge LCA is discussed in Slippery Rock Township.

SOUTH NEW CASTLE BOROUGH

South New Castle Borough is in the central part of Lawrence County and as the name indicates is to the south of New Castle, PA. South New Castle Borough is drained by Big Run which is a tributary to the Shenango River. The borough is mostly a suburb of New Castle, PA. There are no Natural Heritage Areas or managed lands in South New Castle Borough.

SLIPPERY ROCK TOWNSHIP

<u>PNDI Rank</u>		<u>Legal Status</u>	
Global	State	Fed.	State

NATURAL HERITAGE AREAS:

BRUSH RUN BDA

High Significance

Downy Willow-herb (<i>Epilobium strictum</i>)	G5	S2S3	N	PE
Water Smartweed (<i>Polygonum amphibian</i> var. <i>stipulaceum</i>)	G5	S2	N	TU
Meadow Willow (<i>Salix subsericea</i>)	G5	S1	TU	PE
Bog Bluegrass (<i>Poa paludigena</i>)	G3	S3	PT	PR

GRINDSTONE CONFLUENCE BDA

County Significance

River birch-sycamore floodplain scrub	G?	S3	N	N
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HELL RUN BDA

Exceptional Significance

Rich hemlock-mesic hardwood forest	G?	S2S3	N	N
Hell Run	G?	S3	PA	EV

MUDDY CREEK FALLS BDA

County Significance

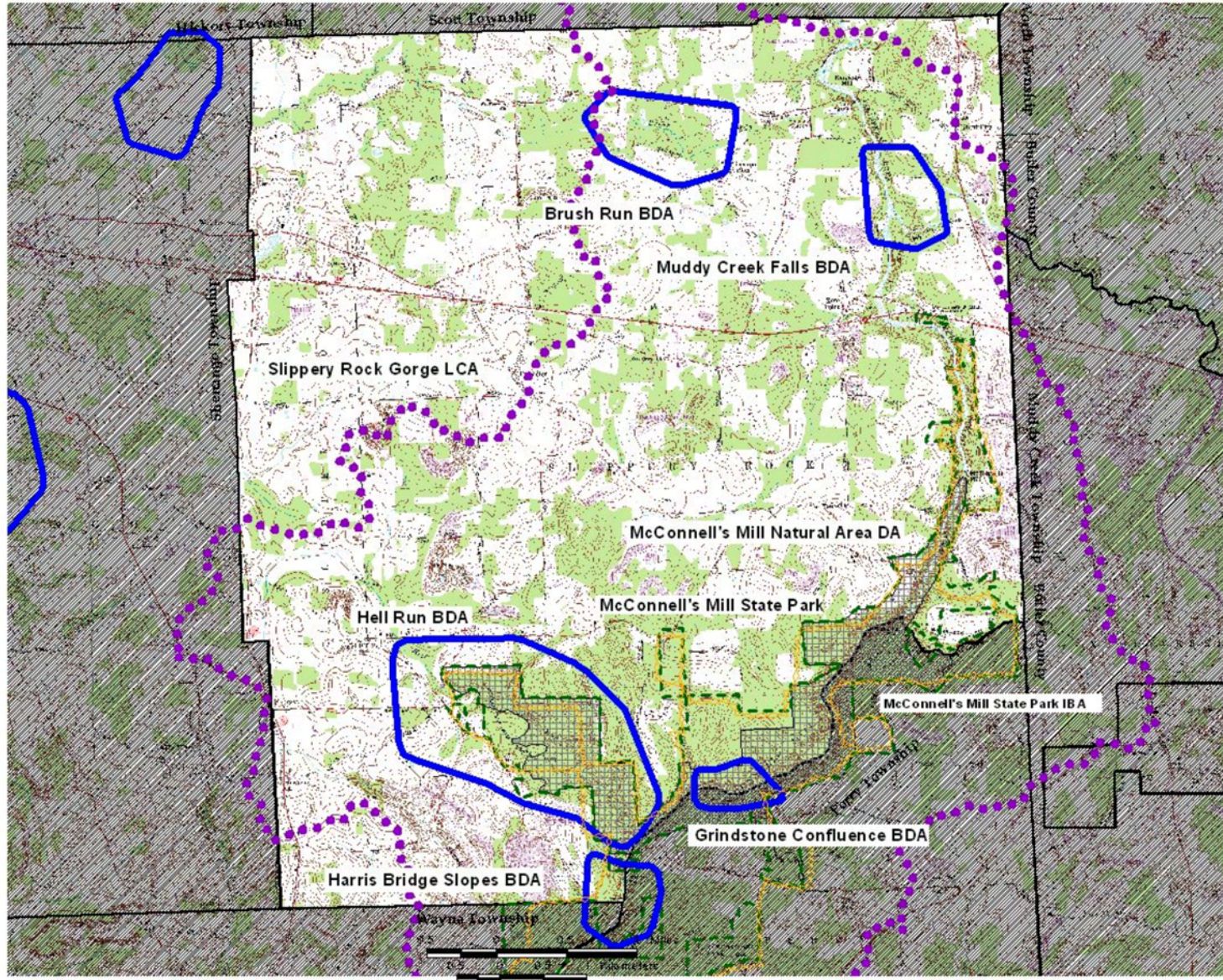
Hemlock (white pine) red oak mixed-hardwood forest	G?	S4	N	N
Skunk cabbage-golden saxifrage seep	G?	S4S5	N	N

SLIPPERY ROCK GORGE LCA

Exceptional Significance

MANAGED LANDS: McConnell's Mill State Park
 McConnell's Mill Natural Area DA
 State Game Lands #216

Slippery Rock Township



Slippery Rock Township

Lawrence County Natural Heritage Inventory

Biological Diversity Areas:

- Brush Run
- Grindstone Confluence
- Harris Bridge Slopes
- Hell Run
- Muddy Creek Falls

Landscape Conservation Areas:




- Slippery Rock Gorge

Managed Areas:

- McConnell's Mill State Park
- McConnell's Mill Natural Area DA
- State Game Lands 216



Map Legend

-  Biological Diversity Area (BDA)
-  Landscape Conservation Area (LCA)
-  Managed Area (MA)
-  Audubon Society Important Bird Area (IBA)
-  Municipality Boundary

SLIPPERY ROCK TOWNSHIP

Slippery Rock Township is located in east central Lawrence County. Slippery Rock Creek as it flows through the Slippery Rock Gorge is the most notable natural feature in the township. There are four Natural Heritage Areas and one managed land -- **McConnell's Mill State Park** in Slippery Rock Township.

Brush Run BDA

Brush Run BDA contains a headwater wetland that lies roughly at the divide between Big Run and Brush Run. Most of the drainage forms the origin of Brush Run. The wetland has been impounded by beaver on the Brush Run side and has become more inundated since the last visit to the wetland in 1996. Four Pennsylvania plant species of concern are found in the wetland including **downy willowherb (*Epilobium strictum*)**, **water smartweed (*Polygonum amphibian* var. *stipulaceum*)**, **meadow willow (*Salix subsericea*)** and **blue bog grass (*Poa paludigena*)**. Most of these species are found growing along seepages at the edge of the wetlands and on islands within the beaver impoundment. The western and northern edges of the wetland support a shrub swamp composed of silky dogwood (*Cornus amomum*), white meadowsweet (*Spiraea alba*), highbush blueberry (*Vaccinium corymbosum*), arrowwood (*Viburnum dentatum*) and black willow (*Salix nigra*). Herbaceous species include arrow-leaved tearthumb (*Polygonum sagittatum*), needlerush (*Juncus effusus*), pointed brome sedge (*Carex scoparia*), sensitive fern (*Onoclea sensibilis*) and tussock sedge (*Carex stricta*).

A mixed hardwood forest surrounds the beaver impoundment and is dominated by red maple (*Acer rubrum*), black cherry (*Prunus serotina*), pin oak (*Quercus palustris*), white oak (*Quercus alba*) and green ash (*Fraxinus pennsylvanica*). Understory species include American hornbeam (*Carpinus caroliniana*), hawthorn (*Crataegus* spp.), witch-hazel (*Hamamelis virginiana*) and cucumber tree (*Magnolia accuminata*). Common herbaceous species are bearded shorthusk (*Brachyelytrum erectum*), mayapple (*Podophyllum peltatum*), sessile bellwort (*Uvularia sessilifolia*), silvery glade fern (*Athyrium thelypteroides*) and wild geranium (*Geranium maculatum*). A few exotic invasive species are present around the uplands including multiflora rose (*Rosa multiflora*), tartarian honeysuckle (*Lonicera tartarica*), tree-of-heaven (*Ailanthus altissima*) and garlic mustard (*Alliaria petiolata*).

Threats and Stresses

The wetland at the headwaters of Brush Run relies on groundwater inputs. At the time of the survey, part of the uplands around the wetland was being actively timbered, resulting in a scattered canopy. Higher light levels and ground disturbance could leave the area susceptible to further invasions by exotic species and may change the microclimate within the wetland. Additionally loss of vegetation may lead to further runoff into the wetland adding nutrients and raising the water level. Beaver activity may also cause additional inundation.



Figure 23. Brush Run Swamp

Recommendations

Informing the landowner of the significance of the wetland could be a good first step in the protection of the species at this site. Beaver activity needs to be monitored to prevent further flooding and impoundment. Increases of the water level could negatively impact some of the rare plant species in the wetland. Activities that change the hydrology of the wetland such as ditching, draining or channelization should be avoided in order to preserve the habitat of the species of special concern. Invasive species need to be monitored at the site and the results of increased light and potential runoff need to be considered. Any infestations should be controlled.

Grindstone Confluence BDA

Grindstone Confluence BDA is discussed in Perry Township.

Harris Bridge Slopes BDA

Harris Bridge Slopes BDA is discussed in Perry Township.

Hell Run BDA

Hell Run BDA is located in the McConnell's Mill State Park Natural Area and is part of the Slippery Rock Gorge LCA collection of BDAs. Hell Run is the only stream in Lawrence County classified as an exceptional value (EV) stream.



Figure 24. Hell Run Falls

The forests of Hell Run are the most mature of those found in the gorge and some are considered to be virgin stands. The communities in Hell Run are embedded in a matrix of rich hemlock-mesic hardwood forest. At the lower sections of Hell Run, a sugar maple-basswood forest occupies the middle elevations and a red oak-mixed hardwood forest occupies the gorge rim.

The rich hemlock-mesic hardwood forest is dominated by hemlock (*Tsuga canadensis*), basswood (*Tilia americana*) and black cherry (*Prunus serotina*) in the overstory. Understory associates include witch-hazel (*Hamamelis virginiana*), spicebush (*Lindera benzoin*) and mountain maple (*Acer spicatum*). Common herbaceous species are marginal log fern (*Dryopteris marginalis*), large-flowered trillium (*Trillium grandiflorum*), doll eyes (*Actaea pachypoda*) and miterwort (*Mitella diphylla*).

A sugar maple-basswood forest occupies the middle elevations of the Hell Run Gorge. Canopy associates include sugar maple (*Acer saccharum*), red oak (*Quercus rubra*), basswood (*Tilia americana*), pignut hickory (*Carya glabra*) and black cherry (*Prunus serotina*). The understory is composed of spicebush (*Lindera benzoin*), mountain maple (*Acer spicatum*) and winterberry (*Ilex verticillata*). Herbaceous species include wood nettle (*Laportea canadensis*), phlox (*Phlox divaricata*), false solomon's seal (*Smilacina racemosa*) and false hellebore (*Veratrum viride*).

Red oak-mixed hardwood forest is found along the top of the gorge and is dominated by red oak (*Quercus rubra*), American beech (*Fagus grandifolia*), sugar maple (*Acer saccharum*), tuliptree (*Liriodendron tulipifera*) and red maple (*Acer rubrum*) and a few white oak (*Quercus alba*). The diverse understory layer is composed of sassafras (*Sassafras albidum*), shagbark hickory (*Carya ovata*), black gum (*Nyssa sylvatica*), cucumber tree (*Magnolia accuminata*) and maple-leaf viburnum (*Viburnum acerifolium*) growing above a sparse herbaceous layer containing woodland goldenrod (*Solidago caesia*), white rattlesnake root (*Prenanthes alba*), squawroot (*Conophilus americana*), beechdrops (*Epifagus virginiana*), black cohosh (*Cimicifuga racemosa*) and blue cohosh (*Caulophyllum thalictroides*).

Threats and Stresses

Being a part of a state park natural area, the natural communities here are protected from direct disturbance due to development. However, changes in surrounding land use could ultimately impact these natural communities. The stream is impacted in the upper sections by abandoned mine drainage (AMD) but currently this impact is minimal compared to other impacts within the overall system. As more development occurs in the upper watershed problems with aging septic systems will increase. Deer browsing poses an additional threat. Exotic invasive plant species are also a threat. Species such as Japanese knotweed (*Polygonum cuspidatum*) and multiflora rose (*Rosa multiflora*) are present in the Slippery Rock Gorge but only multiflora rose occurs in the Hell Run Gorge.

Recommendations

Development in the watershed should be planned with the impacts to Hell Run considered. If possible, septic systems should be updated or replaced with municipal sewage systems to lessen the impact of nitrification. Since Hell Run is an exceptional value stream, special guidelines are in place regarding development and should be adhered to in order to maintain exceptional water quality.

Monitoring the coverage and spread of invasive species in the Hell Run Gorge is needed to ensure the viability of the natural communities. Monitoring would also provide a baseline for future management efforts. Future studies of the plant communities along with present and past research will help understand the dynamics of the community over the long term.

Deer browsing within the forest should be monitored and management of the deer population should be such that the deer do not endanger the ecological health of the natural communities in the gorge.

McConnell's Mill Natural Area DA

McConnell's Mill Natural Area DA covers 930 acres of McConnell's Mill State Park. This area is area conserved through the State Parks Natural Area Program which sets aside location for scientific observation of natural systems, protects examples of typical and

unique plant and animal communities and protects outstanding examples of natural interest. Human activity in these areas is limited

Threats and Stresses

In general, the largest issues that face this natural area involve the compatibility of surrounding land uses with objectives of the natural area. The threats and stresses of McConnell's Mill Natural Area DA are intimately connected with the overall landscape. Because of this the threats for the natural area are discussed in the Slippery Rock Gorge LCA.

Recommendations

Working to increase compatibility with surrounding land uses with management for the natural area is an important overall objective. Utilizing various tools agreements and development scenarios that would allow the broad areas of contiguous forest that are in the gorge and natural area to expand beyond the confines of the natural area. Other recommendations for the landscape can be found in the Slippery Rock Gorge LCA.

Muddy Creek Falls BDA

Muddy Creek Falls BDA is the northernmost BDA in Slippery Rock LCA and the site of a waterfall on Muddy Creek. Muddy Creek enters Slippery Rock Creek at the upper end of the Slippery Rock Creek Gorge and is impounded at Lake Arthur. Historically, Muddy Creek was the outlet for an ancient glacial lake of the same name. The woods around Muddy Creek and the upper part of the gorge follow the same patterns as those seen farther downstream, with the east slopes being moister and the west slopes being drier.

Most of the area is covered by a **hemlock (white pine) - red oak - mixed hardwood forest**. The more sheltered areas harbor more hemlock (*Tsuga canadensis*). The high elevation parts of the gorge are covered by red oak - mixed hardwood forest and the lower elevations hold more hemlock (*Tsuga canadensis*). The mixed hardwood canopies include red oak (*Quercus rubra*), red maple (*Acer rubrum*), American beech (*Fagus grandifolia*) and sugar maple (*Acer saccharum*). The forests near the stream are dominated by black cherry (*Prunus serotina*), hemlock (*Tsuga canadensis*), white oak (*Quercus alba*) and red oak (*Quercus rubra*). Understory associates are similar for both areas with sassafras (*Sassafras albidum*), witch-hazel (*Hamamelis virginiana*), cucumber tree (*Magnolia acuminata*) and American hornbeam (*Carpinus caroliniana*). Some shrubs are present including maple-leaf viburnum (*Viburnum acerifolium*) and gooseberry (*Ribes* spp.). Common herbaceous species are spring beauty (*Claytonia virginica*), beech fern (*Phegopteris hexagonoptera*), stonecrop (*Sedum ternatum*), wild ginger (*Asarum canadense*) and foamflower (*Tiarella cordifolia*). An old meander scar of Muddy Creek contains a **skunk cabbage-golden saxifrage seep** including skunk cabbage (*Symplocarpus foetidus*), sensitive fern (*Onoclea sensibilis*), black haw viburnum (*Viburnum prunifolium*), wild geranium (*Geranium maculatum*) and dwarf ginseng (*Panax trifolia*).



Figure 25. Muddy Creek Falls

Threats and Stresses

Loss of canopy, direct disturbances to the soil or other changes in microhabitat could adversely affect the plant communities. Changes in hydrology of the stream or activities that lower the water table would be detrimental to the wetland community.

Recommendations

Activities that alter the hydrology by affecting groundwater flows and recharge zones in the aquifer should be avoided. Water releases at the Lake Arthur dam should be kept at a level compatible with survival of these communities. Opening the canopy in this area could make the habitat vulnerable to invasive species. While very few invasive species were in the area when surveyed, this area should be monitored.

Slippery Rock Gorge LCA

Slippery Rock Gorge LCA includes Slippery Rock Creek where it descends through a gorge to meet with Connoquenessing Creek at the village of Wurttemberg. The gorge was created during the last ice age when the waters of glacial Lake Arthur burst through an ice dam and drained through the channel of Slippery Rock Creek. Recent research has indicated that there was no dam burst but rather a slow flood similar to typical rainfall floods seen today (D'Urso 2000). The LCA encompasses the area from the Kennedy Mill Bridge to the confluence of Slippery Rock Creek and Connoquenessing Creek.



Figure 26. Slippery Rock Creek Gorge as seen from Cleland Rock

The LCA contains four BDA's, two of which are part of the McConnell's Mill State Park Natural Area and two that are outside of the natural area. The BDA's in the natural area are Grindstone Confluence BDA and Hell Run BDA. Muddy Creek Falls BDA is located in the farthest upstream part of the LCA and Harris Bridge Slopes BDA is farthest downstream.

Ten natural community types occur within the LCA, eight of which are found in the natural area. Outside of the natural area are the hemlock (white pine) - red oak - mixed hardwood forest and a skunk cabbage - golden saxifrage forest seep. Inside the natural area are tuliptree - beech - maple forest, hemlock - tuliptree - birch forest, sugar maple - basswood forest, rich hemlock - mesic hardwood forest, red maple - elm - willow floodplain swamp, river birch - sycamore floodplain scrub, red oak - mixed hardwood forest and a red maple terrestrial forest.

The community locations depend upon slope exposure and the presence of wetland seeps supplied by groundwater and topographic position. Forests with high amounts of hemlock occur in the deepest stream valleys such as Hell Run and Grindstone Run and there is a tendency for a higher amounts of hemlock on the east side of the gorge where conditions are cool and moist.

McConnell's Mill State Park covers most of the middle section of the gorge. Comprising 2,759 acres, the park was designated in 1974 as a National Natural Landmark by the National Park Service, based on the geological features present (Resource Management Plan 1998). More recently, during 2001, the park was approved by Pennsylvania's Ornithological Technical Committee as one of only seventy-eight Important Bird Areas (IBA) in the Commonwealth because of its high quality of bird life.

Threats and Stresses

Except for the immediate streamside of Slippery Rock Creek and the edges of the park, the interior is largely free of recent disturbance. Scattered places along the edge of the park are disturbed by strip-mines, logging and previous agriculture and these disturbances reach into the natural area and represent areas where minimal buffer creates points for invasive exotic species that may then spread into the park.

Japanese knotweed (*Polygonum cuspidatum*) and multiflora rose (*Rosa multiflora*) are invading the streamside of the Slippery Rock Creek. Japanese knotweed represents a considerable threat to the streamside areas of the park and could compromise one natural community (river birch - sycamore floodplain scrub) in the park. Some of the uncommon species that occur only along the streamside could also be quickly outcompeted. Additionally, shallow rooted vegetation like Japanese knotweed could lead to bank instability and subsequent loss of soil. Other exotic invasive species seen in the area include dame's rocket (*Hesperis matronalis*), pale-yellow iris (*Iris pseudacorus*) and garlic mustard (*Alliaria petiolata*).

A high deer population is also detrimental to the natural communities in the LCA. Excessive deer browsing will reduce understory diversity and inhibit the regeneration of the overstory species.

Mining has occurred mostly along the eastern edge of the park. Even though the mines have been reclaimed, and the subsequent erosion stemmed, continued attention to these areas is warranted given that invasive species tend to colonize these areas. A proposed limestone mine in the northwestern section of the park, slated to come within 1,000 feet of the park, threatens not only to increase the amount of strip-mine area around the gorge but also may also produce noise within the gorge. If approved, mining disturbances could have a detrimental effect on the natural communities in the gorge, especially bird and other animal populations.

McConnell 's Mill State Park and Slippery Rock Gorge form an unfragmented forest corridor reaching from the Beaver River to the headwaters of the Slippery Rock and Wolf Creeks. Logging has also occurred along the eastern edge of the park. The areas regenerating from logging create prime areas for invasive species to take hold. An old apple orchard is located on a high plateau at the south side of Hell Run. This area is the location of several invasive species which could potentially threaten the ecological value of the Hell Run Gorge. Recreational activities and associated use in the gorge including hiking, rock climbing and whitewater boating produce additional although likely manageable stresses to the ecosystems in the gorge.

Recommendations

Slippery Rock Creek Gorge and its natural communities are unique to the county, region, state and nation. The contiguousness of the habitats in the otherwise fragmented landscape of the county are exceptional. Careful planning within this LCA would benefit both the

ecological resources and the people living and recreating on the land. Recognizing the gorge and the land surrounding it as prime ecological and recreational resources is an essential step in appropriate planning of activities around the park. A discussion among the Pennsylvania Bureau of Forestry, private landowners and involved municipalities would be beneficial in continuing comprehensive planning for the LCA.

A strategic plan (Rettew Associates 1995) for the protection of Slippery Rock Creek gorge recommends that no mining permits be issued within ½ mile of Slippery Rock Creek. Slippery Rock Creek has been and currently is impacted by AMD, but treatment of effluent in the upstream reaches has resulted in recovery of the aquatic habitats. Further impacts from additional mining could bring harm yet again to the creek and reverse the previous gains. The plan also recommends that rock climbing be allowed where it is currently practiced and that no new climbing areas be opened. Hiking trails should be graded and hikers should be encouraged to stay on the trails to minimize the impacts of erosion and vegetation trampling. Access for whitewater boaters should be clearly marked and boaters should be encouraged to minimize impact to the streamside.

TAYLOR TOWNSHIP

<u>PNDI Rank</u>		<u>Legal Status</u>	
Global	State	Fed.	State

NATURAL HERITAGE AREAS:

BEAVER RIVER FLOODPLAIN BDA

Notable Significance

Sycamore (river birch) boxelder floodplain forest	G?	S2	N	N
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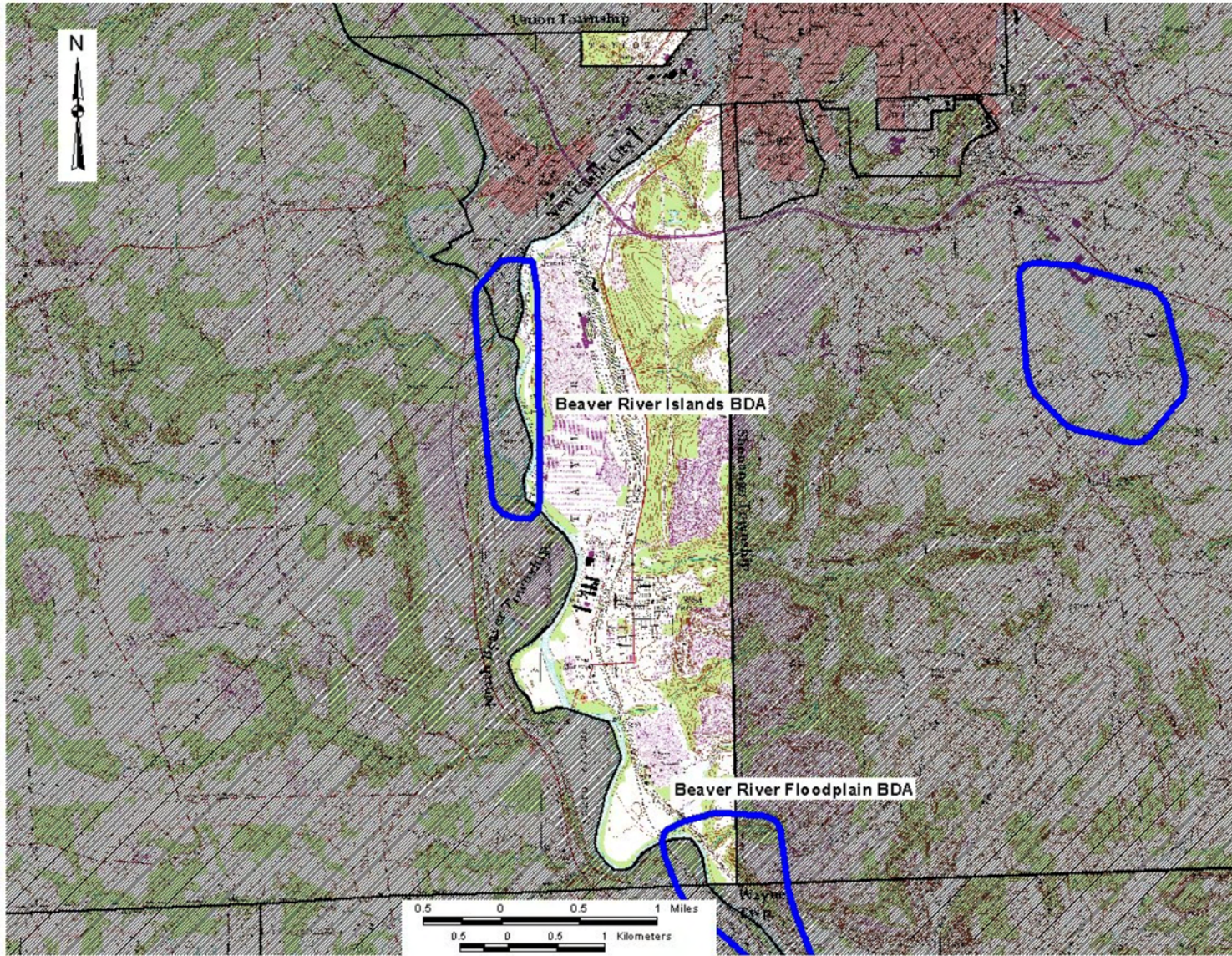
BEAVER RIVER ISLANDS BDA

Notable Significance

Sycamore (river birch) boxelder floodplain forest	G?	S3	N	N
---	----	----	---	---

MANAGED LANDS: None

Taylor Township



Taylor Township

Lawrence County Natural Heritage Inventory

Biological Diversity Areas:

Beaver River Floodplain
Beaver River Islands

Landscape Conservation Areas:

None

Managed Areas:

None



Map Legend

-  Biological Diversity Area (BDA)
-  Landscape Conservation Area (LCA)
-  Managed Area (MA)
-  Municipality Boundary

TAYLOR TOWNSHIP

Taylor Township is located in the central part of Lawrence County to the southeast of New Castle, PA. The Shenango River marks the northern boundary of the township while the Beaver River marks the western boundary. The village of West Pittsburg is the main population center in the township. There is one Natural Heritage Area and no managed lands located in Taylor Township.

Beaver River Floodplain BDA

This site marks a large location of floodplain forest along the Beaver River between Moravia and Wampum, PA. The northern sections are disturbed by past cutting and are regenerating. To the south is an area of mature **sycamore (river birch) - box-elder floodplain forest**. The species here are typical of this forest in western Pennsylvania with sycamore (*Platanus occidentalis*), box-elder (*Acer negundo*), red maple (*Acer rubrum*) and silver maple (*Acer saccharinum*). Understory species include bladdernut (*Staphylea trifoliata*) and spicebush (*Lindera benzoin*). A dense growth of green-head coneflower (*Rudbeckia laciniata*) grows on a natural levee paralleling the river. Behind the levee the floodplain flattens out and has a thick herbaceous layer with wild ginger (*Asarum canadense*), Virginia bluebell (*Mertensia virginica*), large-flowered trillium (*Trillium grandiflorum*) and jewelweed (*Impatiens* spp.).

Threats and Stresses

The floodplain habitats rely on occasional flooding from the Beaver River. The Beaver River is free flowing at this site but is controlled by dams on both the Shenango and Mahoning Rivers.

Many exotic invasive species have come to dominate the floodplain including multiflora rose (*Rosa multiflora*), garlic mustard (*Alliaria petiolata*) and dame's rocket (*Hesperis matronalis*). These species are poised to gain a greater foothold, especially with continued disturbance due to the natural flooding cycles. Further opening of the canopy would almost certainly make the situation worse. An overabundance of deer is leading to significant loss in forest regeneration.

Recommendations

Maintaining natural flooding cycles, allowing the floodplain community to mature without additional timbering and controlling invasive exotic species will be key in conserving this floodplain forest.

Deer herds in the area should be kept at a level that is compatible with the health of the deer and the ecological health of the floodplain community. Activities upstream that change the flooding regime of the river, earth-moving activities and canopy removal should be avoided.

Beaver River Islands BDA

Beaver River Islands BDA is discussed in North Beaver Township.

UNION TOWNSHIP

<u>PNDI Rank</u>		<u>Legal Status</u>	
Global	State	Fed.	State

NATURAL HERITAGE AREAS:

EDINBURG SWAMP BDA

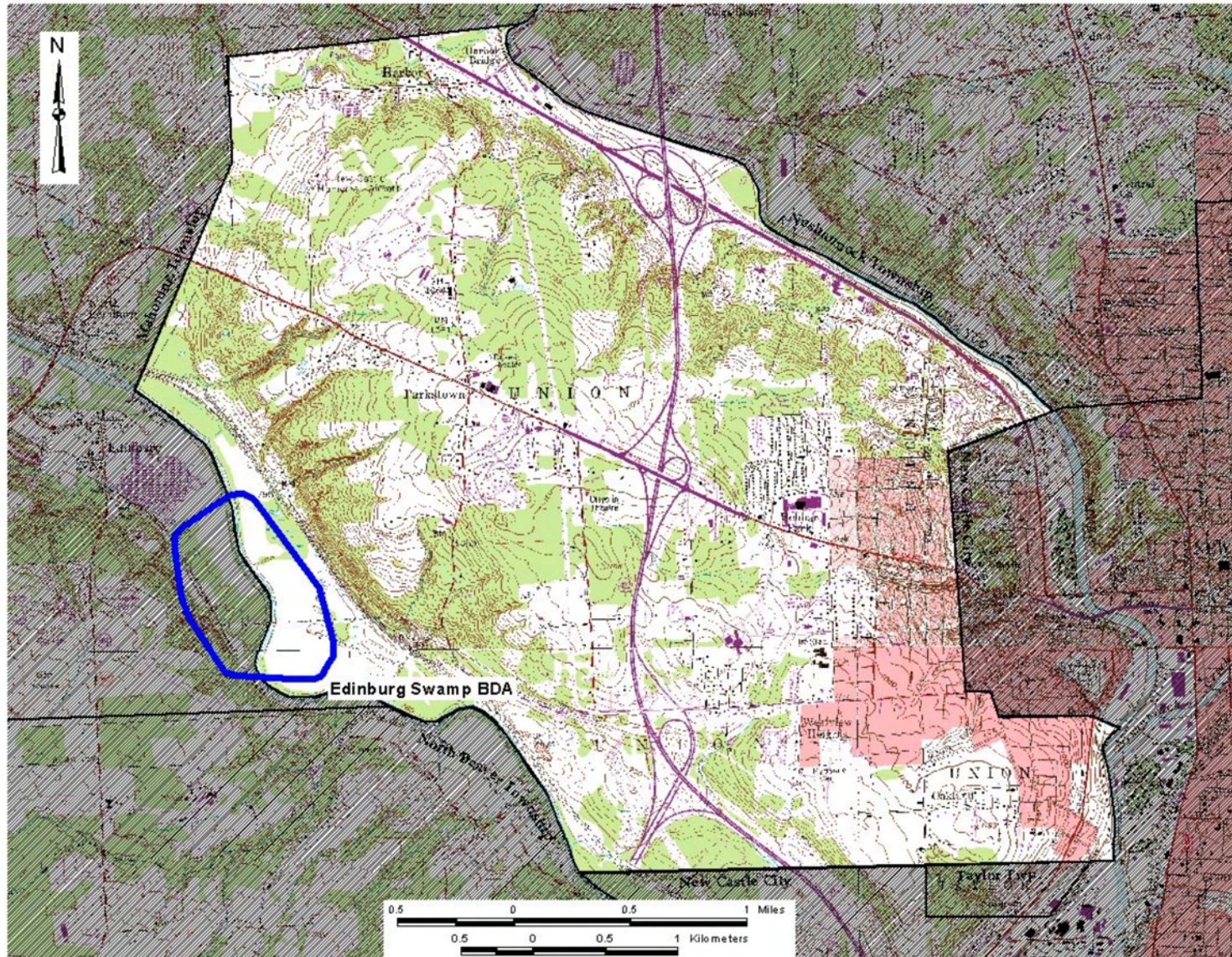
County Significance

Water willow (*Decodon verticillatus*)
shrub wetland

G?	S2	N	N
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MANAGED LANDS: None

Union Township



Union Township

Lawrence County Natural Heritage Inventory

Biological Diversity Areas:

Edinburg Swamp

Landscape Conservation Areas:




None

Managed Areas:

None



Map Legend

-  Biological Diversity Area (BDA)
-  Landscape Conservation Area (LCA)
-  Managed Area (MA)
-  Municipality Boundary

UNION TOWNSHIP

Union Township is located in the central part of Lawrence County bordering the western boundary of New Castle, PA. The township is mostly a suburb of New Castle, PA and is the location of the airport. The Shenango River marks to the northern boundary of the township while the Mahoning River is the southern boundary. There are no Natural Heritage Areas and no managed lands located in Union Township.

Edinburg Swamp BDA

Edinburg Swamp BDA is discussed in Mahoning Township.

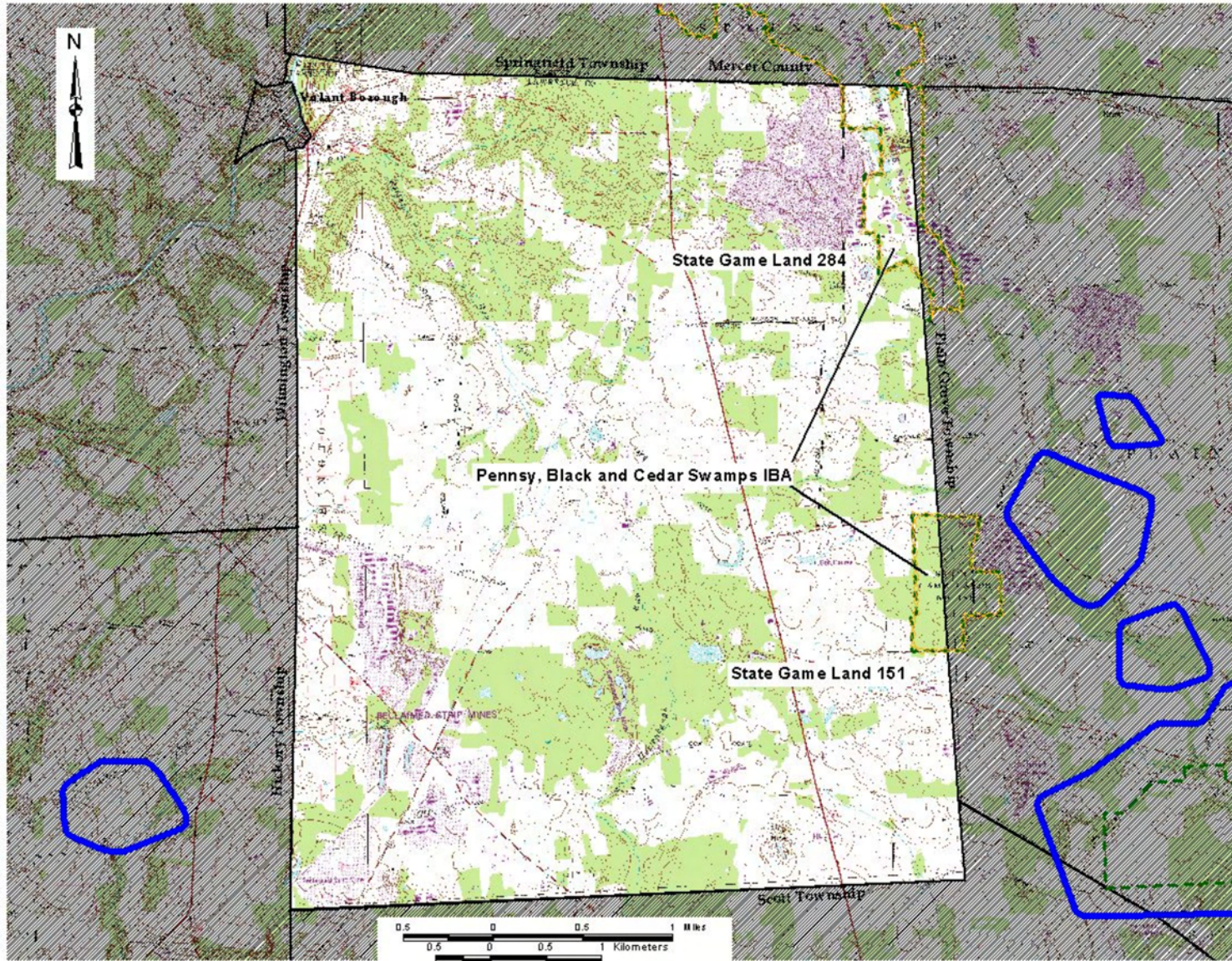
WASHINGTON TOWNSHIP

<u>PNDI Rank</u>		<u>Legal Status</u>	
Global	State	Fed.	State

NATURAL HERITAGE AREAS: None

MANAGED LANDS: State Game Lands #284
State Game Lands #151

Washington Township



Washington Township

Lawrence County Natural Heritage Inventory

Biological Diversity Areas:

None

Landscape Conservation Areas:

None






Managed Areas:

State Game Land 151

State Game Land 284



Map Legend

-  Biological Diversity Area (BDA)
-  Landscape Conservation Area (LCA)
-  Managed Area (MA)
-  Audubon Society Important Bird Area (IBA)
-  Municipality Boundary

WASHINGTON TOWNSHIP

Washington Township is located in the northeastern part of Lawrence County. There are no population centers located in the township. Tributaries to Slippery Rock Creek drain the eastern part of the township while the rest is drained by Neshannock Creek. There are no Natural Heritage Areas and two managed lands -- **State Game Lands #284** and **State Game Lands #151** located in Washington Township.

WAYNE TOWNSHIP, ELLWOOD CITY BOROUGH AND ELLPORT BOROUGH

<u>PNDI Rank</u>		<u>Legal Status</u>	
Global	State	Fed.	State

NATURAL HERITAGE AREAS:

BEAVER RIVER FLOODPLAIN BDA

Notable Significance

Sycamore (river birch) boxelder floodplain forest

G?	S2	N	N
----	----	---	---

CS AND M MINE BDA

Exceptional Significance

Special Animal 1

G2	SUB, S1N	LE	PE
----	----------	----	----

Special Animal 2

G4	S3B, S3N		CR
----	----------	--	----

Bat Hibernacula

ROCK POINT BDA

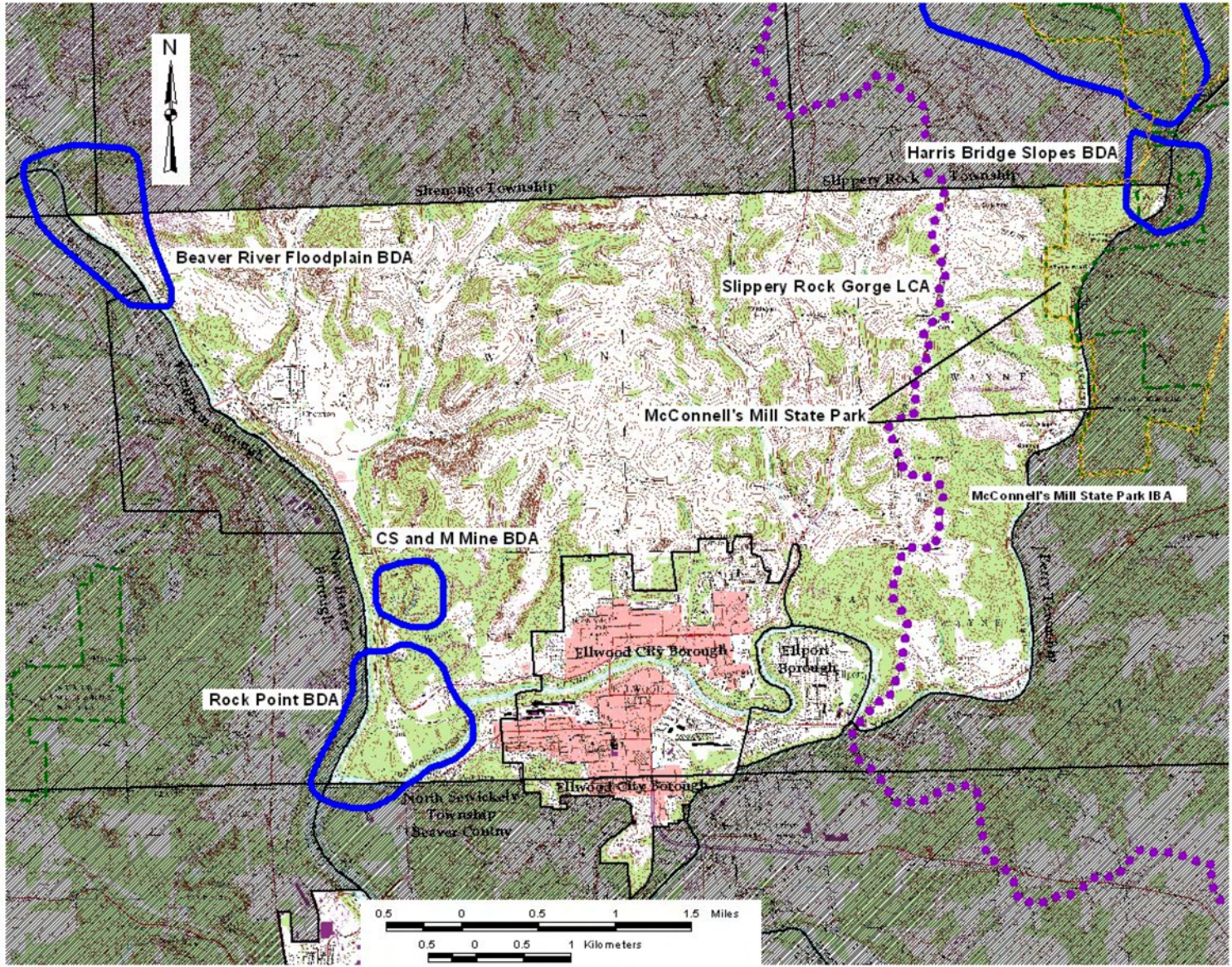
Notable Significance

SLIPPERY ROCK GORGE LCA

Exceptional Significance

MANAGED LANDS: McConnell's Mill State Park

Wayne Township, Ellwood City Borough and Ellport Borough



Wayne Township
Ellwood City Borough
Ellport Borough

Lawrence County Natural Heritage Inventory

Biological Diversity Areas:

- Beaver River Floodplain
- CS and M Mine
- Harris Bridge Slopes
- Rock Point

Landscape Conservation Areas:

- Slippery Rock Gorge

Managed Areas:

- McConnell's Mill State Park



Map Legend

- Biological Diversity Area (BDA)
- Landscape Conservation Area (LCA)
- Managed Area (MA)
- Audubon Society Important Bird Area (IBA)
- Municipality Boundary

WAYNE TOWNSHIP

Wayne Township is located southern part of Lawrence County bordering Ellwood City Borough to the north and west. Three watersheds drain the township. On the east is Slippery Rock Creek, to the south is Connoquenessing Creek and to the west is the Beaver River. There are two Natural Heritage Areas and one managed land -- **McConnell's Mill State Park** located in Wayne Township.

Beaver River Floodplain BDA

Beaver River Floodplain BDA is discussed in Taylor Township.

CS and M Mine BDA

CS and M Mine in Wayne Township provides winter habitat for two Pennsylvania animal species of special concern (**Special Animal 1 and 2**). Cool temperatures (less than 40 F) are critical for overwintering of these animals. Both species need a large space to hibernate, an area to forage outside of the cave and minimal disturbance within immediate habitats.

Threats and Stresses

Lack of recognition and knowledge of the animal's presence probably represents the greatest threat to the animals. Inadvertent constriction or blockage of the entrance would either imprison the animals in the winter or prevent their entrance in the fall. Human visitation and subsequent increases in noise and light, as well as vandalism could disturb the animals, especially during critical seasons. Disturbance of the airflow from any activities, particularly those that could alter the structure of the entrance could change the microclimate (e.g. air temperature and humidity) and make the site unsuitable for the animals. Removal of the canopy, additional mining or other activity near the mine could prove detrimental to the animals.

Recommendations

Making the landowner aware of the significance of the mine would be a good first step in ensuring the survival of the animals and their habitat. Gating of the mine if indicated by damage to the site or excessive visitation would limit access and disturbance to this habitat and ensure that the mine remains favorable to the animals. Forestry activity within the BDA and surrounding area, as well as additional mining, equipment usage and construction would have a negative impact on the animals. Direct disturbances should be avoided and any activities near to the mine should be evaluated as to their impacts to the mine. The Pennsylvania Game Commission holds responsibility for the management of these animals and should be contacted for questions related to management.

Rock Point BDA

Rock Point is located at confluence of Connoquenessing Creek and the Beaver River. It contains a large contiguous forested area and is surrounded by a variety of non-forest land uses. While the canopy is intact the understory is a mixture of thick scrubby areas and more open areas.

Steep sandstone cliffs rise above this section of Connoquenessing Creek. In its route towards the Beaver River, several abrupt changes in the gradient of the creek result in whitewater rapids. Numerous wildflowers line the slopes as well as a healthy population of poison ivy (*Toxicodendron radicans*). Frequent flooding of creek can be seen by high water marks on the rocks.

The forest at Rock Point could best be described as a red oak - mixed hardwoods forest. Dominant species in the canopy include red maple (*Acer rubrum*), sugar maple (*Acer saccharum*), American beech (*Fagus grandifolia*), white oak (*Quercus alba*) and red oak (*Q. rubra*). Scattered about in the valley created by Connoquenessing Creek are eastern hemlock (*Tsuga canadensis*). The understory supports a mixture of invasive and native species. It includes serviceberry (*Amelanchier arborea*), American hornbeam (*Carpinus caroliniana*) and witch-hazel (*Hamamelis virginiana*). On rock outcrops along the slopes, an occasional American yew (*Taxus canadensis*) can be found. Wild ginger (*Asarum canadense*), sharp-leaved hepatica (*Hepatica acutiloba*), Virginia creeper (*Parthenocissus quinquefolia*), bloodroot (*Sanguinaria canadensis*) and trout-lily (*Erythronium americanum*) make up the native species in the herbaceous layer.

Carolina willow (*Salix caroliniana*) historically existed here but field visits did not reveal its presence. A local naturalist and amateur botanist once knew of willows that formerly occurred here, but confirmed that they are no longer here. Invasive species such as multiflora rose (*Rosa multiflora*), once planted here as an ornamental shrub, have taken over much of the potential habitat. Other invasive species include garlic mustard (*Alliaria petiolata*), Japanese Barberry (*Berberis thunbergii*) and amur honeysuckle (*Lonicera maackii*).



Figure 27. Rock Point at the confluence of Connoquenessing Creek and the Beaver River

Threats and Stresses

There are no immediate threats for this BDA. Exotic invasive species, likely encouraged by disturbance from previous land uses, are especially troublesome here significantly impacting the understory and herbaceous layer. In places these species are very dense. Japanese knotweed (*Polygonum cuspidatum*) a real threat to bottomlands, appears not to be currently present. However, it is in a position to colonize this area along the bank of the creek, given that this species is present farther upstream in the watershed of both the Beaver River and Connoquenessing Creek.

Recommendations

Rock Point forms a large unfragmented forested area in an area of Lawrence County that is made up of small woodlots and multiple other uses. It, along with the unfragmented Slippery Rock Creek gorge, provides a corridor for birds and other animals migrating and moving from the Beaver River to the upper reaches of the Slippery Rock watershed. Protection of this large forested area is paramount to the effort to maintain that unfragmented corridor. Although compromised by invasive species in sections,

appropriate habitat for numerous floodplain species, including rarer ones, remains. Management of this area for eradication of invasive species may result in the reestablishment of a natural suite of species and the rare species that were once here.

Slippery Rock Gorge LCA

Slippery Rock Gorge LCA is discussed in Slippery Rock Township.

ELLWOOD CITY BOROUGH

Ellwood City Borough is located in south-central Lawrence County next to Ellport Borough. It forms the business hub of southern Lawrence County. Connoquenessing Creek flows through the middle of the borough roughly dividing the town into a northern half and southern half. There are no Natural Heritage Areas and no managed lands located in Ellwood City Borough.

ELLPORT BOROUGH

Ellport Borough is located in south central Lawrence County next to Ellwood City Borough. Ellport is located in the interior of a horseshoe bend in Connoquenessing Creek. It was formed in 1929 from Wayne Township. There are no Natural Heritage Areas and no managed lands located in Ellport Borough.

WILMINGTON TOWNSHIP, NEW WILMINGTON BOROUGH AND VOLANT BOROUGH

<u>PNDI Rank</u>		<u>Legal Status</u>	
Global	State	Fed.	State

NATURAL HERITAGE AREAS:

LITTLE NESHANNOCK CREEK BDA

Notable Significance

Special Animal 1

G3G4 S2

PT

WESTMINSTER COLLEGE BDA

High Significance

Special Animal 1

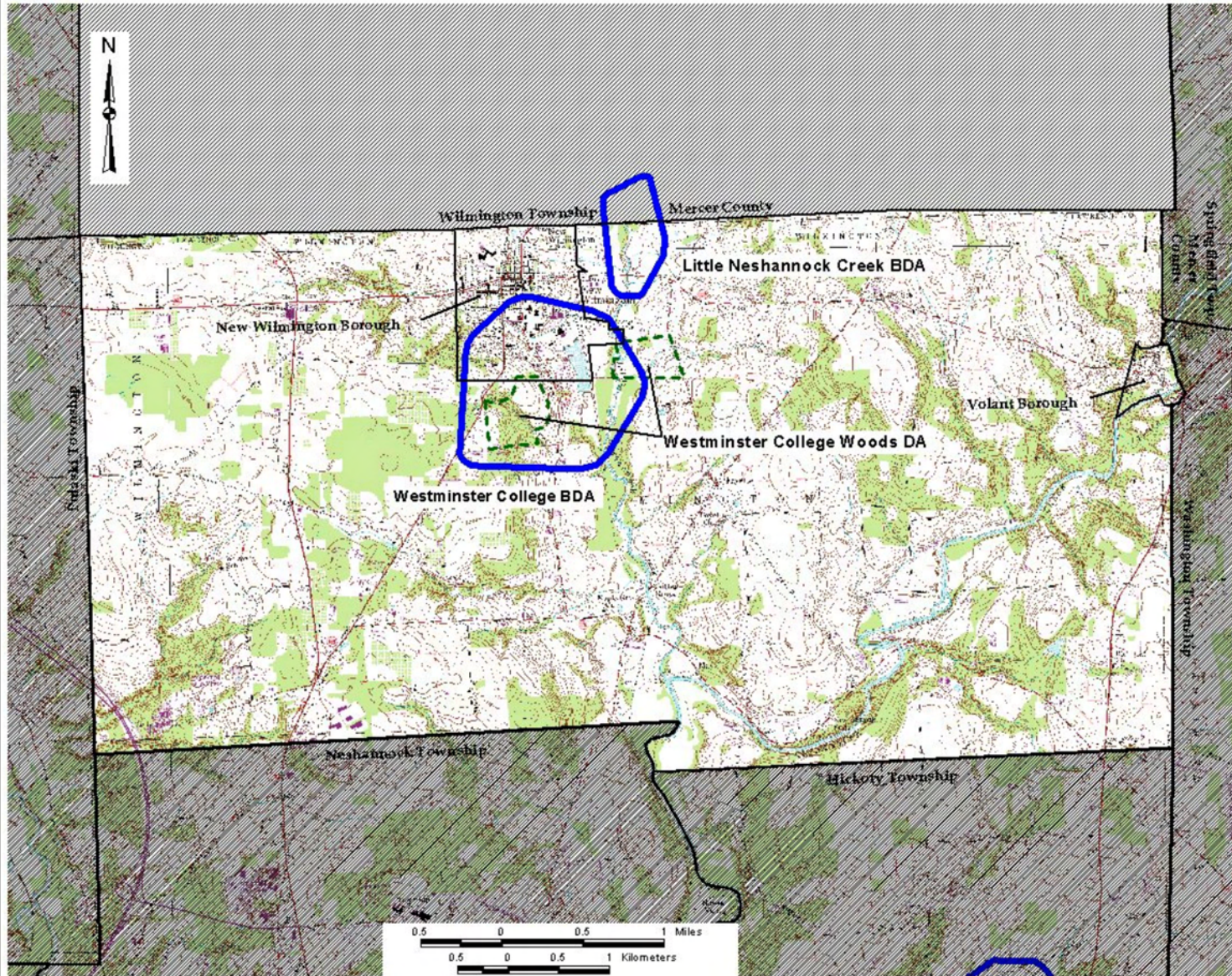
G3G4 S1S2

C

PE

MANAGED LANDS: Westminster College Woods DA

Wilmington Township, New Wilmington Borough and Volant Borough



Wilmington Township, New Wilmington Borough and Volant Borough

Lawrence County Natural Heritage Inventory

Biological Diversity Areas:

Little Neshannock Creek
Westminister College

Landscape Conservation Areas:

None

Managed Areas:

Westminister College Woods DA



Map Legend

-  Biological Diversity Area (BDA)
-  Landscape Conservation Area (LCA)
-  Managed Area (MA)
-  Municipality Boundary

WILMINGTON TOWNSHIP, NEW WILMINGTON BOROUGH AND VOLANT BOROUGH

WILMINGTON TOWNSHIP

Wilmington Township is located in the northern part of Lawrence County. Little Neshannock and Neshannock Creeks drain all but the western tip of the township which is drained by the Shenango River. There is one Natural Heritage Area and one managed land – **Westminster College Woods DA** located in Wilmington Township.

Little Neshannock Creek BDA

Little Neshannock Creek at the Mercer - Lawrence County line and just south of PA 208 is the location of a Pennsylvania animal species of special concern (**Special Animal 1**). The creek flows through a landscape mostly covered by fields and shrub swamps. In its upstream reaches, the creek receives considerable nutrients from agricultural activities. Most of the downstream streambanks within this site have well developed riparian buffers composed of shrubby thickets of black willow (*Salix nigra*), reed canary grass (*Phalaris arundinacea*), blue vervain (*Verbena hastata*), wingstem (*Verbesina alternifolia*) and small sycamore (*Platanus occidentalis*).

A bridge for PA 208 crosses the middle of the BDA. Near to the bridge and upstream of the bridge the streambanks are composed of the same species as above but the buffer is much smaller being about 10 meters in width.

Threats and Stresses

During the survey of Little Neshannock Creek heavy silt loads were observed in the creek. Heavy silts indicate that activities upstream may be contributing excessive silt to the creek. PA 208 crosses Little Neshannock Creek at about the middle of the site and may, along with the runoff from nearby New Wilmington, contribute road salt and other nutrients. As the nutrients accumulate they may make the stream unsuitable for the fish living here. Pollution from other activities such as road salt or runoff could have an additional negative effect on the species here.

Recommendations

Streambank fencing should be used upstream of this site in places where there are cattle. Farmers along the West Branch of Little Neshannock Creek and Little Neshannock Creek in Mercer County may take advantage of streambank fencing programs. The Watershed Assistance Program of the Western Pennsylvania Conservancy as well as other organizations can supply information to assist those wishing to begin such an effort. Activities that add pollutants such as road salting and sewage discharges need to be carefully evaluated and the location and requirements of this species and the aquatic community taken into account.

Westminster College Woods DA

Westminster College Woods DA includes two sections. One is the College Woods located along an unnamed tributary to Little Neshannock Creek. The other is an outdoor teaching laboratory along Little Neshannock Creek. Together they serve as research areas for Westminster College. Some of the woods are considered to be old-growth forest and have not been cut since the mid 1800's. Diameters of some of the American beech (*Fagus grandifolia*), sugar maple (*Acer saccharum*), red oak (*Quercus rubra*) and tuliptree (*Liriodendron tulipifera*) range from three to five feet diameter at breast height. In addition to the species listed above, dominant canopy species are slippery elm (*Ulmus rubra*), white oak (*Quercus alba*), white ash (*Fraxinus americana*) and basswood (*Tilia americana*). Understory species include spicebush (*Lindera benzoin*), American hornbeam (*Carpinus caroliniana*) and alternate-leaved dogwood (*Cornus alternifolia*). Common herbaceous species are intermediate log fern (*Dryopteris intermedia*), sessile bellwort (*Uvularia sessilifolia*), Virginia creeper (*Parthenocissus quinquefolia*), horsebalm (*Collinsonia canadensis*) and herbaceous greenbrier (*Smilax herbacea*). Invasive species such as multiflora rose (*Rosa multiflora*), privet (*Ligustrum vulgare*) and shrubby honeysuckle (*Lonicera morrowii*) are abundant here and threaten the overall integrity of the ecological community.

Threats and Stresses

The main threat for Westminster Woods is exotic invasive plant species. There are many species already present here and they are gradually taking over. Deer browsing, if left unchecked, could eventually become a problem here. The small size of this DA limits the viability of the natural communities here. Small size and extensive edges make such areas vulnerable to aggressive exotic plant and animal species.

Recommendations

A few hiking trails run through Westminster College Woods. Critical to the maintenance of this community is limiting disturbance within the BDA and, wherever possible, expanding the buffer areas surrounding the forest. The woods and research area along the creek might be better combined in order to create a larger protected area of unfragmented forest, and therefore enhancing the viability of both areas. Motorized vehicles should be restricted from the DA to prevent erosion of existing trails and additional damage to soils and vegetation, and clearing of vegetation or cutting of trees, even dead or downed trees should be limited. Monitoring of invasive species such as multiflora rose, privet and shrubby honeysuckle, should be an important component of stewardship at this site.

Minimizing disturbance that would further fragment these areas and make them more vulnerable to exotic species colonization would help to maintain these communities in the short run. Keeping all biomass on site (living and dead wood) would be important in maintaining soil and soil microorganisms as well as other organisms often associated with mature forest communities. Long-term viability may require creation of a larger forested context and careful management to ensure good regeneration of existing areas. Overall, this site represents an exceptional local educational opportunity. Research and

management strategies may derive from programs at the college and students may play a role in developing plans for these areas.

NEW WILMINGTON BOROUGH

New Wilmington Borough is located in the north-central part of Lawrence County. New Wilmington lies in the valley of Neshannock Creek which flows along the eastern boundary of the borough. There are two Natural Heritage Areas and no managed lands in New Wilmington Borough.

Westminster College BDA

The wetlands surrounding the campus of Westminster College provide habitat for a Pennsylvania animal species of special concern (**Special Animal 1**) which potentially exists within this area. A small tributary to Little Neshannock Creek runs through campus and wetlands associated with the stream provide primary winter habitat for the species, while the adjacent upland fields provide foraging habitat. We recognize this habitat in combination with the communities that are part of the Westminster DA because of a recent sighting of this special animal. Additional surveys will be necessary to confirm the presence of the animal.

The communities along Little Neshannock Creek here are broadly sycamore (river birch) box elder floodplain forest. Dominant species in the overstory include sycamore (*Platanus occidentalis*), box elder (*Acer negundo*), green ash (*Fraxinus pennsylvanica*), black ash (*Fraxinus nigra*), red maple (*Acer rubrum*) and pin oak (*Quercus palustris*). Understory associates in the wooded area include American hornbeam (*Carpinus caroliniana*) and hawthorn (*Crataegus* spp.). Some areas are more open with shrub swamps of silky dogwood (*Cornus amomum*), spiraea (*Spiraea alba*) and arrow-wood (*Viburnum dentatum*). Common herbaceous species include skunk cabbage (*Symplocarpus foetidus*), false hellebore (*Veratrum viride*), wingstem (*Verbesina alternifolia*) and trout lily (*Erythronium americanum*). Many invasive species are present throughout the BDA. These include privet (*Ligustrum vulgare*), multiflora rose (*Rosa multiflora*), Japanese barberry (*Berberis thunbergii*) and teasel (*Dipsacus sylvestris*).

Threats and Stresses

The animals potentially living in this BDA require perennial wetlands and associated uplands, preferring open fields that provide good foraging habitat. Activities that stand to alter the wetlands or their hydrology could impact the ability of this area to support these animals. Likewise, disturbance to adjacent uplands, particularly during the summer months could have an adverse effect on this animal. Maintenance of current fields and the uplands immediately surrounding the wetlands could also impact any potential animals living within this area. The use of herbicides and mowing in the fields stand to impact the larger habitat of these animals.

Recommendations

Engaging the landowner in the management of the this area as primary habitat for the special animal can greatly aid the protection of this species. Additional surveys for the animals to better understand their habits and uses of the habitat/wetland would help in furthering their survival. The use of fertilizers, herbicides and pesticides will compromise the ability of the site to maintain a population of this species. The sightings of this species needs to be confirmed and working toward the goal of developing a management plan would be good steps in better understanding and providing an appropriate level of protection for the area. Such effort could provide numerous opportunities for research and collaboration with other agencies and Westminster College.

VOLANT BOROUGH

Volant Borough is located in the northern part of Lawrence County along Neshannock Creek. The borough is wholly located in the Neshannock Creek drainage. There are no Natural Heritage Areas and no managed lands located in Volant Borough.

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APPENDIX I

SIGNIFICANCE RANKS

The Natural Heritage Areas that have qualified for inclusion in this report are ranked according to their significance as areas of importance to the biological diversity and ecological integrity of Lawrence County. The three significance ranks are: **Exceptional**, **High**, and **Notable** significance. These ranks are used to prioritize all identified sites and suggest the relative attention that sites should receive for the amount, degree and rate of protection.

Significance

<u>Rank</u>	<u>Explanation</u>
EXCEPTIONAL	<u>Exceptional significance</u> Sites 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 is of a good size and extent and is in a relatively undisturbed condition. Sites of exceptional significance merit quick, strong and complete protection.
HIGH	<u>High significance</u> Sites that are highly important 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, relatively undisturbed setting, or a combination of these factors, rate as areas with high potential for protecting ecological resources in the county. Sites of high significance merit strong protection in the future.
NOTABLE	<u>Notable significance</u> 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.
COUNTY	<u>County significance</u> 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.

APPENDIX II

PENNSYLVANIA NATURAL DIVERSITY INVENTORY (PNDI)

The Pennsylvania Natural Diversity Inventory (PNDI) Program was established in 1982 as a joint effort of the Western Pennsylvania Conservancy, the Pennsylvania Department of Conservation and Natural Resources, formerly the Pennsylvania Department of Environmental Resources (D.E.R.), Bureau of Forestry, and the Pennsylvania Science Office of The Nature Conservancy. PNDI is part of a network of "Natural Heritage Programs" that utilize methodology developed and constantly refined by The Nature Conservancy. Heritage Programs are established in each of the 50 United States, as well as in Canada and Latin America.

PNDI collects and stores locational and baseline ecological information about rare plants, rare animals, unique plant communities, significant habitats and geologic features in Pennsylvania. Presently, the PNDI database is Pennsylvania's chief storehouse of such information with approximately 9,000 detailed occurrence records that are stored as computer files. Additional data are stored in extensive manual files covering over 150 natural community types, over 800 plant and animal species, and about 1100 managed areas.

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

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

APPENDIX III

LAWRENCE COUNTY NATURAL HERITAGE INVENTORY SITE SURVEY FORM

Site Name:

County: _____ Municipality:

Quad Name: _____ Quad Code: _____ 10,10: _____

Reference:

Land Owners (include best method of contact, date contacted, and method of permission):

Directions to Site:

Site Elevation: _____ Site Size: _____ Aspect: _____

Aerial Photo Int. Air Photo #: _____ Photo Type: _____

Comments from Aerial Photo Interpretation:

Aerial Reconnaissance Date: _____ Team: _____

Comments from Aerial Survey:

Ground Survey Date: _____ Team: _____

Community(s) Type:

Setting of Community(s):

Conditions:

Description of site (quality, vegetation, significant species, aquatic features, notable landforms, natural hazards, age, etc.):

APPENDIX III (CONT.)

Evidence of Disturbance (logging, grazing, mining, past agriculture, erosion, sedimentation, filling, draining, exotic flora, etc.):

Recovery Potential:

Surrounding Land Use:

Threats to Site and Management/Protection:

Previously Identified EO's:

Species:

Accepted for inclusion in report: _____ Rejected: _____ Date:
Reason:

APPENDIX IV

CLASSIFICATION OF NATURAL COMMUNITIES IN PENNSYLVANIA

(DRAFT)

CNHIs and the status of natural community classification 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 Diversity Inventory (PNDI) to update and refine Smith's 1983 report Classification of natural communities in Pennsylvania (draft), the first effort dedicated specifically to the classification of natural communities in Pennsylvania. 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 (early stages of forest regrowth, old agricultural fields, manmade wetlands, etc.), are not addressed in this classification. Until more extensive classification work can be completed to define these types of communities and incorporate them into a single state-wide 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 1983.

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. 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.

FIKE 1999 TYPES

COMMUNITY NAME	GLOBAL RANK	STATE RANK
<hr/>		
<u>TERRESTRIAL FORESTS</u>		
Hemlock (white pine) forest	G5	S4
Serpentine pitch pine – oak forest	G2	S1
Serpentine Virginia pine – oak forest	G2	S1
Pitch Pine – mixed oak forest	G?	S4
Virginia pine – mixed hardwood forest	G?	S5
Dry white pine (hemlock) – oak forest	G?	S4
Hemlock (white pine) – northern hardwood forest	G?	S5
Hemlock (white pine) – red oak – mixed hardwood forest	G?	S4

Hemlock – tuliptree – birch forest

G?

S4

APPENDIX IV (CONT.)

COMMUNITY NAME	GLOBAL RANK	STATE RANK
Rich hemlock – mesic hardwoods forest	G?	S2S3
Dry oak –heath forest	G?	S4S5
Dry oak – mixed hardwood forest	G?	S3
Red oak – mixed hardwood forest	G?	S5
Northern hardwood forest	G?	S4
Black cherry – northern hardwood forest	G?	S4
Tuliptree – beech – maple forest	G?	S4
Sugar maple – basswood forest	G?	S4
Mixed mesophytic forest	G?	S1S2
Sweet gum – oak coastal plain forest	G?	S1
Red maple (terrestrial) forest	G?	S5
Black-gum ridgetop forest	G?	S3
Aspen/gray (paper) birch forest	G?	S?
Black locust forest	G?	SW
<u>PALUSTRINE FORESTS</u>		
Black Spruce- tamarack peatland forest	G?	S3
Red Spruce palustrine forest	G?	S3
Hemlock palustrine forest	G5	S3
Hemlock – mixed hardwood palustrine forest	G?	S3S4
Red spruce – mixed hardwood palustrine forest	G?	S3
Bottomland oak – hardwood palustrine forest	G5	S2
Red maple – black-gum palustrine forest	G5	S3S4
Red maple – black ash palustrine forest	G?	S2S3
Red maple – magnolia Coastal Plain palustrine forest	G?	S1
Great Lakes Region lakeplain palustrine forest	G?	S1
Sycamore – (river birch)- box elder floodplain forest	G?	S3
Silver maple floodplain forest	G?	S3
Red maple – elm – willow floodplain swamp	G?	S2
<u>TERRESTRIAL WOODLANDS</u>		
Pitch pine – heath woodland	G4	S2
Pitch pine – scrub oak woodland	G4	S2
Red spruce rocky summit	G?	S1
Pitch pine – rhodora – scrub oak woodland	G?	S1
Pitch pine – mixed hardwood woodland	G4	S2S3
Virginia pine – mixed hardwood shale woodland	G?	S2
Red-cedar – mixed hardwood rich shale woodland	G?	S1S2
Dry oak – heath woodland	G4	S3

APPENDIX IV (CONT.)

COMMUNITY NAME	GLOBAL RANK	STATE RANK
Birch (black-gum) rocky slope woodland	G?	S2
Yellow oak – redbud woodland	G?	S2
Great Lakes Region scarp woodland	G?	S1S2
Great Lakes Region bayberry – cottonwood community	G?	S1
<u>PALUSTRINE WOODLANDS</u>		
Pitch pine – leatherleaf woodland	G?	S2
Black spruce – tamarack palustrine woodland	G?	S2
Red spruce palustrine woodland	G?	S2S3
Red maple – highbush blueberry palustrine woodland	G5	S4
Red maple – sedge palustrine woodland	G5	S4
Red maple – mixed shrub palustrine woodland	G?	S4
<u>TERRESTRIAL SHRUBLANDS</u>		
Red-cedar – prickly pear shale shrubland	G?	S2
Red-cedar – pine serpentine shrubland	G2	S1
Red-cedar – redbud shrubland	G?	S2
Low heath shrubland	G4	S1
Low heath – mountain ash shrubland	G?	S2
Scrub oak shrubland	G4	S3
Rhodora – mixed heath – scrub oak shrubland	G?	S1
<u>PALUSTRINE SHRUBLANDS</u>		
Buttonbush wetland	G?	S4
Alder – ninebark wetland	G?	S3
Alder – sphagnum wetland	G5	S4
Highbush blueberry – meadow-sweet wetland	G5	S5
Highbush blueberry – sphagnum wetland	G?	S5
Leatherleaf – sedge wetland	G?	S3
Leatherleaf – bog rosemary	G?	S2
Leatherleaf – cranberry peatland	G?	S2S3
Water-willow (<i>Decodon verticillatus</i>) shrub wetland	G?	S3
River birch – sycamore floodplain scrub	G?	S4
Poison sumac – red-cedar – bayberry fen	G2	S1
Buckthorn – sedge (<i>Carex interior</i>) – golden ragwort fen	G2G3	S1
Great Lakes Region scarp seep	G?	S1
Great Lakes Region bayberry – mixed shrub palustrine shrubland	G?	S1

APPENDIX IV (CONT.)

COMMUNITY NAME	GLOBAL RANK	STATE RANK
<u>TERRESTRIAL HERBACEOUS OPENINGS</u>		
Side-oats gramma calcareous grassland	G2	S1
Calcareous opening/cliff	G?	S2
Serpentine grassland	G?	S1
Serpentine gravel forb community	G?	S1
Great Lakes Region dry sandplain	G?	S1
<u>HERBACEOUS WETLANDS</u>		
Bluejoint – reed canary grass marsh	G?	S5
Cat-tail marsh	G?	S5
Tussock sedge marsh	G?	S3
Mixed forb marsh	G3G4	S3
Herbaceous vernal pond	G?	S3S4
Wet meadow	G?	S5
Bulrush marsh	G?	S3
Great Lakes Region palustrine sandplain	G?	S1
Prairie sedge – spotted joe – pye – weed marsh	G?	S1S2
Open sedge (<i>Carex stricta</i> , <i>C. prairea</i> , <i>C. lacustris</i>) fen	G?	S1
Golden Saxifrage – sedge rich seep	G?	S2
Skunk cabbage – golden saxifrage forest seep	G?	S4S5
Serpentine seepage wetland	G?	S1
Golden saxifrage – Pennsylvania bitter-cress spring run	G?	S3S4
Sphagnum – beaked rush peatland	G?	S3
Many fruited sedge – bladderwort peatland	G?	S2
Water-willow (<i>Justicia americana</i>) – smartweed riverbed community	G?	S4
Riverside ice scour community	G?	S1S2
Big bluestem – Indian grass river grassland	G?	S3
Pickerel-weed – arrow-arum – arrowhead wetland	G3G4	S4
Spatterdock – water lily wetland	G?	S4
<u>COMMUNITY COMPLEXES</u>	Complexes not ranked	
Acidic Glacial Peatland Complex		
Great Lakes Region Scarp Complex		
Erie Lakeshore Beach-Dune-Sandplain Complex		
Mesic Till Barrens Complex		
Serpentine Barrens Complex		
Ridgetop Acidic Barrens Complex		

River Bed-Bank-Floodplain Complex

APPENDIX IV (CONT.)

COMMUNITY NAME	GLOBAL RANK	STATE RANK
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Smith 1983 Types

SUBTERRANEAN COMMUNITIES

Solution Cave Terrestrial Community	G?	S3
Solution Cave Aquatic Community	G?	S3
Tectonic Cave Community	G?	S3S4
Talus Cave Community	G?	S2S4

DISTURBED COMMUNITIES

Bare Soil	G?	S?
Meadow/Pastureland	G?	S?
Cultivated Land	G?	S?
Successional Field	G?	S?
Young Miscellaneous Forest	G?	S?
Conifer Plantation	G?	S?

ESTUARINE COMMUNITIES

Deepwater Subtidal Community	G?	S1
Shallow-Water Subtidal Community	G?	S1
Freshwater Intertidal Mudflat	G3G4	S1
Freshwater Intertidal Marsh	G3G4	S1

RIVERINE COMMUNITIES

Low-Gradient Ephemeral/Intermittent Creek	G?	S5
Low-Gradient Clearwater Creek	G?	S3S4
Low-Gradient Clearwater River	G?	S2S3
Low-Gradient Brownwater Creek	G?	S2S3
Medium-Gradient Ephemeral/Intermittent Creek	G?	S5
Medium-Gradient Clearwater Creek	G?	S3
Medium-Gradient Clearwater River	G?	S?
Medium-Gradient Brownwater Creek	G?	S3
High-Gradient Ephemeral /Intermittent Creek	G?	S5
High-Gradient Clearwater Creek	G?	S3
High-Gradient Clearwater River	G?	S?

APPENDIX IV (CONT.)

COMMUNITY NAME	GLOBAL RANK	STATE RANK
High-Gradient Brownwater Creek	G?	S?
Waterfall and Plungepool	G?	S3S4
Spring Community	G?	S1S2
Spring Run Community	G?	S1S2
<u>LACUSTRINE COMMUNITIES</u>		
Glacial Lake	G?	S1
Nonglacial Lake	G?	S2
Artificial Lake		
Natural Pond	G?	S2S3
Artificial Pond		
Stable Natural Pool	G?	S?
Ephemeral/Fluctuating Natural Pool	G?	S1
Artificial Pool		
Ephemeral/Fluctuating Limestone Sinkhole	G?	S1

APPENDIX Va

FEDERAL AND STATE ENDANGERED SPECIES CATEGORIES, GLOBAL AND STATE ELEMENT RANKS

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

FEDERAL STATUS

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

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

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

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

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

{N = No current legal status, but is considered to be of special concern in Pennsylvania, or is under review for such consideration, by conservation biologists. Contact the Pennsylvania Natural Diversity Inventory for more information.}

APPENDIX Vb

PENNSYLVANIA STATUS

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

- PE = Pennsylvania Endangered - Plant species which are in danger of extinction throughout most or all of their natural range within this Commonwealth, if critical habitat is not maintained or if the species is greatly exploited by man. This classification shall also include any populations of plant species that are classified as Pennsylvania Extirpated, but which subsequently are found to exist in this Commonwealth.
- PT = Pennsylvania Threatened - Plant species which may become endangered throughout most or all of their natural range within this Commonwealth, if critical habitat is not maintained to prevent their future decline, or if the species is greatly exploited by man.
- PR = Pennsylvania Rare - Plant species which are uncommon within this Commonwealth because they may be found in restricted geographic areas or in low numbers throughout this Commonwealth.
- PX = Pennsylvania Extirpated - Plant species believed by the Department to be extinct within this Commonwealth. These plants may or may not be in existence outside the Commonwealth.
- PV = Pennsylvania Vulnerable - Plant species which are in danger of population decline within this Commonwealth because of their beauty, economic value, use as a cultivar, or other factors which indicate that persons may seek to remove these species from their native habitats.
- TU = Tentatively Undetermined - A classification of plant species which are believed to be in danger of population decline, but which cannot presently be included within another classification due to taxonomic uncertainties, limited evidence within historical records, or insufficient data.

{N = No current legal status, but is considered to be of special concern in Pennsylvania, or is under review for such consideration, by conservation biologists. Contact the Pennsylvania Natural Diversity Inventory for more information.}

APPENDIX Vb (CONT.)

Wild Birds and Mammals - Legislative Authority: Title 34 Chapter 133, Game and Wildlife Code, revised Dec. 1, 1990 Pennsylvania Game Commission.

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

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

{N = No current legal status, but is considered to be of special concern in Pennsylvania, or is under review for such consideration, by conservation biologists. Contact the Pennsylvania Natural Diversity Inventory for more information.}

APPENDIX Vb (CONT.)

Fish, Amphibians, Reptiles, and Aquatic Organisms - Legislative Authority: Title 30 Chapter 75, Fish and Boat Code, revised February 9, 1991; Pennsylvania Fish and Boat Commission

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

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

Internal Fish and Boat Commission Status Category:

PC = Pennsylvania Candidate - Species that exhibit the potential to become Endangered or Threatened in the future. Pennsylvania populations of these taxa are: 1) "rare" due to their decline, distribution, restricted habitat, etc.; 2) are "at risk" due to aspects of their biology, certain types of human exploitation, or environmental modification; or, 3) are considered "undetermined" because adequate data is not available to assign an accurate status.

This category is unofficial and has no basis in any law (*i. e.*, Chapter 75, Fish and Boat Code), as do the Endangered and Threatened categories.

{N = No current legal status, but is considered to be of special concern in Pennsylvania, or is under review for such consideration, by conservation biologists. Contact the Pennsylvania Natural Diversity Inventory for more information.}

APPENDIX Vb (CONT.)

Invertebrates - Pennsylvania Status: No state agency is assigned to develop regulations to protect terrestrial invertebrates, although a federal status may exist for some species. Aquatic invertebrates are regulated by the Pennsylvania Fish Commission, but have not been listed to date.

Although no invertebrate species are presently state listed, conservation biologists unofficially assign numerous state status and/or state rank designations. NOTE: Invertebrate species are regularly considered under the U.S. Endangered Species Act for federal status assignments.

{N = No current legal status, but is considered to be of special concern in Pennsylvania, or is under review for such consideration, by conservation biologists. Contact the Pennsylvania Natural Diversity Inventory for more information.}

APPENDIX Vc

GLOBAL AND STATE RANKING

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

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.

APPENDIX Vc (CONT.)

G? = Not ranked to date.

NOTE: The study of naturally occurring biological communities is complex and natural community classification is unresolved both regionally and within Pennsylvania. The Global and State Ranking of natural communities also remains

difficult and incomplete. Although many natural community types are clearly identifiable and are ranked, others are still under review and appear as G? and/or S?.

APPENDIX Vd

State Element Ranks

- S1 = Critically imperiled in state because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extirpation from the state.
- S2 = Imperiled in state because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it vulnerable to extirpation from the state.
- S3 = Rare or uncommon in state (on the order of 21 to 100 occurrences).
- S4 = Apparently secure in state, with many occurrences.
- S5 = Demonstrably secure in state and essentially ineradicable under present conditions.
- SA = Accidental (occurring only once or a few times) or casual (occurring more regularly But not every year) in state, including species which only sporadically breed in the state.
- SE = An exotic established in state; may be native elsewhere in North America (e.g., house finch or catalpa in eastern states).
- SH = Of historical occurrence in the state, perhaps having not been verified in the past 20 years, and suspected to be still extant.
- SN = Regularly occurring, usually migratory and typically nonbreeding species for which no significant or effective habitat conservation measures can be taken in the state.
- SR = Reported from the state, but without persuasive documentation which would provide a basis for either accepting or rejecting (e.g., misidentified specimen) the report.
- SU = Possibly in peril in state but status uncertain; need more information.
- SX = Apparently extirpated from the state.
- SZ = Not of significant conservation concern in the state, invariably because there are no (zero) definable element occurrences in the state, although the taxon is native appears regularly in the state.
- S? = Not ranked to date.

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

APPENDIX VI

SPECIAL PLANTS AND ANIMALS OF LAWRENCE COUNTY

PLANTS

<u>SCIENTIFIC NAME</u>	<u>COMMON NAME</u>
<i>Camassia scilloides</i>	Wild Hyacinth
<i>Carex alata</i>	Broad-winged Sedge
<i>Carex prairea</i>	Prairie Sedge
<i>Carex sterilis</i>	Sterile Sedge
<i>Carex tetanica</i>	Rigid Sedge
<i>Cypripedium reginae</i>	Showy Lady's-Slipper
<i>Eleocharis elliptica</i>	Slender Spike-Rush
<i>Eleocharis rostellata</i>	Beaked Spike-Rush
<i>Epilobium strictum</i>	Downy Willow-herb
<i>Eriophorum viridicarinatum</i>	Thin-leaved Cottongrass
<i>Hierochloe odorata</i>	Vanilla Sweet-Grass
<i>Iodanthus pinnatifidus</i>	Purple Rocket
<i>Juncus torreyi</i>	Torrey's Rush
<i>Lemna turionifera</i>	Turion Duckweed
<i>Melanthium virginicum</i>	Virginia Bunchflower
<i>Myriophyllum sibiricum</i>	Northern Water-milfoil
<i>Oxypolis rigidior</i>	Stiff Cowbane
<i>Parnassia glauca</i>	Grass-of-Parnassas
<i>Pedicularis lanceolata</i>	Swamp Lousewort
<i>Poa languida</i>	Drooping Bluegrass
<i>Poa paludigena</i>	Bog Bluegrass
<i>Salix caroliniana</i>	Carolina Willow
<i>Salix serissima</i>	Autumn Willow
<i>Scheonoplectus acutus</i>	Hard Stem Bulrush
<i>Spiranthes lucida</i>	Shining Ladies-Tresses
<i>Swertia caroliniensis</i>	American Columbo
<i>Trollius laxus</i>	American Globeflower

ANIMALS

<u>SCIENTIFIC NAME</u>	<u>COMMON NAME</u>
<i>Amblema plicata</i>	Three-Ridge
<i>Anodontoides ferrussacianus</i>	Cylindrical Papershell
<i>Bartramia longicauda</i>	Upland Sandpiper
<i>Ichthyomyzon greeleyi</i>	Mountain Brook Lamprey
<i>Myotis sodalis</i>	Indiana Bat
<i>Pleuroblema sintoxia</i>	Round Pigtoe
<i>Sistrurus catenatus catenatus</i>	Massasauga Rattlesnake