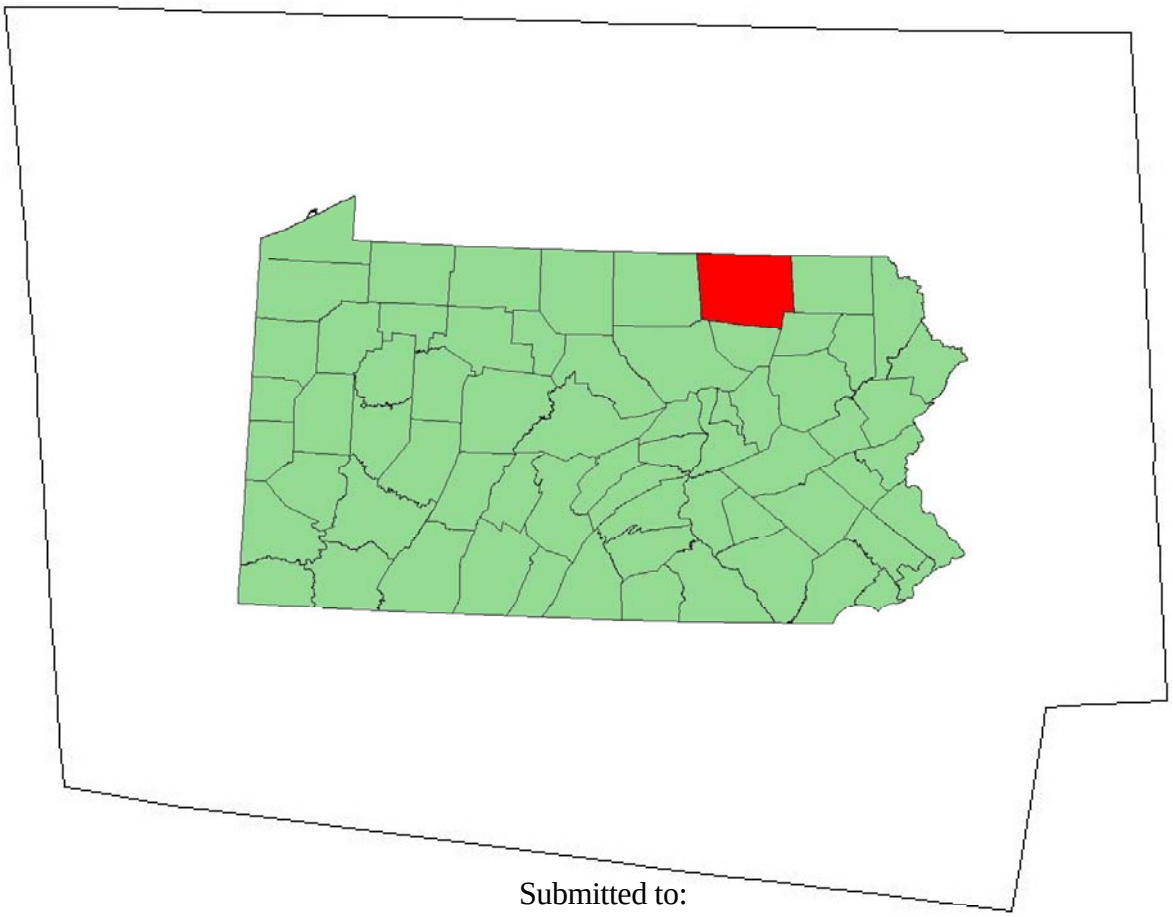
A NATURAL AREAS INVENTORY OF BRADFORD COUNTY, PENNSYLVANIA 2005



Submitted to:
Bradford County Office of Community Planning and Grants
Bradford County Planning Commission
North Towanda Annex No. 1
RR1 Box 179A
Towanda, PA 18848

Prepared by:
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The Nature Conservancy
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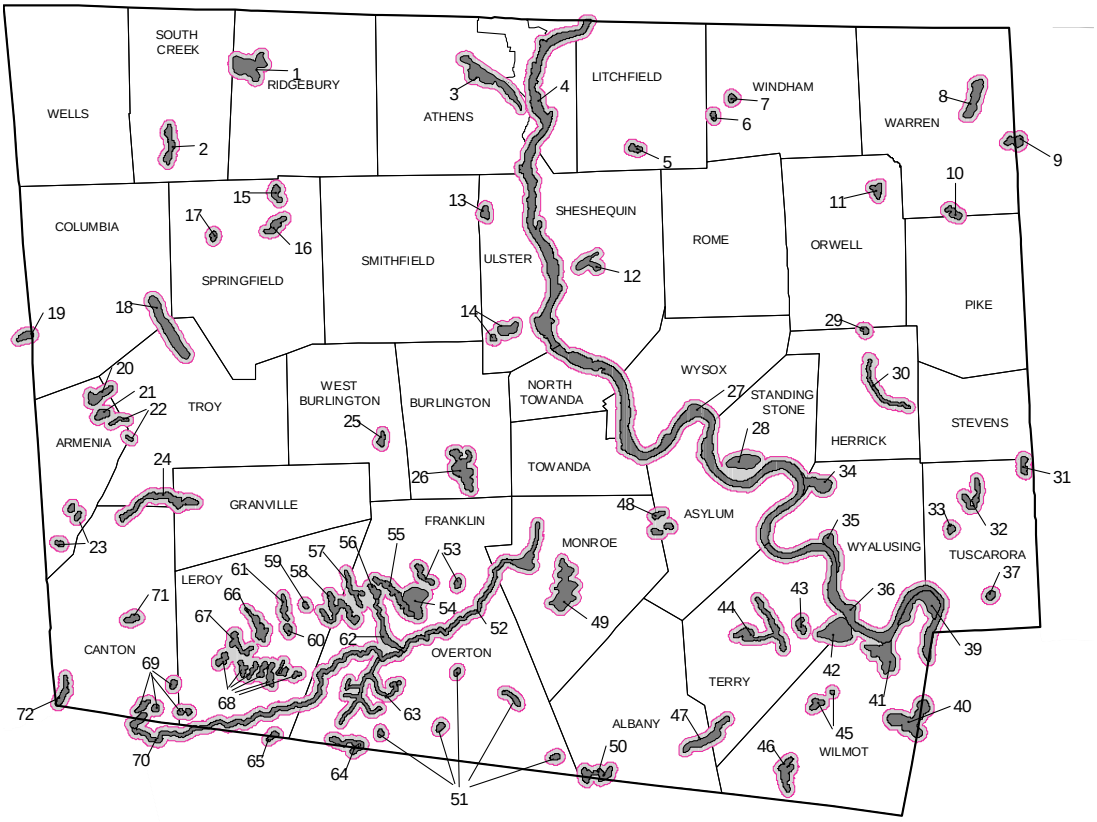
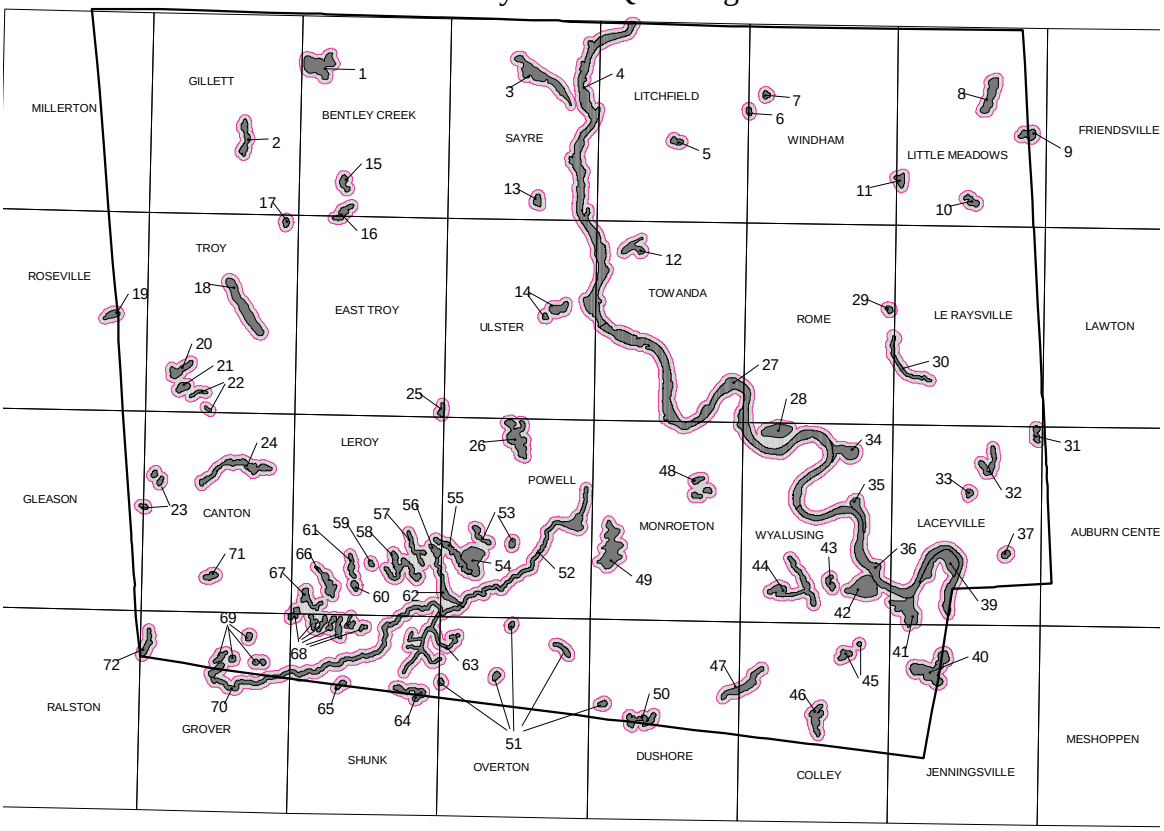
This project was funded in part by a state grant from the DCNR Wild Resource Conservation Program. Additional support was provided by the Department of Community & Economic Development and the U.S. Fish and Wildlife Service through State Wildlife Grants program grant T-2, administered through the Pennsylvania Game Commission and the Pennsylvania Fish and Boat Commission.

Site Index by Township



Site Index by USGS Quadrangle



Site Index

* Notice that natural areas with species of concern are in capital letters while locally significant sites are in lower case letters throughout the document

Site Index: Sites Numbered from North to South

Site #	Site Name	Township(s)	USGS Quadrangle(s)
1	THREE FALLS GLEN	Ridgebury & South Creek Twps.	Bentley Creek Quad
2	South Creek Floodplain at Dunning	South Creek Twp.	Gillett Quad
3	ROUND TOP PARK AND SLOPES	Athens Twp.	Sayre Quad
4	SUSQUEHANNA RIVER (UPPER SECTION)	Athens, Litchfield, Sheshequin & Ulster Twps.	Athens, Litchfield, Sheshequin, Ulster Quads
5	Vawter Wetlands	Litchfield Twp.	Litchfield Quad
6	West Branch Parks Creek	Windham Twp.	Litchfield, Windham Quads
7	Windham Summit Wetland	Windham Twp.	Windham Quad
8	CORBIN CREEK WETLANDS	Warren Twp.	Little Meadows Quad
9	LAKE OF THE MEADOWS	Warren Twp. & Wyoming County	Little Meadows Quad
10	Carey Swamp	Pike & Warren Twps.	Little Meadows Quad
11	Gulf Pond	Orwell Twp.	Little Meadows, Windham Quads
12	DEER LICK WOODS	Sheshequin Twp.	Towanda Quad
13	Balsam Pond	Smithfield & Ulster Twps.	Sayre Quad
14	Saco Wetlands	Ulster Twp.	Ulster Quad
15	LAKE ONDAWA HEADWATERS	Springfield Twp.	Bentley Creek Quad
16	Big Pond Wetlands	Springfield Twp.	Bentley Creek, East Troy Quads
17	Little Pond	Springfield Twp.	Troy Quad
18	NORTH BRANCH SUGAR CREEK	Columbia & Troy Twps.	Troy Quad
19	RT-6 COUNTY LINE WETLANDS	Columbia Twp. & Tioga County	Roseville Quad
20	Case Glenn & Headwaters	Armenia Twp.	Troy Quad
21	Tamarack Swamp	Armenia & Troy Twps.	Troy Quad
22	Armenia Mountain Ravines	Armenia & Troy Twps.	Canton, Troy Quad
23	ARMENIA MOUNTAIN WETLANDS	Armenia Twp.	Canton, Gleason Quads
24	North Branch Towanda Creek	Canton, Granville & Troy Twps.	Canton Quad
25	Mount Selleck Wetland	West Burlington Twp.	East Troy, Leroy, Powell, Ulster Quads
26	HIGHLAND WETLANDS	Burlington Twp.	Powell, Ulster Quads

Site Index

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Site #	Site Name	Township(s)	USGS Quadrangle(s)
27	SUSQUEHANNA RIVER (MIDDLE SECTION)	Asylum, North Towanda, Standing Stone, Towanda, & Wysox Twps.	Monroeton, Rome, Towanda, Wyalusing Quads
28	STANDING STONE MARSH	Standing Stone Twp.	Rome, Wyalusing Quads
29	Herrickville Wetland	Herrick & Orwell Twps.	Le Raysville, Rome Quads
30	Cold Creek	Herrick Twp.	Le Raysville, Rome Quads
31	Beaver Meadow Wetlands	Stevens & Tuscarora Twps.	Laceyville, Le Raysville Quads
32	MILL CREEK WETLANDS	Tuscarora Twp.	Laceyville Quad
33	Ackley Pond	Tuscarora Twp.	Laceyville Quad
34	LIMEHILL	Standing Stone & Wyalusing Twps.	Wyalusing Quad
35	WYALUSING ROCKS	Wyalusing Twp.	Wyalusing Quad
36	SUSQUEHANNA RIVER (LOWER SECTION)	Terry, Wilmot & Wyalusing Twps.	Laceyville, Wyalusing Quads
37	EDINGER SCHOOL WETLANDS	Tuscarora Twp.	Laceyville Quad
39	QUICKS BEND	Wilmot Twp.	Laceyville Quad
40	COUNTY LINE BOGS	Wilmot Twp. & Wyoming Co.	Jenningsville Quad
41	SUGAR RUN CREEK	Wilmot Twp.	Jenningsville, Laceyville, Wyalusing Quads
42	TERRYTOWN WOODS	Terry & Wilmot Twps.	Wyalusing Quad
43	North Branch Sugar Run	Terry Twp.	Wyalusing Quad
44	RIENZE WETLANDS	Terry Twp.	Wyalusing Quad
45	Crane Swamp	Wilmot Twp.	Colley Quad
46	Cumiskey Wetlands	Wilmot Twp.	Colley Quad
47	COYLES CORNERS WETLANDS	Albany & Terry Twps.	Colley, Terry Quads
48	Liberty Corners Wetlands	Asylum & Monroe Twps.	Monroeton Quad
49	KELLOGG MOUNTAIN	Monroe Twp.	Dushore, Overton, Shunk Quads
50	Beaver Pond Wetlands	Albany Twp. & Sullivan Co.	Dushore Quad
51	Overton Ponds	Overton Twp.	Dushore, Overton, Shunk Quads
52	LOWER SCHRADER CREEK	Franklin, Monroe & Overton Twps.	Powell Quad
53	Cash Pond	Franklin Twp.	Powell Quad
54	SGL #36 Reclaimed Strip Mine	Franklin Twp.	Powell Quad

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Site #	Site Name	Township(s)	USGS Quadrangle(s)
55	Falls Creek Wetlands	Franklin Twp.	Leroy, Powell Quads
56	Swimming Dam Bog	Franklin Twp.	Leroy, Powell Quads
57	East Holcomb Pond Wetlands	Franklin & Leroy Twps.	Leroy Quad
58	CARBON RUN WETLANDS	Franklin & Leroy Twps.	Leroy Quad
59	MCCRANEY RUN BOG	Leroy Twp.	Leroy Quad
60	SUNFISH POND	Leroy Twp.	Leroy Quad
61	West Holcomb Pond Wetlands	Leroy Twp.	Leroy Quad
62	COAL RUN	Franklin Twp.	Leroy, Powell Quads
63	SUGAR RUN HEADWATERS	Overton Twp.	Leroy, Overton, Shunk Quads
64	WILLIAMS LAKE WETLANDS	Overton Twp. & Sullivan Co.	Shunk Quad
65	Roundtop Mountain Wetland	Leroy Twp. & Sullivan Co.	Shunk Quad
66	MARSH RUN BOG	Leroy Twp.	Leroy Quad
67	Little Schrader Creek Headwaters	Leroy Twp.	Leroy Quad
68	Wolf Run – Rollinson Run Wetlands	Leroy Twp.	Canton, Grover, Leroy, Shunk Quads
69	LYE RUN WETLANDS	Canton & Leroy Twps. and Sullivan Co.	Grover Quad
70	Schrader Run Headwaters	Canton, Franklin, Leroy & Overton Twps. & Sullivan County	Grover, Leroy, Powell Shunk Quads
71	CANTON MUD POND	Canton Twp.	Canton Quad
72	Grover Wetlands	Canton Twp.	Grover, Ralston Quads

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Site Index: Sites Listed Alphabetically by Site Name

Site #	Site Name	Township(s)	USGS Quadrangle(s)
33	Ackley Pond	Tuscarora Twp.	Laceyville Quad
22	Armenia Mountain Ravines	Armenia & Troy Twps.	Canton, Troy Quad
23	ARMENIA MOUNTAIN WETLANDS	Armenia Twp.	Canton, Gleason Quads
13	Balsam Pond	Smithfield & Ulster Twps.	Sayre Quad
31	Beaver Meadow Wetlands	Stevens & Tuscarora Twps.	Laceyville, Le Raysville Quads
50	Beaver Pond Wetlands	Albany Twp. & Sullivan Co.	Dushore Quad
16	Big Pond Wetlands	Springfield Twp.	Bentley Creek, East Troy Quads
71	CANTON MUD POND	Canton Twp.	Canton Quad
58	CARBON RUN WETLANDS	Franklin & Leroy Twps.	Leroy Quad
10	Carey Swamp	Pike & Warren Twps.	Little Meadows Quad
20	Case Glenn & Headwaters	Armenia Twp.	Troy Quad
53	Cash Pond	Franklin Twp.	Powell Quad
62	COAL RUN	Franklin Twp.	Leroy, Powell Quads
30	Cold Creek	Herrick Twp.	Le Raysville, Rome Quads
8	CORBIN CREEK WETLANDS	Warren Twp.	Little Meadows Quad
40	COUNTY LINE BOGS	Wilmot Twp. & Susquehanna Co.	Jenningsville Quad
47	COYLES CORNERS WETLANDS	Albany & Terry Twps.	Colley, Terry Quads
45	Crane Swamp	Wilmot Twp.	Colley Quad
46	Cumiskey Wetlands	Wilmot Twp.	Colley Quad
12	DEER LICK WOODS	Sheshequin Twp.	Towanda Quad
57	East Holcomb Pond Wetlands	Franklin & Leroy Twps.	Leroy Quad
37	EDINGER SCHOOL WETLANDS	Tuscarora Twp.	Laceyville Quad
55	Falls Creek Wetlands	Franklin Twp.	Leroy, Powell Quads
72	Grover Wetlands	Canton Twp.	Grover, Ralston Quads
11	Gulf Pond	Orwell Twp.	Little Meadows, Windham Quads
29	Herrickville Wetland	Herrick & Orwell Twps.	Le Raysville, Rome Quads

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Site #	Site Name	Township(s)	USGS Quadrangle(s)
26	HIGHLAND WETLANDS	Burlington Twp.	Powell, Ulster Quads
49	KELLOGG MOUNTAIN	Monroe Twp.	Dushore, Overton, Shunk Quads
9	LAKE OF THE MEADOWS	Warren Twp. & Susquehanna County	Little Meadows Quad
15	LAKE ONDAWA HEADWATERS	Springfield Twp.	Bentley Creek Quad
48	Liberty Corners Wetlands	Asylum & Monroe Twps.	Monroeton Quad
34	LIMEHILL	Standing Stone & Wyalusing Twps.	Wyalusing Quad
17	Little Pond	Springfield Twp.	Troy Quad
67	Little Schrader Creek Headwaters	Leroy Twp.	Leroy Quad
52	LOWER SCHRADER CREEK	Franklin, Monroe & Overton Twps.	Powell Quad
69	LYE RUN WETLANDS	Canton & Leroy Twps. and Sullivan Co.	Grover Quad
66	MARSH RUN BOG	Leroy Twp.	Leroy Quad
59	MCCRANEY RUN BOG	Leroy Twp.	Leroy Quad
32	MILL CREEK WETLANDS	Tuscarora Twp.	Laceyville Quad
25	Mount Selleck Wetland	West Burlington Twp.	East Troy, Leroy, Powell, Ulster Quads
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43	North Branch Sugar Run	Terry Twp.	Wyalusing Quad
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51	Overton Ponds	Overton Twp.	Dushore, Overton, Shunk Quads
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44	RIENZE WETLANDS	Terry Twp.	Wyalusing Quad
3	ROUND TOP PARK AND SLOPES	Athens Twp.	Sayre Quad
65	Roundtop Mountain Wetland	Leroy Twp. & Sullivan Co.	Shunk Quad
19	RT-6 COUNTY LINE WETLANDS	Columbia Twp. & Tioga County	Roseville Quad
14	Saco Wetlands	Ulster Twp.	Ulster Quad
70	Schrader Run Headwaters	Canton, Franklin, Leroy & Overton Twps. & Sullivan County	Grover, Leroy, Powell Shunk Quads
54	SGL #36 Reclaimed Strip Mine	Franklin Twp.	Powell Quad
2	South Creek Floodplain at Dunning	South Creek Twp.	Gillett Quad

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Site #	Site Name	Township(s)	USGS Quadrangle(s)
28	STANDING STONE MARSH	Standing Stone Twp.	Rome, Wyalusing Quads
41	SUGAR RUN CREEK	Wilmot Twp.	Jenningsville, Laceyville, Wyalusing Quads
63	SUGAR RUN HEADWATERS	Overton Twp.	Leroy, Overton, Shunk Quads
60	SUNFISH POND	Leroy Twp.	Leroy Quad
27	SUSQUEHANNA RIVER (MIDDLE SECTION)	Asylum, North Towanda, Standing Stone, Towanda, & Wysox Twps.	Monroeton, Rome, Towanda, Wyalusing Quads
4	SUSQUEHANNA RIVER (UPPER SECTION)	Athens, Litchfield, Sheshequin & Ulster Twps.	Athens, Litchfield, Sheshequin, Ulster Quads
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21	Tamarack Swamp	Armenia & Troy Twps.	Troy Quad
42	TERRYTOWN WOODS	Terry & Wilmot Twps.	Wyalusing Quad
1	THREE FALLS GLEN	Ridgebury & South Creek Twps.	Bentley Creek Quad
5	Vawter Wetlands	Litchfield Twp.	Litchfield Quad
6	West Branch Parks Creek	Windham Twp.	Litchfield, Windham Quads
61	West Holcomb Pond Wetlands	Leroy Twp.	Leroy Quad
64	WILLIAMS LAKE WETLANDS	Overton Twp. & Sullivan Co.	Shunk Quad
7	Windham Summit Wetland	Windham Twp.	Windham Quad
68	Wolf Run – Rollinson Run Wetlands	Leroy Twp.	Canton, Grover, Leroy, Shunk Quads
35	WYALUSING ROCKS	Wyalusing Twp.	Wyalusing Quad

PREFACE

The Bradford County Natural Areas Inventory is a document compiled and written by the Pennsylvania Science Office of The Nature Conservancy. It contains information on the locations of rare, threatened or endangered species and the highest quality natural areas in the county; it is not an inventory of all open space. It is intended as a conservation tool and should in no way be treated or used as a field guide. Accompanying each site description are general management recommendations that would help to ensure the protection and continued existence of these rare plants, animals and natural communities. The recommendations are based on the biological needs of these elements (species and communities). The recommendations are strictly those of The Nature Conservancy and do not necessarily reflect the policies of the state or the policies of the county or townships for which the report was prepared.

Managed areas such as federal, state, county and township lands, private preserves and conservation easements are also provided on the maps where that information was available to us. This information is useful in determining where gaps occur in the protection of land with rare species, natural communities and locally significant habitats. The mapped boundaries are approximate and our list of managed areas may be incomplete, as new sites are always being added.

Implementation of the recommendations is up to the discretion of the landowners. However, cooperative efforts to protect the highest quality natural features through the development of site-specific management plans are greatly encouraged. Landowners working on management or site plans for specific areas described in this document are encouraged to contact the Pennsylvania Science Office of The Nature Conservancy for further information.

Although an attempt was made through advertising, public meetings, research, and informal communications to locate the sites most important to the conservation of biodiversity within the county, it is likely that many things were missed. Anyone with information on sites that may have been overlooked should contact the Bradford County Planning Commission (see address on following page). This Natural Areas Inventory will be updated within five years, and additional sites may be included at that time.

ACKNOWLEDGEMENTS

This project was funded in part by a state grant from the DCNR Wild Resource Conservation Program. Additional support was provided by the Department of Community & Economic Development, Additional funding was provided by the U.S. Fish and Wildlife Service through State Wildlife Grants program grant T-2, administered through the Pennsylvania Game Commission and the Pennsylvania Fish and Boat Commission. Thanks to everyone who provided financial and administrative support for the inventory. Without your help, this study would not have been possible.

The species information utilized in the inventory came from many sources as well as our own field surveys. We wish to acknowledge all of those who carried out botanical and zoological survey work over the years. Without their contributions, this survey would have been far less complete.

The report benefited from the help of local naturalists and conservationists who gave generously of their time. Thanks to all the help and support given by Mary Baker, Nancy Baker, Dave Buck, Melody Buck, Ken Cooke, Keith Darlington, Trudy Gerlach, Doug Gross, Carol Loeffler, Rich Lupinski, Mike Lovegreen, Ray Stolinas, Tony Liguori, Jim Lacek, Ron Young and David Werier. Thanks to the many other private citizens who contacted our office with information on natural areas.

Many thanks to everyone who participated in the Technical Advisory Committee by reviewing the draft Natural Area Inventory Report. Finally, we especially wish to thank the many landowners that granted us permission to conduct inventories on their lands. The task of inventorying the natural heritage of Bradford County would have been far more difficult without this tremendous pool of information gathered by many people over many years.

Copies of this document may be obtained from:

Bradford County Office of Community Planning and Grants
Bradford County Planning Commission
North Towanda Annex No. 1
RR1 Box 179A
Towanda, PA 18848

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List of Pictures:

Glaciated High Plateau Section

The southern portion of Bradford County is within the Glaciated High Plateau Section of the Allegheny Plateaus Physiographic Province. The High Plateau section rises dramatically in elevation from the relatively lower adjacent landscape. Numerous cliffs and waterfalls spill down from the high section to the low section with an average 1000-foot change in elevation. The highland section is mostly forested, with the bulk of the area in public ownership comprised of State Game Lands #12 and #36. The High Plateau is dotted with numerous large and small wetlands, seeps, rock outcrops and waterfalls, within a matrix of extensive, almost unbroken forest cover. This region of the county represents one of the

INTRODUCTION

The current physical environment of Bradford County is largely the result of glaciation. Glacial episodes had covered much of the area with a thick layer of ice; perhaps a mile thick in some areas. The ebb and flow of the glacial ice sheets ground down the area's topography, and left deposits of till, in many instances damming small streams to create wetlands. Enormous ice blocks were buried in the ground, and as they melted formed glacial ponds or kettleholes. Over time, the kettleholes were colonized by northern boreal vegetation, particularly sphagnum moss, which created a floating substrate over much of the open water. These floating moss mats were then colonized by other specialized plants adapted to the acidic conditions to create the bog habitats that still occur in some of Bradford County's wetlands.

As the glacial ice pack melted, enormous quantities of water drained through the County's creeks and rivers, cutting deeply into softer bedrock portions of the land to create a webbing of hills and valleys, high rock outcrops and wide floodplains (Cuff et al 1989). As the last ice age ended (about 12,000 years ago) and the glaciers retreated, the area was revegetated by a succession of plant communities as the climatic conditions changed. The tundra habitat of sedges and lichens was replaced by a boreal conifer forest, which was in turn replaced by a northern hardwood forest as the climate warmed.

Most of Bradford County was covered in a millennia-old forest when the first Europeans began settling the area. The forests were home to several species of large mammals long since gone from the county including elk, wolves, mountain lions and lynx. Fishers, pine martens and river otters were also common. A little over 200 years ago, the settlers cleared forests for farms, shelter and fuel, concentrating initially on the most fertile and easily worked soils of river and creek floodplains, but continued up many hillsides as more desirable land was already occupied. Steep slopes, creek beds, stony ground and other obstructions to farming provided refuge to animals and plants to repopulate the less fertile fields once they were abandoned (Doutt 1977).

Bradford County was formed from parts of Luzerne and Lycoming Counties in 1810, under the name of Ontario, but in 1812 it was changed to Bradford in honor of Wm. Bradford of Philadelphia, Attorney General of the United States (Beers 1869). Coal was discovered on Barclay Mountain in 1812, and coal extraction stimulated an economic boom in the region through the 1800's. Large areas of the mountain were mined, initially by tunnels, then by strip mining. Railroads were built to haul coal and several towns sprang up to accommodate the workers. Much of the original forest cover was removed for mine supports, railroads, buildings and fuel. The coal seams were nearly exhausted by the late 1800's and the mining towns of Barclay, Carbon Run and Laquin were abandoned (Bradsby, 1891).

A second wave of logging occurred in the late 1800's and early 1900's, when rapidly expanding industrial cities created a seemingly insatiable demand for lumber. Much of Pennsylvania was clear-cut during this period. Most of the forests of Bradford County are less than 100 years old, having grown up since this last extensive timber harvest. Bradford County is currently a mosaic of agricultural fields interspersed with large and small woodlots. Many glacially derived wetlands and other areas of poor drainage dot the landscape.

The population of Bradford County has maintained a nearly even level of growth in the past 100 years. In 1900 the population was approximately 59,400 and dropped to a low of 50,600 in 1940, to rise to roughly 63,000 in 2000 (U.S. Census Bureau). Though there has been little recent increase in population in the county, future increases should be anticipated. A substantial increase in population may lead to increased development pressure on some of the sensitive natural areas of the county. Economically unsustainable farms may be sold for residential and commercial uses.

Farms represent several generations of cultural heritage, and many farms contain a natural component or are adjacent to a natural area. The natural areas that comprise the natural heritage of Bradford County can be easily lost without careful planning of growth and development. Ironically the scenic and remote nature of these areas may make them prime targets for residential developments. Protecting the integrity of these natural systems provides benefits to humans as well as providing for the survival of all flora and fauna, rare and otherwise. Planning for long-term sustainability can maintain open space, including natural environments and the plants and animals associated with them. Using a Natural Areas Inventory as a conservation tool can steer development away from environmentally sensitive areas, creating a needed balance between growth and the conservation of scenic and natural resources.

It is important that county and municipal governments, the public, developers and planners know the location of environmentally sensitive areas in order to protect these areas. Knowing where these areas are located can help prevent potential land-use conflicts and help focus conservation efforts and limited funds to the most vulnerable areas. The Pennsylvania Science Office of The Nature Conservancy, under contract with the Bradford County Planning Commission, has undertaken this project to provide a document and maps that will aid in the identification of these important areas.

The Natural Areas Inventory (NAI) report presents the known outstanding natural features, floral, faunal and geologic in Bradford County. The Inventory provides maps of the best natural communities (habitats) and the locations of animal and plant species of special concern (endangered, threatened, or rare) in Bradford County. Due to budget and time constraints, many high-quality areas in the county are likely to have been overlooked. The maps do not pinpoint the site of the species of concern but rather represent a zone of potential impacts within the site's vicinity. A written description and a summary table of the sites, including quality, degree of rarity, and last-observed date, accompany each map. Potential threats and suggestions for protection of the rare plants or animals at the site are included in the individual site descriptions.

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

Potential threats and some suggestions for protection of the rare plants or animals at the site are included in many of the individual site descriptions. Selected geologic features of statewide significance are also noted. In addition, the inventory describes locations of areas that are significant on a county-wide scale, but have not been deemed exemplary natural communities because no species of concern were documented at these sites. These **"locally significant"** sites represent good examples of habitats that are relatively rare in the county, support an uncommon diversity of plant species, and/or provide valuable wildlife habitat on a local level. Locally significant sites are referenced in **lower case lettering** throughout this report.

The information and maps presented in this report provide a useful guide for planning commercial and residential developments, recreational parks, for conserving natural areas, and for setting priorities for the preservation of the most vulnerable natural areas. An overall summary identifies the highest quality sites in the county. All of the sites in this report were evaluated for their importance in protecting biological diversity on a state and local level, but many also have

scenic value, provide water quality protection, and are potential sites for low-impact passive recreation, nature observation and/or environmental education.

The Natural Areas Inventory will be provided to each municipality through the Bradford County Planning Commission. The Inventory is a conservation tool that will aid in the creation of municipal, county and comprehensive plans, and the emphasis on biological diversity should inform county and regional open space plans already underway. Bradford County, its municipalities, land trusts, and other organizations can also use the Natural Areas Inventory to identify potential protection projects that may be eligible for funding through state or community grant programs such as the Growing Greener Fund.

Landowners will also find this inventory useful in managing and planning for the use of their land; it gives them the opportunity to explore alternatives that will provide for their needs and still protect the species and habitats that occur on their land. For example, the Forest Stewardship Program, coordinated by PA Department of Conservation and Natural Resources, Bureau of Forestry, assists landowners in creating management plans. This plan is developed based on landowner objectives (e.g., wildlife or timber management). Other programs include the USDA's Forest Legacy Program and the PA Department of Agriculture's Agricultural Land Preservation Program. Land managers may wish to consult with this report and the Pennsylvania Natural Diversity Inventory (PNDI) in an effort to avoid potential conflicts in areas with species of special concern and/or identify ways of enhancing or protecting this resource. Users of this document are encouraged to contact the Pennsylvania Science Office (717-948-3962) of The Nature Conservancy for additional information.

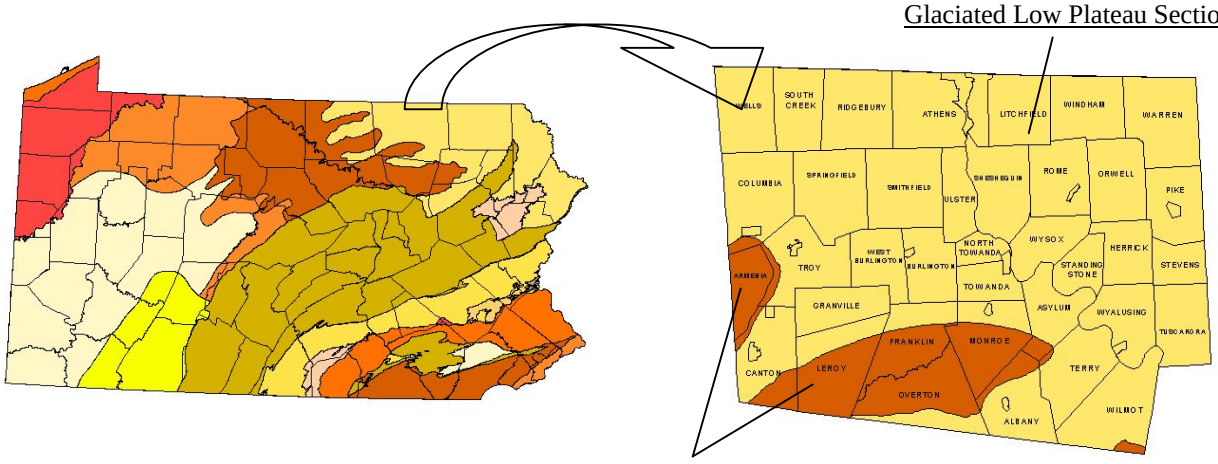
Questions regarding potential conflicts between proposed projects and species of concern mentioned in this report should be directed to the Environmental Review Specialist at the PNHP Office in Harrisburg (717) 772-0258.

NATURAL HISTORY OVERVIEW OF THE COUNTY

Climate, topography, geology, and soils have been particularly important in the development of ecosystems (forests, fields, wetlands) and physical features (streams, rivers, mountains) that occur in Bradford County. Many disturbances, both natural and human, have been influential in forming and altering many of Bradford County's ecosystems, causing extinction of some species and the introduction of others. These combined factors provide the framework for locating and identifying exemplary natural communities and species of special concern in the county. The following sections provide a brief overview of the physiography, geology, soils, surface water, and vegetation of Bradford County.

Physiography and Geology

The characteristic landscapes and distinctive geological formations classify Physiographic Provinces. Physiography relates in part to a region's topography and climate. These two factors, along with bedrock type, significantly influence soil development, hydrology, and land use patterns of an area. Additionally, both physiography and geology are important to the patterns of plant community distribution, which in turn influences animal distribution. Because of the differences in climate, soils, and moisture regime, certain plant communities would be expected to occur within some provinces and not in others. Physiographic and geologic information was obtained from many sources including Ground Water in Northeastern Pennsylvania (Lohman 1957), The Geology of Pennsylvania (PA Geological Survey and Pittsburgh Geological Survey 1999), Soil Survey of Bradford and Sullivan Counties, Pennsylvania (USDA 1986), and Physiographic Provinces of Pennsylvania (Sevan 2000).



Bradford County is situated within the Allegheny Plateaus Physiographic Province and is divided into the Glaciated High Plateau Section and the Glaciated Low Plateau Section (Sevan 2000). The Allegheny Plateaus Physiographic Province covers the largest portion of the Appalachian Mountains, and extends from New York to Alabama. The Plateau Sections, as the name implies, are characterized by primarily flat bedrock layers, which were not as drastically folded and tilted like those

of the Ridge and Valley Province to the east by historic geological events. The mainly flat bedrock layers can be seen in exposed outcrops throughout the county. The landscape was additionally scoured by retreating and advancing glaciers, which ground down mountains and filled valleys with till. The advance and retreat of glaciers has occurred at least twice, with the Wisconsinian glacier retreating less than 15 thousand years ago (Cuff et al 1989). The County's landscape is not flat, however, having been deeply dissected by the numerous streams and creeks into an expanse of undulating mounds. The melting of the glaciers resulted in enormous amounts of running water, which cut deep river and creek beds as they drained the melting ice pack. The banks of the Susquehanna River show the results of the cutting action of the rushing water with frequent extremely steep cliffs such as those at Wyalusing Rocks in Wyalusing Township. The glaciers also left till deposits in their retreat, damming streams to create lakes and bogs, which dot the landscape of the county.

The most striking physiographic feature of Bradford County occurs at the junction of the Low Plateaus section and the High Plateaus section. The softer bedrock parent material of the Low Plateaus section has resulted in a lower relief of this area in contrast to the High Plateaus section, which has a coarser, harder bedrock parent material (USDA 1986). The High Plateaus section rises dramatically in elevation from the relatively lower adjacent landscape. Numerous cliffs and waterfalls spill down from the high section to the low section with an average 1000-foot change in elevation. The High Plateau section is mostly forested, with the bulk of the area in public lands comprised of State Game Lands #12 and #36. The High Plateau is dotted with numerous large and small wetlands, seeps, rock outcrops and waterfalls, within a matrix of extensive, almost unbroken forest cover. This region of the county represents one of the highest quality natural areas in the state. One could spend many years conducting a biological inventory of this portion of the county alone.

The Lowland Plateau section also contains many wetlands, bogs and lakes, forested lands, rock outcrops and other interesting habitat types, but the majority of this section of the county has been fragmented and altered by human activity. This portion of the county is primarily composed of a patchwork of agricultural fields and smaller woodlots. Many wetlands have been drained for agriculture or dammed for recreational or farm activities. The ones that remain unaltered are, for the most part, ringed in cultivated fields or otherwise isolated from the context of a forested matrix. Many of these habitats still support remnant populations of species rare to the state. Future land use patterns may see the conversion of farmland into residential and commercial development. As lands change from agriculture to development, efforts should be made to ensure undisturbed forested buffers are maintained or enhanced around wetlands, streams and other significant natural features.

Bradford County is completely within the Susquehanna River drainage basin. The other main streams feeding the Susquehanna River in Bradford County include the Chemung River, which joins the Susquehanna just south of Sayre, Towanda Creek, Sugar Creek, Schrader Creek and Wyalusing Creek. Other tributaries to these main streams form a network across the county.

Soils

A soil association is a group of soils with a distinctive, proportional pattern of occurrence in the landscape. This description of the soils of Bradford County comes from *The Soil Survey of Bradford and Sullivan Counties* (USDA, 1986). There have been five mapped soil associations for Bradford and Sullivan Counties. They include: 1) Volusia-Mardin-Lordstown association, 2) Morris-Oquaga-Wellsboro association, 3) Wellsboro-Oquaga-Morris association, 4) Dystrochrepts-Oquaga-Wellsboro association and 5) Alton-Pope-Chenango association. Several soils types have low permeability to water are considered hydric. These soils are most likely to support wetland vegetation and be considered inappropriate for residential and commercial development. For a list of these soils and their ranges, please refer to the Soil Survey of Bradford and Sullivan Counties, or contact the Bradford County Conservation District or the National Resource Conservation Service.

Table #1: Soil Associations of Bradford and Sullivan Counties

Soil Association	Description	Percentage of Area (Bradford and Sullivan Counties combined)	Land Use
Volusia-Mardin-Lordstown Association	Deep and moderately deep, gently sloping to moderately steep, somewhat poorly drained to well drained soils; on broad hillsides and hilltops	38	Most of this land is used for dairy farms with the rest in woodland and scattered residences. Seasonal high water table and moderate depth to bedrock limit its suitability for cultivated crops and pasture.
Morris-Oquaga-Wellsboro association	Deep and moderately deep, sloping to steep, somewhat poorly drained to somewhat excessively drained soils; on narrow hillsides and hilltops.	23	Most of this soil type is farmed. The rest is woodland, scattered residential sites or is idle. Seasonal high water table and moderate depth to bedrock and slope limit its suitability for cultivated crops and pasture.
Wellsboro-Oquaga-Morris association	Deep and moderately deep, gently sloping to moderately steep, somewhat excessively drained to somewhat poorly drained soils; on broad plateaus and mountaintops.	20	Most of this soil type is wooded, while some areas have been cleared for farms and residential sites. These soils are mostly too stony for cultivated crops. This soil type can be used for wildlife habitat and recreation.
Dystrochrepts-Oquaga-Wellsboro association	Deep and moderately deep, moderately steep to very steep, somewhat excessively drained to somewhat poorly drained soils: on mountainsides and in narrow stream valleys.	26	Most of this soil type is wooded, while some areas have been cleared for farms and residential sites. Most of these soils are too steep and stony for cultivated crops and pasture. Farmed areas are in narrow valleys, usually on floodplains and terraces. This soil type can be used for wildlife habitat and recreation.
Alton-Pope-Chenango association.	Deep, nearly level and gently sloping, somewhat excessively drained and well drained soils: on uplands, terraces and floodplains.	3	Most of this soil type has been cleared and is used for farmland and residential sites. Most of the farmland is in dairy, but some is used for vegetables or small fruits. Flooding and the hazard of contaminating groundwater limit non-farm uses.

Vegetation

Upland Forest Communities

The American chestnut once dominated many of the Eastern North American Hardwood Forests from Maine to Michigan to Alabama. However, around 1904, a chestnut blight (*Cryphonectria parasitica*) was introduced to North America from Asia. The blight spread from the Bronx Zoo northward and southward, and by 1960, there were basically no mature chestnuts left standing. Today, some young sprouts and shoots still remain, but very few will ever reach maturity due to the blight. The loss of the chestnut from the canopy left huge breaks all across the eastern United States. These holes have since filled with many of the chestnut's associate species, including species of oak and hickory. These oak species comprise the Appalachian Oak Forest, which is the dominant vegetation type in the uplands of Bradford County (Cuff et al 1989). White oak, northern red oak and chestnut oak dominate the upland forest communities along with an array of other hardwood species. Hardwood associates such as scarlet oak, black birch, red maple, hickory, beech and tulip poplar are the major associates within an Appalachian Oak Forest (Cuff et al 1989). The understory of Appalachian Oak Forests typically consists of mountain-laurel, low sweet blueberry, lowbush blueberry, black huckleberry, witch hazel and other species (Cuff et al 1989).

A smaller portion of Bradford County is made up of the Northern Hardwood Forest as the major vegetation type. This forest type is typically dominated by American beech, red maple, sugar maple, black cherry, sweet, yellow and paper birches, red oak and white ash. There are also scattered white pine and hemlock, but these do not typically contribute more than 25% to the canopy cover (Fike 1999). Common shrubs in the understory of this forest type include witch-hazel, striped maple, witch-hobble, mountain holly, serviceberry and hornbeam (Fike 1999).

Wetlands

Wetlands are the key to the survival of many species of plants and animals considered rare in the state. Even though wetlands account for only two percent of Pennsylvania's total area, they are home to a diverse array of rare plants and animals and are an extremely productive part of the landscape (Cuff et al 1989). The Glaciated Plateau sections of the Appalachian Plateau Province make up 24% of the state's area, while they contain 62% of the state's wetlands (Tiner 1987). Bradford County, like the other glaciated counties of Pennsylvania, accounts for a disproportionate share of the state's wetlands. Wetlands differ in size, structure and species diversity. Wetlands also differ according to their placement on the landscape – at stream headwaters, dips in valleys, or on slopes where ground water discharges; and whether the water is flowing or stagnant. These different scenarios result in bogs and fens, marshes, swamps, floodplain forests, forested wetlands, wet meadows, and seeps. Wetlands differ also in vegetative species cover. Tree species such as red maple, yellow birch, eastern hemlock and ash species usually dominate forested swamps. The understory typically consists of shrub species such as highbush blueberry, rhododendron and azaleas, winterberry holly, alders, swamp rose and many others.

Graminoid marshes are wetlands dominated by grass-like plants such as cattails, sedges, rushes and grasses. This type of wetland may be found in association with slow streams or in areas with ground water seepages. Graminoid marshes in the county are usually formed as successional communities following beaver dams or other impoundments.

Shrub swamps are wetlands occurring on mineral soils usually with a thick accumulation of sphagnum and other organic matter with water near or above the surface most of the year (Cuff et al 1989). Shrubs under 20 feet tall dominate the wetland. Shrub swamps in the county frequently

include highbush blueberry, chokeberry, mountain holly, winterberry holly, alder, leatherleaf, swamp rose, meadowsweet, steeplebush, buttonbush and silky dogwood.

Ephemeral or vernal pools are wetlands that fill with water on an intermittent basis due to annual precipitation, rising groundwater, or surface water runoff (Kenney and Burne, 2000). These pools become almost completely dry in most years, losing water through transpiration and evaporation. These pools, due to being ephemeral and virtually free of breeding fish, attract many species of breeding salamanders, turtles, frogs and toads. Some species, like the Spotted Salamander are obligate vernal pool species. This species and other *Ambystoma* species lay eggs only in vernal pools. Plants typically associated with vernal ponds include woolgrass, three-way sedge, highbush blueberry, and red maple.

Due to the rarity of undisturbed examples of wetlands in Bradford County and Pennsylvania, all good examples of these habitats should be preserved whenever possible. Wetlands provide valuable habitat for breeding and migrating birds, mammals, reptiles, amphibians and insects. Wetlands also provide a refuge for many species of wetland dependent rare plants.

Disturbance

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

Natural disturbances such as fire and flooding can actually benefit certain natural communities and species. Periodic fires are needed to maintain pitch pine and scrub oak barren areas in order to sprout new growth of these species and keep out other successional species. Floodplain forests benefit from the periodic scouring and deposition of sediments as streams overtop their banks. At the same time, streamside wetland communities hold excess water, thus reducing the scale of flooding downstream.

Another natural disturbance, over-browsing by deer, can have detrimental effects on natural communities and species (Rhoads and Klein, 1993). Excessive deer browse can decrease the understory of some forests and halt regeneration of new growth of the canopy and understory. Deer feeding preferences can also have a direct effect on rare plants. Private landowners can be encouraged to control deer populations by allowing hunting on their lands.

Human and natural disturbances create different habitats in different scenarios, but it's human disturbances that often leave the most lasting effect on the environment. Many human disturbances can be beneficial, especially to species that require an early successional habitat. As farming remains an important industry in Bradford County, some farm practices and abandoned farmland make conditions favorable for some grassland birds. Birds such as Short-eared Owl, Eastern Meadowlark, Bobolink, Henslow's Sparrow and Vesper Sparrow have benefited from human managed and created early successional habitats including reclaimed strip mines. However, what may be beneficial to a few species is often detrimental to other species. Many rare species have become rare because they just can't adapt to disturbance of their particular habitat, which is often a specialized niche. Consequently, many species have declined due to human alteration of the landscape. Human disturbances are semi-permanent parts of landscape, but decisions about the type, timing, location and extent of future disturbances are important to the natural ecological diversity that remains.

In many cases, human disturbances have directly affected natural communities and animal and plant species in certain areas. In Bradford County, farming and urbanization have created biological "islands" where small natural areas are surrounded by agriculture or development. These islands isolate gene pools of wildlife and/or plant species, inhibiting the gene flow between populations. In addition, logging and mining can affect forest age and natural community structure. For example, old-growth forests have virtually disappeared despite the fact that some scattered old

trees remain. Additionally, many wetlands have been intentionally flooded or drained resulting in loss of biodiversity at a given site.

Mining, industry, agriculture, residences, road building and other activities have contributed to the degradation of water quality in many areas of the county. Protecting the quality and purity of surface and groundwater resources from degradation contributes to the future well being of all plants and animals including our own communities. The PA State-wide Surface Waters Assessment Program can provide information on specific potential sources of water impairment within Bradford County. Much information on the water and geological resources of the county can be found on the PA DEP eMap web page (http://www.dep.state.pa.us/external_gis/gis_home.htm).

Probably the most detrimental indirect effect that human disturbance has had on natural communities and associated species is the spread of non-native (i.e. exotic) invasive species into natural areas. Many of these invasive species, including the chestnut blight that changed the composition of eastern forests, have caused such widespread problems that they are now out-competing native species and decreasing overall quality of natural areas. Non-native plants have become commonplace in disturbed woodlands throughout the state, often to the point of excluding some of the native plants. Common reed, European buckthorn, autumn olive, purple loosestrife, garlic mustard, yellow garden loosestrife, multiflora rose, Japanese honeysuckle, Japanese knotweed and tree-of-heaven are aggressive, weedy species that follow in the wake of disturbance and crowd out native species.

Some of these non-native invasive plants have become serious threats to ecosystems in Bradford County and across Pennsylvania. Control of these invasive plants is needed, especially in or adjacent to areas that have been categorized as high quality natural areas to help control further encroachment. Some nurseries in Pennsylvania now carry a selection of tree, shrub and herbaceous species that are native to Pennsylvania, and these are recommended where plantings are necessary in, or adjacent to, natural areas. *The Vascular Flora of Pennsylvania* (Rhoads and Klein 1993) is a helpful reference for determining whether a plant species is native to the state or not. Additional references include two PA Department of Conservation and Natural Resources publications*: Invasive Plants in Pennsylvania* and *Landscaping with Native Plants in Pennsylvania.*

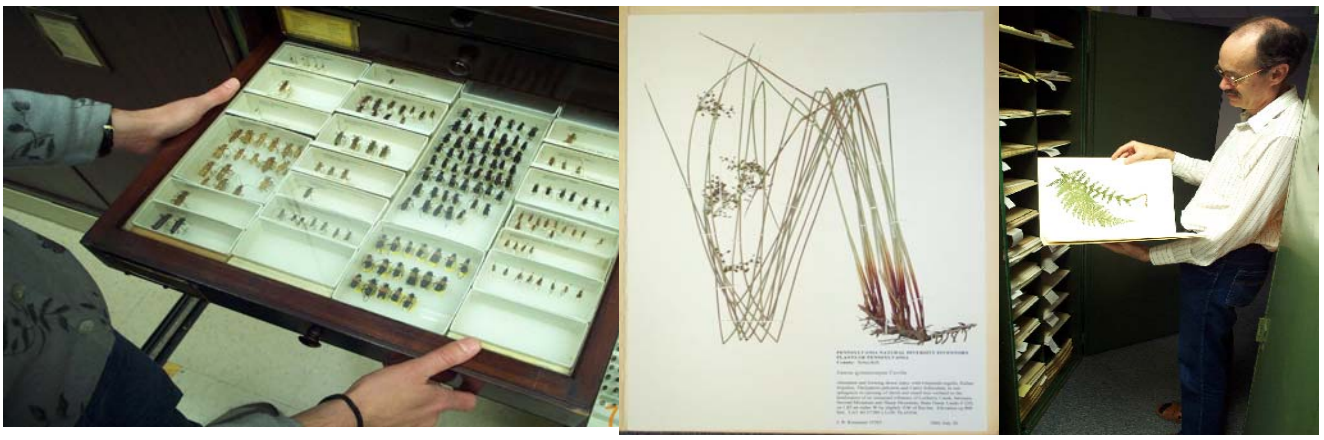
PENNSYLVANIA NATURAL HERITAGE PROGRAM DATA SYSTEM

In order to conduct an inventory of significant flora, fauna, and natural communities in the county, scientists from The Nature Conservancy PA Science Office (PSO) first consulted the Pennsylvania Natural Heritage Program (PNHP) database. PNHP was established in 1982 as a joint venture between the PA Department of Conservation and Natural Resources (DCNR), The Nature Conservancy (TNC), and the Western Pennsylvania Conservancy (WPC). In its 20 years of operation, the PNHP database has become Pennsylvania's chief storehouse of information on outstanding natural habitat types (natural communities), sensitive plants and animals (species of special concern). Several other noteworthy natural features are also mapped including DEP designated Exceptional Value Streams (Shertzer 1992) and outstanding geologic features (based on recommendations from Geyer and Bolles (1979 and 1987).

PNHP has collected existing data on occurrences of species and communities (elements) of special concern, drawing from publications, herbarium and museum specimens, and the knowledge of expert botanists, zoologists, ecologists, and naturalists. From this foundation, PNHP has focused its efforts on, and conducts systematic inventories for, the best occurrences of the priority species and natural communities.

PNHP has recorded over 15,000 detailed occurrences of species and communities of special concern, largely the result of field surveys. These are stored in computer and manual files and denoted on topographic maps. Additional data are stored in extensive manual and digital files set up for over 200 natural community types, 1400 animals, and 3500 plants. These files are organized by each of Pennsylvania's 881 7½ USGS topographic quadrangle maps using a geographic information system (GIS).

The PA Science Office has used this systematic inventory approach to identify the areas of highest natural integrity in Bradford County. The natural community and sensitive species data are the basis for judging the biological values of sites within the County. Protecting the sites with the best occurrences of the County's natural communities and good populations of sensitive plant and animal species can help to insure that a full range of biological diversity in Bradford County is preserved for the future.



The Pennsylvania Natural Diversity Inventory database has collected existing data on occurrences of species and communities (elements) of special concern, drawing from publications, herbarium and museum specimens, and the knowledge of expert botanists, zoologists, ecologists, and naturalists.

NATURAL AREAS INVENTORY METHODS

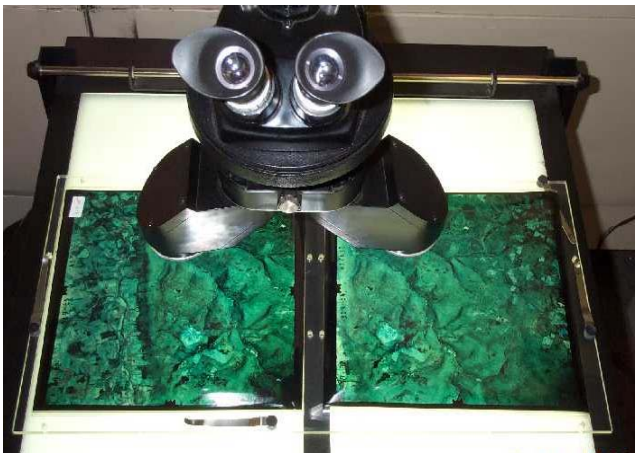
Methods used in the Bradford County Natural Areas Inventory followed Pennsylvania Natural Heritage Program (PNHP) procedures and those developed in Illinois (White 1978) and Indiana. The inventory proceeds in three stages: 1) information is gathered from the PNHP database files, local experts, and map and air photo interpretation; 2) ground surveys are preceded by one low-altitude flight over the county; and 3) data are analyzed and mapped.

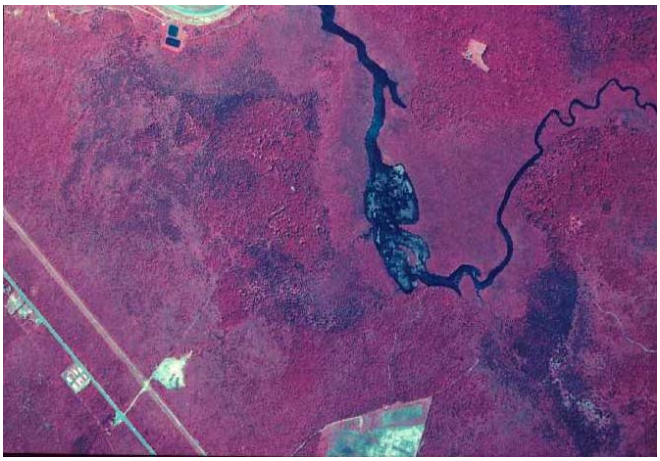
Information Gathering

A list of natural features found in the county was prepared from the PNHP database and supplemented with information volunteered by local individuals and organizations familiar with Bradford County. In April of 2002 a public meeting was held and recommended Natural Area Survey Forms (Appendix I) were distributed to facilitate public input. PNHP staff solicited information about potential natural communities, plant species of special concern and important wildlife breeding areas from knowledgeable individuals and local conservation groups. A number of potential natural areas were identified by audience members and scheduled for field surveys.

Map and Air Photo Interpretation

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





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

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

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

Field Work

Experienced PSO biologists and contractors conducted numerous field surveys throughout Bradford County during 2003 and 2004. Biologists evaluated the degree of naturalness of habitats (including assessment of percent of native vs. non-native plant species, degree of human disturbance, age of trees, etc.) and searched for plant and animal species of special concern. Workers also categorized the vegetation of each potential natural area visited. An evaluation of quality was made for each potential natural community element, care being taken to give reasons for the quality rank. Boundaries of the community types were redrawn, if needed, based on new field information. Community information recorded included the dominant, common, and other species, as well as disturbances to the community. Field forms were completed for all occurrences of plant and animal species of special concern, and natural communities (see sample Field Survey Form, Appendix III), the quality of each population or community was assessed, and locations were marked on USGS topographic quadrangle maps.

In April of 2002, one low altitude reconnaissance flight was flown over the county to provide a more accurate overview of the current condition and extent of known natural areas and to assess the potential of any additional areas.

Data Analysis

To organize the natural features data and set conservation priorities, each natural community or species (element) is ranked using factors of rarity and threat on a state-wide (state element ranking) and range-wide (global element ranking) basis (see Appendix IV). Each location of a species (an element occurrence) is ranked according to naturalness, its potential for future survival or recovery, its extent or population size, and any threats to it. An explanation of the five element occurrence quality ranks is given in Appendix V. The element-ranking and element occurrence-ranking systems help PSO personnel to simultaneously gauge the singular importance of each occurrence of, for example, a Hemlock Palustrine Forest or bog rosemary occurrence in Bradford County, as well as the statewide or world-wide importance of these natural features. Obviously, sites with a greater number of highly ranked elements merit more immediate attention than sites with a smaller number of lower ranked elements.

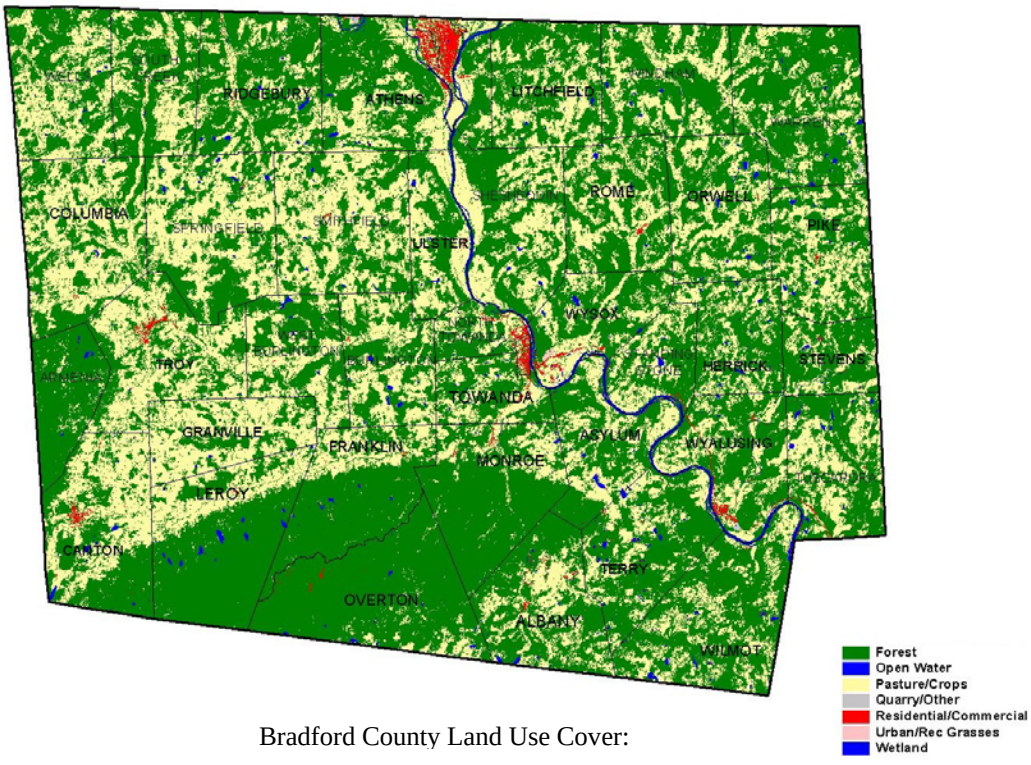
Field data for natural communities of C-rank or better and for all plant and animal species of concern found, were combined with existing data and summarized on PNHP Element Occurrence Records for mapping and computerization. Mapped locations of natural features, including approximate watershed or subwatershed boundaries, were then created and added electronically to PNHP's Geographical Information System (GIS) layer.

Information on the needs of the rare species in this report has come from a variety of sources, including field guides and research publications. For reptiles and amphibians, the major sources are Hulse et al. (2001) and DeGraaf and Rudis (1981); for birds, Brauning (1992); for moths, Covell (1984); for butterflies, Opler and Krizek (1984) and Opler and Malikul (1992); Schweitzer (1981) provided much of the information on rare moth and butterfly species in Pennsylvania. A list of Plant and Animals of Special Concern in Bradford County is provided in Appendix VI. A list of animal and plant species of concern in Pennsylvania can be viewed at http://www.dcnr.state.pa.us/forestry/pndi/

Landscape Analysis

Background: Fragmentation of the landscape by roads, utility lines, and other human disturbances can impact the surrounding landscape significantly. A road or utility line cut through a forested block cleaves the large block into two smaller blocks and significantly increases the amount of edge habitat within the forest. When a forest with a closed canopy is disturbed by road building activities, the newly disturbed soil and open canopy favor the establishment of invasive species of plants and animals. Many of these will out-compete and displace native species in this disturbed habitat. These smaller forest fragments will have significantly more edge habitat and less forest interior than the original forest block. Furthermore, fragmentation of large forest blocks decreases the ability of many species to migrate across manmade barriers such as roads. Migration corridors, once severed, isolate populations of species one from another, limit the gene flow between populations and create islands of suitable habitat surrounded by human activity. Much of the native biological diversity of an area can be preserved by avoiding further fragmentation of these large forested areas.

The larger forested blocks in the County (those of at least one mile in area ~ 640 acres) have been highlighted in an effort to draw attention to the significance of large forested blocks within the County. Besides being habitat suitable for many native species, large unfragmented forest blocks in close proximity to each other become natural corridors for species movement within and through the county. In many cases, by highlighting the larger forested blocks, the most natural landscape corridors become evident.

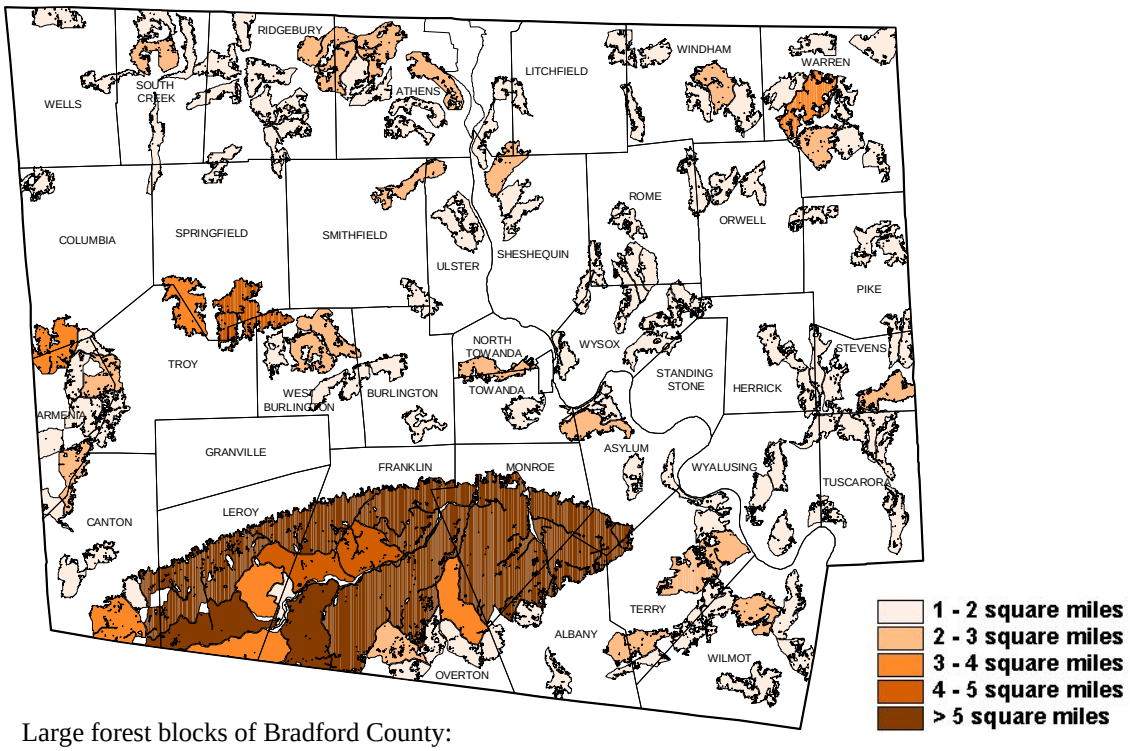


Bradford County Land Use Cover:

GIS Methodology: Creating NAI Forest Block Layers

The Pennsylvania portion of the National Land Cover Dataset (NLCD) was created as part of land cover mapping activities for Federal Region III that includes the states of Maryland, Delaware, Pennsylvania, Virginia, West Virginia, and the District of Columbia. The NLCD classification contains 21 different land cover categories with a spatial resolution of 30 meters. The NLCD was produced as a cooperative effort between the U.S. Geological Survey (USGS) and the U.S. Environmental Protection Agency (US EPA) to produce a consistent, land cover data layer for the conterminous U.S. using early 1990s Landsat thematic mapper (TM) data. The analysis and interpretation of the satellite imagery was conducted using very large, sometimes multi-state image mosaics (i.e. up to 18 Landsat scenes). Using a relatively small number of aerial photographs for 'ground truth', the thematic interpretations were necessarily conducted from a spatially-broad perspective. **This evaluation must be made remembering that the NLCD represents conditions in the early 1990s** (The Nature Conservancy 1999).

Deciduous, evergreen and mixed forest land cover types were grouped to provide a single "forested" cover type. This forest block layer was overlain by the Penn DOT road layer to identify forest blocks fragmented by roads. The Penn DOT right-of-way (ROW) distance was applied as a buffer to roads: Interstates have a 500-foot ROW, PA and US designated roads have a 150-foot ROW, local roads have a 100-foot ROW. Forest blocks with an area of greater than one square mile were selected from the forest land cover type. This process highlights interior forest blocks greater than one square mile in area as presented below.



Large forest blocks of Bradford County:
Besides being habitat suitable for many native species, large unfragmented forest blocks in close proximity to each other become natural corridors for species movement within and through the county. In many cases, by highlighting the larger forested blocks, the most natural landscape corridors become evident.

CONSERVATION RECOMMENDATIONS

The following are general recommendations for protection of natural areas within a county. Approaches to protecting a natural area are wide-ranging and factors such as land ownership, time constraints, and tools/resources available should be considered when prioritizing protection of these sites. Prioritization works best within a planning situation, however, opportunities may arise that do not conform to a plan and the decision on how to manage or protect a natural heritage area may be made on a site-by-site basis. Keep in mind that personnel in our program or staff from state natural resource agencies are available to discuss more specific options as needed.

1. Consider conservation initiatives for natural areas on private land.

Conservation easements protect land while leaving it in private ownership. A conservation easement is a legal agreement between a landowner and a conservation or government agency that permanently limits a property's use in order to protect its conservation values. It can be tailored to the needs of both landowner and conservation organization. Tax incentives apply to conservation easements.

Leases, management agreements, and mutual covenants also allow the landowner to retain ownership and ensure permanent protection of land, though in a much more limited way. There are no tax deductions for these conservation methods. A lease to a land trust or government agency can protect land temporarily and ensure that its conservation values will be maintained. This can be a first step to help a landowner decide if they want to pursue more permanent protection methods. Management agreements require landowner and land trust to work together to develop a plan for managing resources such as plant or animal habitat, or protecting a watershed. Mutual covenants can be appropriate where land protection is important to several landowners but not of sufficient benefit to the general public to warrant a conservation easement.

Land acquisition can be at fair market value, as a last resort by conservation organization, or as a bargain sale in which a sale is negotiated for a purchase price below fair market value with tax benefits that reduce or eliminate the disparity. The NAI will help to pinpoint areas that may be excellent locations for new county or township parks. Sites that can serve more than one purpose such as wildlife habitat, flood and sediment control, water supply, recreation, and environmental education would be particularly ideal. Private lands adjacent to public should be examined for acquisition when a priority site is present on either property and there is a need of additional land to complete protection of the associated natural features.

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

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

2. Prepare management plans that address species of special concern and natural communities.

Many of the already-protected natural areas are in need of additional management recommendations to ensure the continued existence of the associated natural elements. We hope that managers will incorporate specific recommendations into existing plans or prepare new plans. These may include: removal of exotic plant species; leaving the area alone to mature and recover from previous disturbance; creating natural areas within existing parks; limiting land-use practices such as mineral extraction, residential or industrial development, agriculture and certain forestry practices.

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

3. Protect bodies of water.

Protection of reservoirs, wetlands, rivers, and creeks is vital; especially those that protect biodiversity, supply drinking water, and are attractive recreational resources. Many sites that include rare species, unique natural communities or locally significant habitats are associated with water. Protection of high quality watersheds is the only way to ensure the viability of natural habitats and water quality. Land managers and township officials should scrutinize development proposals for their impact on entire watersheds not just the immediate project area. Cooperative efforts in land use planning among municipal, county, state, and federal agencies, developers, and residents can lessen the impact of development on watersheds.

4. Provide for buffers around natural areas.

Development plans should provide for natural buffers between disturbances and natural areas, be it a barrens community, wetland, water body, or forest. Disturbances may include construction of new roads and utility corridors, non-conservation timber harvesting, and disruption of large pieces of land. County and township officials can encourage landowners to maintain vegetated buffer zones within riparian zones. Vegetated buffers (preferably of PA-native plant species) help reduce erosion and sedimentation and shade/cool the water. This benefits aquatic animal life, provides habitat for other wildlife species, and creates a diversity of habitats along the creek or stream.

Watersheds or subwatersheds where natural communities and species of special concern occur (outlined on the Township maps in this report) should be viewed as areas of sensitivity, although all portions of the watershed may not be zones of potential impact. As an example, conserving natural areas around municipal water supply watersheds provides an additional protective buffer around the water supply, habitat for wildlife, and may also provide low-impact recreation opportunities.

5. Reduce fragmentation of surrounding landscape.

Residents and township officials should encourage development in sites that have already seen past disturbances. Care should be taken to ensure that protected natural areas do not become "islands" surrounded by development. In these situations, the site is effectively isolated and its value for wildlife is reduced. Careful planning can maintain natural environments and the plants and animals associated with them. A balance between growth and the conservation of natural and

scenic resources can be achieved by guiding development away from the most environmentally sensitive areas.

The reclamation of previously disturbed areas, or brownfields development, for commercial and industrial projects presents one way to encourage economic growth while allowing ecologically sensitive areas to remain undisturbed. Cluster development could be used to allow the same amount of development on much less land and leave much of the remaining land intact for wildlife and native plants. By compressing development into already disturbed areas with existing infrastructure (villages, roads, existing ROW's), large pieces of the landscape can be maintained intact. If possible, networks or corridors of woodlands or greenspace should be preserved linking sensitive natural areas to each other.

6.Encourage the formation of grassroots organizations.

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

7.Manage for invasive species.

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

The ***Mid-Atlantic Exotic Plant Pest Council*** (MA-EPPC) is a non-profit organization (501c3) dedicated to addressing the problem of invasive exotic plants and their threat to the Mid-Atlantic region's economy, environment, and human health by: providing leadership; representing the mid-Atlantic region at national meetings and conferences; monitoring and disseminating research on impacts and controls; facilitating information development and exchange; and coordinating on-the-ground removal and training. A membership brochure is available as a pdf file at http://www.ma-eppc.org .

Several excellent web sites exist to provide information about invasive exotic species. The following sources provide individual species profiles for the most troublesome invaders, with information such as the species' country of origin, ecological impact, geographic distribution, as well as an evaluation of possible control techniques.

The Nature Conservancy's Weeds on the Web at http://tncweeds.ucdavis.edu/
The Virginia Natural Heritage Program's invasive plant page at
http://www.dcr.state.va.us/dnh/invinfo.htm
The Missouri Department of Conservation's Missouri Vegetation Management Manual at
http://www.conservation.state.mo.us/nathis/exotic/vegman/

The following site is a national invasive species information clearinghouse listing numerous other resources on a variety of related topics:
http://www.invasivespecies.gov/

RESULTS

Each year biologists from various taxonomic groups of the Pennsylvania Biological Survey meet to discuss and rank the most important species for the protection of biodiversity in Pennsylvania. The various Biological Technical Committees include the Vascular Plant Technical Committee, the Herpetological Technical Committee and the Ornithological Technical Committee. These meetings consist of a review and ranking of species of concern within the state, in terms of the rarity and quality of the species or habitats of concern, potential threats, and protection needs. The results of these meetings provide a baseline for evaluating the statewide significance of the species recognized in the Natural Areas Inventory. The list of sites for Bradford County was then evaluated by the Pennsylvania Science Office of The Nature Conservancy and ranked in order of importance for conservation of biodiversity at a statewide level based on the relative importance of the species found there. Rankings are also based on the ecological integrity of the site.

Priorities for Protection

The Natural Areas Inventory recognizes sites at two primary levels of significance for the protection of biological diversity: 1) sites of statewide importance and 2) sites of local significance.

Table 2 presented in the Results section prioritizes sites with natural communities and species of concern documented in Bradford County. These sites are displayed in **UPPER CASE LETTERS** throughout the report. This table ranks sites from the most important and threatened to the least. Ranks are based on rarity, quality, and threats or management needs of the elements at the site. Sites in this category that are ranked 1 or 2 may contain some of the best natural areas in the state. Table 2 lists the site name, local jurisdiction, and pertinent information about the site. A more detailed description for each site is included in the text for each Township in which it occurs.

"Locally Significant" sites are indicated in **Title Case Letters** throughout the document, and are briefly discussed in the text accompanying each map. These are sites at which species of special concern or high-quality natural communities could not be documented during the survey period. These areas are not exemplary at the state level, but may be important at the county level. Examples would include relatively intact forested areas, large wetlands, and other areas significant for maintaining local biodiversity. These secondary sites are arranged in Table 3 in the Results section. They have been given qualitative ranks (high, medium, or low) according to size, level of disturbance, proximity to other open-space lands, and potential for sustaining a diversity of plant and animal life. These secondary-site ranks must be viewed as very approximate.

Each of the primary sites identified in this report has associated with it areas described as **Core Habitat** and **Supporting Landscape**. Core Habitat areas are intended to identify the essential habitat of the species of concern or natural community that can absorb very little activity or disturbance without substantial impact to the natural features. The Supporting Landscape identifies areas surrounding or adjacent to core habitat that are not considered the primary habitat of the species of concern or natural community, but may serve as secondary habitat. These areas also provide support by maintaining vital ecological processes as well as isolation from potential environmental degradation. Supporting Landscape areas may be able to accommodate some types of activities without detriment to natural resources of concern.

Exceptional Natural Feature

The southern quarter of Bradford County is within the Glaciated High Plateau Section of the Allegheny Plateaus Physiographic Province. The High Plateau section rises dramatically in elevation from the relatively lower adjacent landscape. Numerous cliffs and waterfalls spill down from the high section to the low section with an average 1000-foot change in elevation. This section is mostly forested, with the bulk of the area in public lands comprised of State Game Lands #12 and #36. The High Plateau is dotted with numerous large and small wetlands, seeps, rock outcrops and waterfalls, within a matrix of extensive, almost unbroken forest cover. This region of the county represents one of the highest quality natural areas in the state. One could spend many years conducting a biological inventory of this portion of the county alone.

Top Priority Natural Areas in Bradford County

CARBON RUN WETLANDS (Franklin and Leroy Townships): Several shrub swamps and an artificially impounded pond occupy the core habitat of this site. The surrounding landscape bears the scars of past mining operations, but the area has since reverted to forest. A total of seven animal species of concern have been documented at this location. All utilize the wetlands as their primary habitat. **Northern Harrier (*Circus cyaneus*) a G5, S3B, S4N PA animal species of concern** has been documented as breeding at this site since it was added to the PA species of concern list in 1985. A good-quality population of **a terrestrial invertebrate species of concern, the G4G5, S2 bog copper butterfly (*Lycaena epixanthe*)**, and **five other aquatic species of concern** were also documented at this location.

COUNTY LINE BOGS (Wilmot Township and Wyoming County): The series of wetlands identified in this site are bogs in which the water levels have been elevated in recent years by beaver and human activity. Two plants and one animal species of concern were documented at this site. The **G5, S2 lesser panicled sedge (*Carex diandra*)** and the **G5, S3 slender sedge (*Carex lasiocarpa*)** were found in these wetlands along with other plant species typical of acidic bog habitats such as the insectivorous pitcher plant and cranberries. A butterfly species that feeds exclusively on cranberry plants during its larval stage, the **G4G5, S2 bog copper butterfly (*Lycaena epixanthe*),** was found among dense patches of cranberries at this site. The bog habitat that remains at these sites is primarily restricted to floating mats of thick sphagnum moss that have been colonized by herbs, shrubs and trees. These floating mats are the fragile remains of the bog system that used to characterize these wetlands prior to raised water levels.

SUGAR RUN HEADWATERS (Overton Township): This site along Sugar Run is a northern hardwood forest with an excellent diversity of spring ephemeral wildflowers including a population of a **G5, S1 plant species of concern, the great–spurred violet (*Viola selkirkii*)**. A small mammal survey of the headwaters of Sugar Run documented a population of the **G5T5, S3 animal species of concern, northern water shrew (*Sorex palustris albibarbis*).** The water shrew is a boreal species, also inhabiting relict habitat in southern mountains. It requires high quality water, preferably mountain streams, and abundant cover such as rocks, logs, or overhanging stream banks. Suitable management consists primarily of maintaining these conditions (NatureServe 2004).

SUSQUEHANNA RIVER (Entire length): The Susquehanna River has cut deeply through Bradford County, creating soaring rock outcrops opposite low-lying floodplains. The river is subject to great fluctuations in its water level, from a near trickle during dry periods to severe flooding events. The action of the powerful ebb and flow of the river has created various microhabitats along its length. The steep cliff communities, scoured islands, oxbows and wide floodplains can all have unique assemblages of plants and animals. The frequently scoured cobble substrate of the Susquehanna River provides quality habitat for numerous populations of fish, turtles, freshwater mussels and other aquatic invertebrates including **four aquatic animal species of concern** that were documented in the river as part of this survey. **Illinois pondweed (*Potamogeton illinoensis*), a G5, S3S4 plant species of concern** and **Bald Eagles** have also been documented along the river in Bradford County. Many of the ice and flood scoured islands have distinctive "Big bluestem (*Andropogon gerardii*)-Indian grass (*Sorghastrum nutans*) River Grasslands", which are natural tall grassland communities created as the result of these natural disturbances. These natural communities are part of the "Riverbed – Bank – Floodplain Community Complex" (Fike 1999), a broadly defined mosaic of community types that typify much of the natural vegetation along the Susquehanna River.

THREE FALLS GLEN (Ridgebury and South Creek Townships): This large unfragmented forested block contains a series of waterfalls from which the creek gets its name. The falls spill through extremely steep sidewalls that are primarily dry outcrops of fossil-bearing shale that contain an interesting mix of vegetation. This site contains a **G5, S1 PA-threatened plant species of concern, ebony sedge (*Carex eburnea*).** Though considered secure at the global level, this plant is currently known from only seven other counties in the state. The forest surrounding the creek and waterfalls is primarily a hemlock – northern hardwood forest, with a rich and well developed shrub and herb layer.

Table 2: Summary of the sites of statewide significance for the protection of biological diversity in Bradford County in approximate order of priority from the most important (rank = 1) to the least (rank = 5). The presence of species of special concern and/or exemplary natural communities has been documented at these sites. More in-depth information on each site including detailed site descriptions and management recommendations where appropriate can be found in the text of the report following the maps for each municipality.

County Rank[1]	Site Name	Municipality	PA Heritage Ranks[2] and Site Importance
1	Carbon Run Wetlands	Franklin & Leroy Twps.	Several shrub swamps and an artificially impounded pond occupy the core habitat of this site. The surrounding landscape bears the scars of past mining operations, but the area has since reverted to forest. A total of seven animal species of concern have been documented at this location. All utilize the wetlands as their primary habitat. **Northern Harriers (*Circus cyaneus*) a G5, S3B, S4N PA animal species of concern** have been documented as breeding at this site since they were added to the PA species of concern list in 1985. A good-quality population of a terrestrial invertebrate species of concern, the **G4G5, S2 bog copper butterfly (*Lycaena epixanthe*)**, was also documented from this site. **Five other aquatic species of concern** were also documented at this location.
1	County Line Bogs	Wilmot Twp. & Wyoming Co.	Two plants and one animal species of concern were documented from this site. The **G5, S2 lesser panicled sedge (*Carex diandra*)** and the **G5, S3 slender sedge (*Carex lasiocarpa*)** were found in these wetlands along with other plant species typical of acidic bog habitats such as the insectivorous pitcher plant and cranberries. A butterfly species that feeds exclusively on cranberry plants during its larval stage, the **G4G5, S2 bog copper (*Lycaena epixanthe*),** was found among dense patches of cranberries at this site. The bog habitat that remains at these sites is primarily restricted to floating mats of thick sphagnum moss that have been colonized by herbs, shrubs and trees. These floating mats are the fragile remains of the bog system that used to characterize these wetlands prior to raised water levels.
1	Sugar Run Headwaters	Overton Twp.	There is an excellent diversity of spring ephemeral wildflowers including a population of a **G5, S1 plant species of concern, the great–spurred violet (*Viola selkirkii*)**. A small mammal survey of the headwaters of Sugar Run documented a population of the **G5T5, S3 animal species of concern, northern water shrew (*Sorex palustris albibarbis*).**

County Rank[1]	Site Name	Municipality	PA Heritage Ranks[2] and Site Importance
1	Susquehanna River (Upper Section)	Athens, Litchfield, Sheshequin & Ulster Twps.	**A G5, S3S4 plant species of concern, Illinois pondweed (*Potamogeton illinoensis*), and four aquatic animal species of concern** were documented in the Susquehanna River near Athens during a survey of this portion of the Susquehanna River in 2003. Additional surveys are recommended to better estimate populations of these species of concern in the river.
1	Susquehanna River (Middle Section)	Asylum, North Towanda, Standing Stone, Towanda, & Wysox Twps.	**Nesting Bald Eagles, and four aquatic animal species of concern** have been documented along this section of the Susquehanna River. Additional surveys are recommended to better estimate populations of these species of concern in the river.
1	Susquehanna River (Lower Section)	Terry, Tuscarora, Wilmot & Wyalusing Twps.	**Four aquatic animal species of concern** have been documented along this section of the Susquehanna River. Additional surveys are recommended to better estimate populations of these species of concern in the river.
1	Three Falls Glen	Ridgebury & South Creek Twps.	This large unfragmented forested block contains a series of waterfalls, which spill through extremely steep sidewalls that contain an interesting mix of vegetation. This site contains a **G5, S1 PA-Threatened plant species of concern, ebony sedge (*Carex eburnea*).**
2	North Branch Sugar Creek Rookery	Columbia & Troy Twps.	This site contains a large nesting colony of **Great Blue Herons (*Ardea herodias*), a G5, S3S4B,S4N animal species of concern.**
3	Armenia Mountain Wetlands	Armenia Twp.	This site is a boggy shrub thicket surrounded by a well-drained mixed hardwood-conifer forest. A fair-quality population of the **G5, S3 plant species of concern creeping snowberry (*Gaultheria hispidula*)** was documented at this site. This site falls primarily within Tioga State Forest.
3	Lower Schrader Creek	Franklin, Leroy, Monroe & Overton Twps.	This site contains a rookery of **Great Blue Herons (*Ardea herodias*), a G5, S3S4B,S4N animal species of concern**. Twenty nests of this species were found in white pines in a slightly fragmented forest dominated by white pine with a few eastern hemlock and sparse understory layer. Schrader Creek is also designated a High Quality Cold Water Fishery from Coal Run to Towanda Creek by the Department of Environmental Protection.

County Rank[1]	Site Name	Municipality	PA Heritage Ranks[2] and Site Importance
3	Standing Stone Marsh	Standing Stone Twp.	There are several wetlands within an agricultural context at this location. Breeding populations of two bird species of concern the **G5, S3B Sora (*Porzana carolina*), and the G5, S3B Virginia Rail *(Rallus limicola)*** were documented at this site.
3	Sugar Run Creek	Wilmot Twp.	A nesting colony of **Great Blue Herons (*Ardea herodias*), a G5, S3S4BS4N animal species of concern**, was documented at this forested site.
4	Coal Run	Franklin Twp.	Coal Run is considered a **High Quality Cold Water Fishery** from its source of Swimming Dam to its confluence with Schrader Creek. The slopes of the run have a very good variety of spring ephemeral wildflowers, including the **G5, S1 plant species of concern, great-spurred violet (*Viola selkirkii*)**.
4	Corbin Creek Wetlands	Warren Twp.	Corbin Creek has experienced periodic modification by beaver, which have created a series of pools and shrub meadows in various states of succession. A **G5, S3 PA-rare plant species of concern, soft-leaved sedge (*Carex disperma*)**, was documented along the creek in a hemlock palustrine forest natural community.
4	Highland Wetlands	Burlington Twp.	This wetland complex contains three main wetland habitats: two bog-like shrub-herbaceous openings, and one artificially created lake. Much of this wetland complex has a wide forested buffer from adjacent residential and agricultural activities. This wetland complex provides important habitat for an array of marsh and wetland dependent wildlife species including **Northern Harrier (*Circus cyaneus*), a G5, S3BS4N animal species of concern.**
4	Mill Creek Wetlands	Tuscarora Twp.	This site contains two artificially dammed lakes and one beaver-impacted wetland. The **sedge skipper (*Euphyes dion*), a G4, S1 animal species of concern,** was documented at this site. There is only one other known record for this species in Pennsylvania. Also documented at this site was a **G5, S2S3 aquatic animal species of concern.**
4	Kellogg Mountain	Monroe Twp.	The flat plateau-like top of Kellogg Mountain has many extensive flat rock outcrops and several small shrub-dominated wetlands. This site supports a **G4, S3S4 aquatic animal species of concern.**

County Rank[1]	Site Name	Municipality	PA Heritage Ranks[2] and Site Importance
4	Lake Ondawa Headwaters	Springfield Twp.	Wetlands at this site include a hemlock palustrine forest, in which a population of a **G5, S3 PA-rare plant species of concern, soft-leaved sedge (*Carex disperma*)** was documented.
4	Lye Run Wetlands	Canton & Leroy Twps. and Sullivan Co.	This site includes an artificially created open-water pond, several areas of dense shrub swamp, and one herbaceous-dominated wetland. The northern edge of the man-made pond at this site still contains some characteristic acidic bog plant species. **Two aquatic animal species of concern** were documented at this site. This site occurs primarily on State Game Lands #12.
4	Marsh Run Bog	Leroy Twp.	**A Leatherleaf-sedge Wetland Natural Community**, a component of the Acidic Glacial Peatland Complex (Fike 1999), dominates this particular wetland. The wetland drains both to the north and to the south, the wetland sitting on the divide between the Towanda Creek and Schrader Run watersheds. The northern portion drains off the steep divide between the high and low portions of the glaciated plateau. This run likely has waterfalls along the course of its rapid decent off the mountain. Waterfalls occasionally harbor specialized species of plants that are well suited to the cool, moist microhabitat found here.
4	McCraney Run Bog	Leroy Twp.	This site is a mountaintop beaver meadow that has been flooded and then abandoned by beavers many times over the years. Succession has advanced, to be set back by flooding from beaver impoundments. **Three aquatic species of concern** have been documented at this location.
4	Quicks Bend	Wilmot Twp.	A fair-quality population of the **G5, S3 plant species of concern, white trout-lily (*Erythronium albidum*)** was documented along the banks of the Susquehanna River at Quicks Bend. Though there are several historical records for this species in other northern portions of the state, this population may be the northernmost known existing location for this species in Pennsylvania.
4	Rienze Wetlands	Terry Twp.	This site contains a beaver impacted wetland with a fair-quality population of a **G5, S1 plant species of concern, the backwards sedge (*Carex retrorsa*).**

County Rank[1]	Site Name	Municipality	PA Heritage Ranks[2] and Site Importance
4	Round Top Park and Slopes	AthensTwp.	**Wild blue lupine (*Lupinus perennis*) a G5, S3 plant species of concern** had been documented at this location in 1992. A survey for this species in 2004 was unable to relocate this population of lupine. The 2004 survey did document two previously unreported plant species of concern, the **G4G5, S1 PA- threatened wild pea (*Lathyrus ochroleucus*),** and the **G3G4Q, S2 drooping bluegrass (*Poa languida*).** These species both occur on the forested slopes overlooking the Chemung River.
4	Rt-6 County Line Wetlands	Columbia Twp.	This site contains forested wetlands that support a good–quality population of the **soft-leaved sedge (*Carex disperma*) a G5, S3 PA-Rare plant species of concern**. This site has richly diverse vegetation that includes a Hemlock Palustrine Forest Natural Community. A rare fern species, Clinton's shield fern (*Dryopteris clintoniana*) was last documented from this site in 1935. This fern was not relocated at this site.
4	Wyalusing Rocks	Wyalusing Twp.	The dramatic cliffs along the Susquehanna River at the French Azilum Overlook provide a breathtaking view of the Susquehanna River and the valley below. This area is considered an **outstanding scenic geologic feature** (Gyer & Bolles 1979). This site contains the **G5, S2 plant species of concern Appalachian sand cherry (*Prunus pumila var. susquehanae*).** Other species of concern are also likely to inhabit this specialized habitat as well as the adjacent hemlock-dominated ravine. A good-quality population of a dwarfed form of serviceberry (*Amelanchier sp.)* has also been documented from this location. The serviceberries are notoriously difficult to distinguish one from another, and these specimens are still under review.
5	Coyles Corners Wetlands	Albany & Terry Twps.	Most of this chain of wetlands has been modified by dams to create a series of open water ponds. The ponds still have remnants of the wetland vegetation in shallow areas along edges and upstream ends of ponds. **A G5, S2S3 aquatic animal species of concern** was documented at this site.
5	Deer Lick Woods	Sheshequin Twp.	A fair-quality population of a **G4G5, S1 PA-threatened plant species of concern, wild pea (*Lathyrus ochroleucus*)**, occurs on loose shale substrate primarily along the road in this area.

County Rank[1]	Site Name	Municipality	PA Heritage Ranks[2] and Site Importance
5	Edingers School Wetlands	Tuscarora Twp.	A bog remnant at this site contains a small population of the **lesser-panicled sedge (*Carex diandra*) a G5, S2 PA-threatened plant species of concern**. This small circular wetland has floating mats of diverse vegetation buoyed by thick accumulations of sphagnum moss in a partially degraded agricultural context.
5	Lake of the Meadows	Warren Twp. & Susquehanna County	This lake, straddling the Bradford-Susquehanna County border, is a flooded bog remnant. The floating islands are buoyed by thick layers of sphagnum moss, and dominated by a tangle of the short shrub, leatherleaf. Also on the floating mats is a small population of the **G5, S3 PA-rare plant species of concern, bog rosemary (*Andromeda polifolia*)**. Together with the leatherleaf, this characterizes **a Leatherleaf-bog rosemary Peatland Natural Community.**
5	Limehill	Standing Stone & Wyalusing Twps.	A fair-quality population of a **G4G5, S1 PA-threatened plant species of concern, wild pea (*Lathyrus ochroleucus*)**, occurs on loose shale substrate primarily along the road in this area.
5	Canton Mud Pond	Canton Twp.	The wetland at this site is an open-water pond that has pronounced 'bulls-eye' ring zones of vegetation. A ring of floating islands occurs towards the center of the pond, and is a near monoculture of water-willow (*Decodon verticillatus*), forming a **Water-willow Shrub Wetland Natural Community.** Inside the ring of water-willow islands is a circular area of open water, which is likely a very deep central zone in this pond.
5	Sunfish Pond	Leroy Twp.	This site includes Sunfish Pond County Park, which is an artificial lake formed by damming a tributary to Little Schrader Creek. The park offers recreational opportunities like fishing, boating, picnicking and camping surrounded by State Game lands #12. **A G4, S2S3 aquatic animal species of concern** was documented at this site.
5	Terrytown Woods	Terry & Wilmot Twps.	A small population of a **G4G5, S1 PA-threatened plant species of concern, wild pea (*Lathyrus ochroleucus*)**, was documented on loose shale substrate primarily along the road in this area in 1989. A survey in 2004 was unable to relocate this population.
5	Williams Lake Wetlands	Overton Twp. & Sullivan Co.	Williams Lake is an isolated mountain bog that has received periodic flooding by beaver. The wetlands to the north have areas that are dominated by shrubs and herbaceous vegetation. **Two aquatic animal species of concern were documented at this site in 1993**.

Table 3. Areas of Local Significance in Bradford County based on size, diversity of wildlife and plant life, water quality protection, and recreation potential (these sites do not have documented populations of species of special concern although most of these areas have potential for rare species to occur).

County Rank[1]	Site Name	Municipality(ies)	Natural Feature and Importance
High	Case Glen	Armenia & Troy Twps.	This aerial photo determined site contains the extremely steep ravine known as Case Glen and the headwater wetlands of the West Branch of Sugar Creek. This hemlock-dominated ravine likely has waterfalls along the course of its very rapid decent. The groundwater feeding the headwaters of West Branch Sugar Creek originates in an extensive wetland that has been artificially divided into two portions. The southern portion has been modified by a dam into an open water pond, while the northern portion appears to have been unaltered, retaining its natural bog habitat.
High	Crane Swamp	Wilmot Twp.	This site is well known for having a good diversity of wetland dependent and pond bird species and is commonly visited by birders. At the time of visit, this area was a large pond with herbaceous plants dominating the edges and lots of aquatic vegetation. One area was an open shrub swamp with herbaceous openings. This area showed signs of beaver activity and probably has been flooded recently.
High	East Holcomb Pond Wetlands	Franklin & Leroy Twps.	The series of small wetlands at this aerial photo-determined site drain north towards Holcomb Pond and from there off the steep side of the high plateau. The wetlands appear to contain a variety of habitat types including shrub swamps, conifer forested wetlands, herbaceous wetlands and open water. All of the wetlands are likely to have had past or current beaver impoundments. The drainage continues northward off the steep mountainside, likely creating waterfalls along its rapid descent.
High	Falls Creek Wetlands	Franklin Twp.	Most of this site was identified from aerial photo interpretation. Falls Creek drains southward into Schrader Creek, creating a series of waterfalls along steep portions of its descent. The headwaters are a series of expansive wetlands, which appear to vary from thick shrub swamps to more open herbaceous-dominated wetlands and one large artificially impounded open water pond.
High	Gulf Pond	Orwell Twp.	The relatively undisturbed surroundings of this bog-like wetland and the fact that it seems to have avoided flooding by both humans and beavers are the reasons this is considered a high quality natural community.

County Rank[1]	Site Name	Municipality(ies)	Natural Feature and Importance
High	Little Schrader Creek Headwaters	Leroy Twp.	This site was identified from aerial photo interpretation. This site includes what appears to be a large, open, shrub-swamp wetland that has experienced periodic flooding due to beaver activity.
High	Overton Ponds	Overton Twp.	This site contains four open-water ponds and one pond with a floating mat of vegetation. All may have beaver or human created dams, or may be naturally occurring.
High	SGL #36 Reclaimed Strip Mine	Franklin Twp.	A former strip-mine, this site is a large, open area that has been successfully reclaimed with plantings of a variety of grasses and low shrubs to create an open savannah-like habitat. This type of habitat provides exceptional surroundings for a large diversity of early successional and grassland dependent bird species. This area is probably the best reclaimed strip mine in the county and possibly the best in the region. The bird list is extensive in this area.
High	Swimming Dam Bog	Franklin Twp.	A former bog, the remnants of this habitat type persist as a large area of floating mats of vegetation buoyed by thick accumulations of sphagnum moss. The floating mats are dominated by characteristic bog species of plants that are adapted to the acidic conditions typically encountered in these habitats.
High	Tamarack Swamp	Armenia & Troy Twps.	Tamarack Swamp, from aerial photo interpretation, is a high elevation bog that appears to have been modified by a man-made dam. The flooded bog habitat persists as a large floating vegetated island surrounded by open water. The island vegetation is likely composed primarily of leatherleaf as in similar habitats in the county. This bog system is likely the site of a 90 year old record for bog rosemary (*Andromeda polifolia*) documented in 1913 as occurring in a bog southwest of Troy.
High	West Branch Parks Creek	Windham Twp.	This aerial photo determined site includes the beaver influenced wetland along the floodplain of West Branch Parks Creek and the adjacent conifer dominated forest. The wetland at this site appears to be fairly diverse, with sections of herbaceous openings and shrub dominated areas interrupted by open water ponds, with the creek meandering through the broad, flat floodplain. The wetland opening is bordered by a dense conifer forest that may have waterlogged soils, creating a hemlock palustrine forest. This section of the creek has an excellent undisturbed forested buffer.

County Rank[1]	Site Name	Municipality(ies)	Natural Feature and Importance
High	Wolf Run – Rollinson Run Wetlands	Leroy Twp.	This site contains several very dense shrub swamps with many plant species that are characteristic of northern acidic wetlands. The wetlands at this site provide habitat for a variety of wildlife within an excellent forested context.
Medium	Ackley Pond	Tuscarora Twp.	Viewed from the air, this wetland has distinct ringed zones of vegetation characteristic of a kettlehole bog. The outer edges of the bog are dominated by water tolerant trees, diminishing to shrubs and herbaceous vegetation on top of a thick layer of sphagnum moss towards the center. The southern portion of the wetland appears to have a hemlock swamp forest outside the bog perimeter.
Medium	Armenia Mountain Ravines	Armenia & Troy Twps.	This site was determined from aerial photo interpretation. These hemlock-dominated ravines likely have waterfalls along the course of their very rapid decent. These habitats may harbor species adapted to the high moisture environment found here, especially where the falls cut through calcareous bedrock parent material.
Medium	Beaver Meadow Wetlands	Stevens & Tuscarora Twps.	This site includes two wetlands connected by a narrow drainage. The southern portion of the wetland has been flooded by the construction of a dam, creating an open-water environment. The upper portion has not been severely impacted by this hydrologic modification, and still supports much of its bog-like vegetation, floating on thick mats of sphagnum moss.
Medium	Big Pond Wetlands	Springfield Twp.	This site is significant for its variety of wetland habitats that provide a quality environment for numerous wetland plant and animal species.
Medium	Carey Swamp	Pike & Warren Twps.	This aerial-photo determined locally significant site may be natural, or may have been dammed. A ground survey is needed for confirmation. A good conifer forest surrounds the wetland as a buffer.
Medium	Cold Creek	Herrick Twp.	This site was determined from aerial photo interpretation. Cold Creek passes through a largely unfragmented forest block south of Herrickville. The flat floodplain of the creek expands periodically into broad herbaceous wetlands, likely the result of past beaver activity. This forested creek floodplain functions as wildlife habitat and a natural wildlife corridor, providing cover and food for wildlife.

County Rank[1]	Site Name	Municipality(ies)	Natural Feature and Importance
Medium	Cumiskey Wetlands	Wilmot Twp.	The wetland at this aerial photo determined site appears to have been periodically influenced by beaver activity. A large, open shrub and herbaceous dominated wetland occupies the central portion of this wetland complex. An open water channel winds through the wetland. A conifer-dominated swamp forest appears to dominate the eastern and northern edges of the open wetland.
Medium	Grover Wetlands	Canton Twp.	An extensive shrub and herbaceous wetland has formed between Grover and the County line as the water draining off the eastern slopes is trapped at the base of the railroad grade. This wetland provides good quality habitat for wetland dependent species of plants and animals.
Medium	Herrickville Wetland	Herrick & Orwell Twps.	This site was determined from aerial photo interpretation. The wetland at this site appears to have a perimeter of herbaceous vegetation surrounding a central area of open water or floating sphagnum moss. The wetland is buffered by a mostly hemlock and white pine forest, with agricultural fields in portions of the adjacent uplands. This site likely has a characteristic northern acidic wetland plant community, which could include leatherleaf, cranberry and various sedges.
Medium	Little Pond	Springfield Twp.	This pond has a ring of floating vegetation islands, characteristic of a flooded bog. This bog remnant is likely protected from non-point sources of pollution, and from introduced species of plants by a relatively intact forested buffer.
Medium	North Branch Towanda Creek	Granville & Troy Twps.	This site was determined from aerial photo interpretation. The North Branch Towanda Creek between Granville Summit and Alba forms a series of narrow curves and oxbows within its relatively flat floodplain. Wide shrub swamps, marshes and forested wetlands border the creek in many places. This linear wetland provides habitat and a natural landscape corridor for wildlife movement through the area.
Medium	South Creek Floodplain at Dunning	South Creek Twp.	This portion of the South Creek floodplain near Dunning, is an extensive shrub swamp mostly within State Game Lands #123. This area provides cover, food and a valuable wildlife corridor for many species of plants and animals.
Medium	Vawter Wetlands	Litchfield Twp.	This site contains a wetland with floating mats of thick sphagnum moss that are dominated by shrubs and small trees. The wetland has an elevated water level, likely due to blocked drainage from an adjacent road. A wide border of uneven-aged swampy conifer forest dominated by hemlock and white pine surrounds most of the pond, creating a significant buffer to a portion of this wetland.

County Rank[1]	Site Name	Municipality(ies)	Natural Feature and Importance
Medium	West Holcomb Pond Wetlands	Leroy Twp.	Included in this aerial photo determined site are what appear to be an open-water, artificially-enhanced pond, a shrub swamp and a narrow ravine with waterfalls.
Medium	Windham Summit Wetland	Windham Twp.	This large open wetland, determined from aerial photo interpretation, appears to be largely dominated by herbaceous and short shrub vegetation. There has likely been past or ongoing beaver influence on the hydrology. The conifer forest on the northern edge of the wetland may have saturated soils, grading into a hemlock palustrine forest.
Low	Balsam Pond	Smithfield & Ulster Twps.	This wetland at the headwaters of Cash Creek has likely been flooded by a man-made dam, though the dam is not apparent in the aerial photo used to determine this site. A cluster of floating islands at the northern end of the pond likely includes an assemblage of characteristic northern acidic bog species of plants.
Low	Beaver Pond Wetlands	Albany Twp.	Beaver and human dam building activities have altered much of the shallow wetland hydrology at this site. There are two large wetlands and two smaller wetlands in this complex. A site visit in 1993 documented a population of the recently delisted plant species pointed water meal (*Wolffia brasiliensis*). The wetlands continue to provide valuable habitat for aquatic dependent species.
Low	Cash Pond	Franklin Twp.	This site includes the headwater wetlands of Long Valley Run and Cash Pond. These mostly open water ponds have apparently been flooded by beaver activity. The largest pond to the north is a drowned forest, while the other two ponds are less flooded. Cash Pond is an artificially-enhanced open water wetland. This pond retains some of its former wetland vegetation at its northern inflow. Migrating waterfowl, particularly ducks and geese, likely use the open water habitat at this site. This site is primarily in State Game Lands #36.
Low	Liberty Corners Wetlands	Asylum & Monroe Twps.	Wetlands at this aerial photo-determined site include a recently flooded bog remnant and herbaceous wetlands in a largely agricultural context.
Low	Mount Selleck Wetland	West Burlington Twp.	The large shrub dominated wetland at this aerial photo-determined site has likely seen past or current beaver activity. This periodic hydrologic disturbance helps to keep this wetland in a successional stage. This wetland likely has an assemblage of plants characteristic of northern acidic wetlands such as leatherleaf, cotton-grass, and highbush blueberry.

County Rank[1]	Site Name	Municipality(ies)	Natural Feature and Importance
Low	North Branch Sugar Run	Terry Twp.	This site, which was determined from aerial photo interpretation, contains the beaver impacted floodplain of the North Branch Sugar Run. A portion of the creek floodplain opens up into a herbaceous and shrub dominated wetland, with the creek meandering through. This wetland is well buffered by a large conifer-dominated forested block.
Low	North Branch Towanda Creek	Canton Twp.	The North Branch Towanda Creek between Granville Summit and Alba forms a series of narrow curves and oxbows within its relatively flat floodplain. Wide shrub swamps, marshes and forested wetlands border the creek in many places. This linear wetland provides habitat and a natural landscape corridor for wildlife movement through the area.
Low	Saco Wetlands	Ulster Twp.	The mostly open water wetland at this aerial photo-determined site appears to have an area of shallow water with emergent vegetation or floating mats of vegetation buoyed by thick mats of sphagnum. The lake itself is likely the result of a man-made dam. A smaller wetland southwest of the lake appears to be dominated by a thick shrub layer, which may be floating on a layer of sphagnum moss. These wetlands may have a good diversity of characteristic northern acidic wetland plant species such as leatherleaf, cotton-grass, and pitcher-plants.

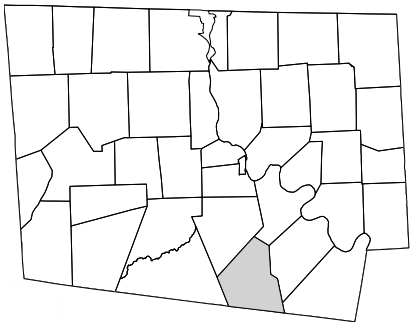
Wyalusing Rocks, Wyalusing Township

Appalachian sand cherry (*Prunus pumila var. susquehannae)*

ALBANY TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen (y-m-d)	Quality**
Coyles Corners Wetlands	Animal species of concern	G5	S2S3	N	2003-7-30	E

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks



Locally Significant: Beaver Pond Wetlands

Managed Lands: State Game Lands #36
Tioga State Forest

Split in two by the northward flowing South Branch Towanda Creek, Albany Township is primarily an agricultural valley with low rolling hills and isolated woodlots. A small portion of the Glaciated High Plateau Section of the Allegheny Plateaus Physiographic Province is in the northern corner of the Township. The amount of area covered in forest increases with elevation up to Hatch and Robwood Mountains. The Township contains small portions of Tioga State Forest, and State Game Lands #36. Several areas within the Township could be the focus of future biological inventories. The portion of Tioga State Forest at the northern tip of the township has a section of seepy woods draining north off of Robwood Mountain past Nichols Point into Kent Run. Fenner Run drains northwest through an uneven-aged hemlock stand in Tioga State Forest. The South Branch Towanda Creek originates from a series of wetlands at the Wilmot Township border. Beaver Pond Wetlands at the Township's southern border with Sullivan County may be the most ecologically interesting wetlands in the Township.

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COYLES CORNERS WETLANDS (Albany and Terry Townships)

Most of this chain of wetlands has been modified by dams to create a series of open water ponds. The ponds still have remnants of the wetland vegetation in shallow areas along edges and upstream ends of ponds. A **G5, S2S3 aquatic animal species of concern** was documented during a survey of a portion of this site in 2003. This species is under the jurisdiction of the PA Fish and Boat Commission, and its name cannot be released under a data-sharing agreement. This species uses the wetlands as its primary habitat. Reduction of wetland quality by degradation of water quality could detrimentally impact these populations.

Threats and Disturbances:

Reduction of the forested buffer surrounding these wetlands could lead to increased runoff from agricultural fields, roads and residences resulting in a decrease in water quality.

Conservation Recommendations:

Preserve the wetland's existing forested buffer, and restore buffer where it is lacking. Avoid building dams that would create hydrologic changes in the unaltered portions of this wetland chain.

Locally Significant sites:

Beaver Pond Wetlands (Albany Township and Sullivan County)

Beaver and human dam-building activities have altered much of the shallow wetland hydrology at this **locally significant site**. There are two large wetlands and two smaller wetlands in this complex. Though called Beaver Pond on topographic maps, this area is known locally Murphy's Pond. A site visit in 1993 documented a population of pointed water meal (*Wolffia brasiliensis*), which at the time was considered a PA species of concern. It has since been removed from the list based on updated population estimates. The wetlands continue to provide valuable habitat for aquatic dependent species.

Threats and disturbances:

Beaver and human dams have altered the hydrology at these wetlands. Agricultural fields and residences occur along portions of the wetlands. Logging of the wetlands or removal of the surrounding forested buffer would likely impact the quality of this wetland community.

Conservation recommendations:

Maintain an undisturbed forested buffer around the wetlands. Avoid building dams, drainage channels, roads or logging trails in the vicinity that may impact the hydrology of these wetlands. Additional ground surveys are encouraged.

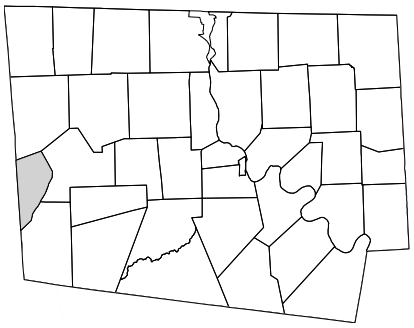
ARMENIA TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen (y-m-d)	Quality**
Armenia Mountain Wetlands	Plant: Creeping snowberry (*Gaultheria hispidula*)	G5	S3	PR	2003-7-10	C

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks.

Locally Significant: Armenia Mountain Ravines
Case Glen & Headwaters
Tamarack Swamp

Managed Lands: Tioga State Forest



The boundaries of Armenia Township roughly coincide with the boundary between the High and Low Glaciated Plateau Sections of the Allegheny Plateaus Physiographic Province, with the township occupying the upper slopes of Armenia Mountain. The Township is primarily forested, interspersed with some farms and scattered residences. The Township contains a portion of Tioga State Forest. Much of the native biodiversity of the township can be preserved by avoiding draining or damming wetlands and by providing for forested buffers around all wetlands. Avoiding fragmentation of the Township's large forested blocks with additional roads can help preserve much of the Township's native biodiversity. Care should be taken during logging and road maintenence operations to avoid introducing invasive species of plants into the largely unfragmented forest blocks. Machinery should be thoroughly rinsed to avoid transferring invasive plant seeds and other exotic pests and pathogens from other locations. The spread of invasive species of plants could severely degrade the forests of the Township. Removal of invasive species as they first appear is easier and more cost effective than removal of established populations. Timber-oriented tree farms should be planted in species native to Bradford County to avoid the spread of introduced species of trees.

ARMENIA MOUNTAIN WETLANDS (Armenia Township)

This site is a boggy shrub thicket surrounded by a well-drained mixed hardwood-conifer forest. A fair-quality population of the **G5, S3 plant species of concern creeping snowberry (*Gaultheria hispidula*)** was documented at this site. The wetland has a sphagnum moss substrate and is dominated by highbush blueberry and mountain holly with occasional sphagnum openings. Some typical bog species are present including cotton-grass, small cranberry and wild calla. This site falls primarily within Tioga State Forest.

Threats and disturbances:

No disturbances were observed. The primary threat to the habitat would be changes in the wetlands hydrology. Logging of the perimeter forest would also likely impact the habitat for this species.

Conservation recommendations:

Maintain a wide undisturbed forested buffer around the wetland. Avoid building dams, drainage channels, roads or logging trails in the vicinity that may impact the hydrology of this wetland.

Locally significant sites:

Case Glen & Headwaters (Armenia and Troy Townships)

This **locally significant site**, identified from aerial photography and roadside surveys, contains the extremely steep ravine known as Case Glen and the headwater wetlands of the West Branch of Sugar Creek. Case Glen occurs at the interface of the Low and High Sections of the Glaciated Plateau Physiographic Province. The softer bedrock material of the Low Section has eroded more quickly than the harder bedrock of the High Section resulting in an extreme rise in elevation between the two sections. This hemlock-dominated ravine likely has waterfalls along the course of its very rapid decent. These habitats may harbor species adapted to the high moisture environment found here, especially where the falls cut through calcareous bedrock parent material. The groundwater feeding the headwaters of West Branch Sugar Creek originate in an extensive wetland that has been artificially divided into two portions. The southern portion has been modified by a dam into an open water pond, while the northern portion appears to have been unaltered, retaining its natural bog habitat. The bog is likely dominated by a mixture of characteristic bog vegetation including high-bush blueberry, leatherleaf, cranberries and the insectivorous pitcher-plant.

Threats and disturbances:

The steep ravine has experienced some dumping activity, but its steepness prevents most activities. The bog remnant at this site is in a forested context, some of which consists of conifer plantations. The hydrology of the southern portion of this bog natural community has already been altered to create an open-water recreational environment. Logging of the forested buffer surrounding the wetland would likely decrease the quality of the habitat. Conversion from a forested to residential development would also likely detrimentally impact this natural community.

Conservation recommendations:

The bog natural community would benefit from a slight reduction in the water level of the southern open water portion of this wetland complex. Avoid building dams or draining the more natural northern portion of this wetland complex. If the land changes from its present use as forested woodland to residential development, a 100-meter undisturbed forested buffer is encouraged around this wetland. Surveys for species of concern in this and adjacent wetlands are encouraged.

Tamarack Swamp (Armenia Township)

This **locally significant site** was determined from aerial photo interpretation. Tamarack Swamp is a high elevation bog that has been modified by a man-made dam. The flooded bog habitat persists as a large floating vegetated island surrounded by open water. The island vegetation is likely composed primarily of leatherleaf as in similar habitats in the county. This bog system is likely the site of a 90-year-old record of bog rosemary (*Andromeda polifolia*) documented in 1913 as occurring in a bog southwest of Troy. The floating bog mat appears to have had a channel cut through the center sometime in the past.

Threats and disturbances:

This bog remnant is in excellent forested context with no obvious disturbances other than the man-made dam and a dirt lane around the perimeter. The hydrology of this bog natural community has already been altered. Logging of the forested buffer surrounding the wetland would likely decrease the quality of the habitat. Conversion from a forested to residential development would also likely detrimentally impact this natural community.

Conservation recommendations:

The bog natural community would benefit from a slight reduction in the water level. Natural processes will likely return the bog to a previous level of vegetation cover, but this process could take thousands of years. Reducing the water level slightly would accelerate this process. If the land changes from its present use as forested woodland to residential development, a 100-meter undisturbed forested buffer is encouraged around this wetland. Surveys for species of concern in this and adjacent wetlands are encouraged.

Armenia Mountain Ravines (Armenia and Troy Townships)

The two steep ravines in this site were determined from aerial photo interpretation. These hemlock-dominated ravines likely have waterfalls along the course of their very rapid decent. These habitats may harbor species adapted to the high moisture environment found here, especially where the falls cut through calcareous bedrock parent material.

Threats and disturbances:

The very steep slopes of these ravines prevent most uses, but logging of these slopes would likely result in excessive erosion, a decrease in downstream water quality and degradation of this habitat.

Conservation recommendations:

An undisturbed forested buffer should be maintained on the slopes of these ravines. Surveys for species of concern in these ravines, particularly in the vicinity of waterfalls, are encouraged.

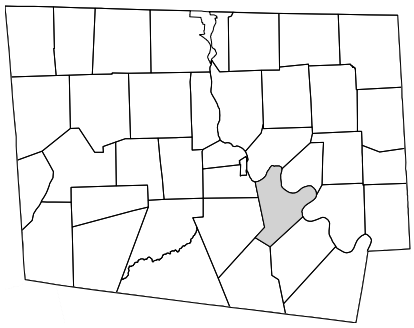
Tamarack Swamp, Armenia Township

The vegetation floating on the surface of this bog, flooded by a man-made dam, likely once covered most of its surface. Bog habitats contain several species of plants and animals rare to Pennsylvania. Photo: PA Science Office of The Nature Conservancy

ASYLUM TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen	Quality**
Susquehanna River (Middle Section)	Animal: Bald Eagle *(Haliaeetus leucocephalus)*	G4	S2B	PE	2004	E
	Animal species of concern	G3G4	S3S4	N	2004	E
	Animal species of concern	G4	S4	N	2004	E
	Animal species of concern	G4	S3S4	N	2004	E
	Animal species of concern	G3	S2	N	2004	E

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks.



Locally Significant: Liberty Corners Wetlands

Managed Lands: Tioga State Forest

The rolling hills of Asylum Township are a mixture of agricultural fields and woodlots. The southwestern tip of the Township contains a small portion of the High Glaciated Plateau Section of the Allegheny Plateaus Physiographic Province, while the remainder is in the Low Section. The wide meandering loops of the Susquehanna River mark the northeastern boundary of the Township. The cliffs, floodplains and islands of the Susquehanna River are primary areas of species of concern in the Township. The large forested block of Tip Top Mountain and the wetlands near Liberty Corners could be the focus of future ground surveys. Floodplains in this area of the River typically have a narrow fringe of trees adjacent to agricultural fields. Forested buffers should be maintained, widened and created where absent along the length of the river with logging operations refraining from cutting within 100 meters of the river edge.

ASYLUM TOWNSHIP MAP

SUSQUEHANNA RIVER (Middle Section) (Asylum, North Towanda, Standing Stone, Towanda, and Wysox Townships)

Nesting Bald Eagles and four aquatic animal species of concern have been documented along this section of the Susquehanna River. The Bald Eagles nest in large trees along the river and utilize the river as their main food foraging area, feeding on fish and waterfowl. Bald Eagles had been in steep decline throughout Pennsylvania between 1940 and 1970 due largely to the poisonous effects of organochlorine insecticides, but recently, habitat loss may have replaced pesticide poisoning as the major threat to eagles (Brauning 1992). Nesting occurrences of Bald Eagles in Pennsylvania have increased in the last two decades, particularly along the Susquehanna River and in northwestern PA. The four aquatic animal species of concern are under the jurisdiction of the PA Fish & Boat Commission, and their names cannot be released under a data sharing agreement. These animal species of concern are affected by non-point sources of pollution including sedimentation from cultivated and developed land along the river, runoff from roadways, pesticide runoff from agricultural fields, discharge of chemical pollutants and thermal pollution.

The Susquehanna River has cut deeply through Bradford County, creating soaring rock outcrops opposite low-lying floodplains. The river is subject to great fluctuations in its water level, from a near trickle during dry periods to severe flooding events. The action of the powerful ebb and flow of the river has created various microhabitats along its length. The steep cliff communities, scoured islands, oxbows and wide floodplains can all have unique assemblages of plants and animals.

Many of the ice and flood scoured islands have distinctive "Big bluestem (*Andropogon gerardii*)-Indian grass (*Sorghastrum nutans*) River Grasslands," which are natural tall grassland communities created as the result of these natural disturbances. The two plant species the community type is named for dominate these habitats and also include switch grass (*Panicum virgatum*) and Indian hemp (*Apocynum cannabinum*). The habitat tends to grade into a "Water willow (*Justicia americana*) – smartweed Riverbed Community" on the lowest island elevations and into a "Black willow Scrub/shrub Wetland" and "River birch – sycamore Floodplain Scrub" as the elevation increases and the habitat becomes drier. These natural communities are part of the "Riverbed – Bank – Floodplain Community Complex" (Fike 1999), a broadly defined mosaic of community types that typify the natural vegetation along the Susquehanna River in Bradford County.

Another important area for conservation are the forested slopes along the Susquehanna River. These steep ravines and slopes have likely remained forested because of their topography. The direction the slope is facing will have a significant impact on the species composition found there. Forestry practices on these steep slopes should be evaluated to minimize negative effects such as erosion. Additional surveys of forested slopes, ravines and streams in this township are encouraged.

Threats and Disturbances:

The main threat to these animal species of concern is the reduction of water quality. Activities of industries and landowners along the river can have significant impacts on water quality in the River down to the Chesapeake Bay. Erosion and chemical runoff into the water systems is a serious concern throughout the state. The banks, floodplains and islands of the river have large populations of several aggressive introduced plants including Japanese knotweed (*Polygonum cuspidatum*) and purple loosestrife (*Lythrum salicaria*). Control of established populations of these

species is very difficult. Eradication of pioneer populations is the best way to control the spread of these invasive species.

Conservation Recommendations:
Forested buffers should remain intact for the length of the river with logging operations minimizing cutting within 50 to 100 meters of the river bank. Floodplain forests help buffer the watershed from the effects of non-point sources of pollution including runoff from agricultural, residential and roadway settings. In addition, the river floodplain and corridor can be an area of significantly higher biodiversity than the adjoining uplands. Much of the area's important biodiversity can be preserved by maintaining an intact, forested floodplain along the river. The effectiveness of the river as a habitat corridor would be diminished by fragmentation of the forest continuity by the construction of buildings, houses and additional roadways along the river. Local planning should discourage new construction and roadways along the river, adjacent slopes and floodplain.

Locally Significant Site:

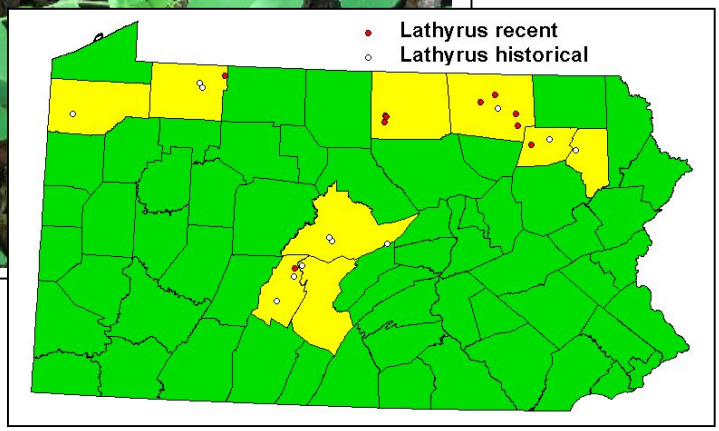
Liberty Corners Wetlands (Asylum and Monroe Townships)

The three wetlands in this **locally significant site** were determined from aerial photo interpretation. Despite the modified nature of the surrounding landscape, these three wetlands appear to have persisted as a variety of wetland types. Coniferous trees had dominated the large southernmost wetland, but the water level has recently been elevated, drowning the trees. An incomplete ring of floating islands persists on the western edge of the wetland, with an open central zone of sphagnum moss and herbaceous vegetation. Until recently, this wetland had appeared to be a good-quality bog natural community. A recent man-made dam appears to have been constructed at the eastern outflow of the bog, elevating the water level. This flooded bog is in the process of becoming an open water pond, which eliminates the bog natural community. Remnants of the bog habitat will likely persist indefinitely as floating mats, but only rapid restoration of the previous wetland hydrology will prevent the rest of the wetland vegetation from drowning. The other two wetlands may have also have been converted to open water ponds recently. These had been more open, herbaceous-dominated sphagnum moss wetlands.

Threats and Disturbances:
A fair amount of the landscape surrounding these wetlands remains forested. These wetlands may have man-made dams that have altered their hydrology. This greatly diminishes the quality of these natural communities. Residential and agricultural activities have removed some of the forested buffer adjacent to the wetlands.

Conservation Recommendations:
Restorative measures may need to be taken to prevent the loss of the bog and vegetated wetland habitats. Preserve and repair the forest buffer surrounding the wetlands. Ground surveys of these habitats are encouraged.

Roundtop Park and Slopes, Athens Township

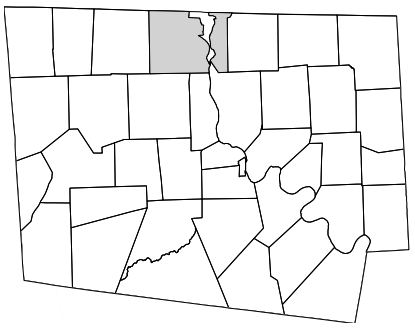


Wild-pea (*Lathyrus ochroleucus*) was documented at Roundtop Park & Slopes in Athens Township as part of this inventory. Recent records of this species in Pennsylvania are primarily restricted to the northern tier counties.
Photos: David Werier.

ATHENS TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen (y-m-d)	Quality**
Round Top Park and Slopes	Plant: wild blue lupine (*Lupinus perennis*)	G5	S3	PR	1992	E
	Plant: wild pea (*Lathyrus ochroleucus*)	G4G5	S1	PT	2004-6-02	E
	Plant: drooping bluegrass (*Poa languida*)	G3G4Q	S2	N	2004-6-02	E
Susquehanna River (Upper section)	Plant: Illinois Pondweed (*Potamogeton illinoensis*)	G5	S3S4	N	2003-8-27	E
	Animal species of concern	G3	S2	N	2003-8-27	E
	Animal species of concern	G3G4	S3S4	N	2003-8-27	E
	Animal species of concern	G4	S4	N	2003-8-27	E
	Animal species of concern	G4	S3S4	N	2003-8-27	E

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks.



Locally Significant: None

Managed Lands: State Game Lands #239

Athens Township contains much riverfront with both the Susquehanna River and the Chemung River flowing through its borders, with the town of Athens at their confluence. The River floodplain typically has a narrow fringe of trees between the river and agricultural fields. Forested buffers should be maintained, widened and created where absent along the length of the river with logging operations refraining from cutting within 100 meters of the river edge. Maintaining an intact, forested floodplain along the river can preserve much of the Township's important biodiversity. Other areas of interest include the forested slopes overlooking the Chemung River at Round Top Park and the wetlands in and adjacent to State Game Lands #239.

ATHENS TOWNSHIP MAP

ROUND TOP PARK AND SLOPES (Athens Township)

Wild blue lupine (*Lupinus perennis*) a G5, S3 plant species of concern had been documented at this location in 1992. A survey for this species in 2004 was unable to relocate this population of lupine. In 1992, the population was observed primarily along a road within the park. Past road maintenance activities may have inadvertently destroyed this population. The 2004 survey did document two previously unreported plant species of concern, the **G4G5, S1 PA-threatened wild pea (*Lathyrus ochroleucus*),** and the **G3G4Q, S2 drooping bluegrass (*Poa languida*).** These species both occur on the forested slopes overlooking the Chemung River. Oaks and hickories with a diverse and abundant shrub layer dominate the upper slopes of the forest in this area. The northeastern facing slopes are primarily hemlock-northern hardwood forests with a nearly closed canopy and sparse shrub and herbaceous layers.

Threats and Disturbances:

The habitat of the Township park has been modified by recreational activities. Much of the park area has populations of introduced invasive plant species such as Japanese barberry, autumn olive, Morrow's honeysuckle and garlic mustard, which are particularly adept at colonizing disturbed sites. Some recent logging has occurred on portions of the slopes. These invasive plant species pose a potential threat to the newly logged slopes.

Conservation Recommendations:

Additional surveys for the wild blue lupine are encouraged. This species may still exist in this area. If relocated, park managers should be notified so future park maintenance projects can avoid impacting this PA-rare plant species. Care should be taken during logging and road maintenance operations to avoid introducing invasive species of plants into this largely unfragmented forest block. Machinery should be thoroughly rinsed to avoid transferring invasive plant seeds and other exotic pests and pathogens from other locations. The spread of invasive species of plants could severely degrade this habitat. Removal of invasive species as they first appear is easier and more cost effective than removal of established populations.

Wild blue lupine (*Lupinus perennis*) has been documented from Ulster Township in the past, but was not relocated during recent surveys for this species. Additional surveys are encouraged. Photo of Dauphin County population by the PA Science Office of the Nature Conservancy.

SUSQUEHANNA RIVER (Upper Section) (Athens, Litchfield, Sheshequin and Ulster Townships)

A **G5, S3S4 plant species of concern, Illinois pondweed (*Potamogeton illinoensis*), and four aquatic animal species of concern** were documented in the Susquehanna River near Athens during a survey of this portion of the Susquehanna River in 2003. Additional surveys are recommended to better estimate populations of these species of concern in the river. The river also provides a valuable migration corridor for many bird species, especially aquatic-dependent species, but also many neo-tropical passerine migratory species.

The Susquehanna River is subject to frequent flooding and seasonal low water levels. Scouring of the banks and islands by ice and flooding has created pockets of specialized habitats along the river floodplain. Several islands have distinctive "Big bluestem (*Andropogon gerardii*)-Indian grass (*Sorghastrum nutans*) River Grasslands," which are natural tall grassland communities created as the result of these natural disturbances. The two plant species the community type is named for dominate these habitats and also include switch grass (*Panicum virgatum*) and Indian hemp (*Apocynum cannabinum*). The habitat tends to grade into a "Water willow (*Justicia americana*) – Smartweed Riverbed Community" on the lowest island elevations, and into a "Black willow Scrub/shrub Wetland," and "River birch – Sycamore Floodplain Scrub" as the elevation increases and the habitat becomes drier. These natural communities are part of the "Riverbed – Bank – Floodplain Community Complex" (Fike 1999), a broadly defined mosaic of community types that typify the natural vegetation along the Susquehanna River in Bradford County.

Threats and Disturbances:

There are numerous examples of disturbance along the Susquehanna River. These animal species of concern are affected by non-point sources of pollution including sedimentation from cultivated and developed land along the river, runoff from roadways, pesticide runoff from agricultural fields, discharge of chemical pollutants and thermal pollution. The main threat to these animals is reduction of water quality. The banks, floodplains and islands of the river have the invasive introduced plant species Japanese knotweed (*Polygonum cuspidatum*) and purple loosestrife (*Lythrum salicaria*). Control of established populations of these species is very difficult. Eradication of pioneer populations is the best way to control the spread of these species of plants.

Conservation Recommendations:

Any of the above types of disturbances should be minimized where possible. Also, monitoring of these populations should continue into the future. Loss of individuals and reductions in population sizes should lead to an investigation into possible causes. Water quality should be monitored and pollution sources should be identified where possible. Forested buffers should be maintained and created where absent along the length of the river with logging operations refraining from cutting within 100 meters of the river edge. River bank forests help buffer the watershed from the effects of non-point sources of pollution including runoff from agricultural, residential and roadway settings. In addition, the river floodplain and corridor is usually an area of significantly higher biodiversity than the adjoining uplands. Much of the area's important biodiversity can be preserved by maintaining an intact, forested floodplain along the river. The effectiveness of the forested riverbanks as a habitat corridor would be diminished by fragmentation of the forest continuity by the construction of houses, businesses and additional roadways along the river. Local planning should discourage construction of new structures and roadways along the river, adjacent slopes and floodplain.

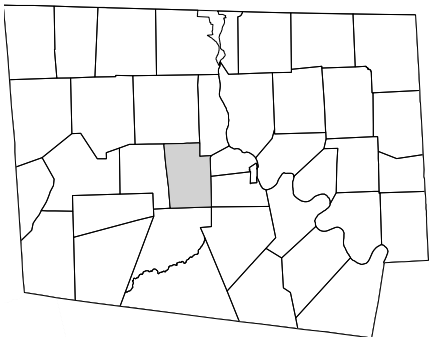
Falls Creek Wetlands, Franklin Township

Expansive shrub swamps and graminoid marshes occur at the headwaters of Falls Creek in Franklin Township. The creek tumbles through a ravine flanked by lofty rock outcrops with remnants of past mining activity.
Photos: PA Science Office of The Nature Conservancy

BURLINGTON TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen	Quality**
Highland Wetlands	Animal: Northern Harrier (*Circus cyaneus*)	G5	S3BS4N	N	2003	E

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks.



Locally Significant: None

Managed Lands: None

Route 6 follows roughly the same pathway as Sugar Creek through Burlington Township. Most of the Township is agricultural with rolling hills dotted with large and small woodlots. Route 6 will likely become a development corridor through the Township, with business and industry attracted to the high traffic along this road. Residential development will likely replace agricultural land use as some small farms are abandoned. Local planning in advance of these changes can help preserve the rural character and the best natural areas of the Township from haphazard development. Flooding or draining of wetlands by dam or channel construction should be avoided. Development should be steered away from wetlands, floodplains and their forested buffers. New roads and residences should be discouraged in and through large blocks of forest to avoid fragmentation of the natural landscape. Future ground surveys could focus on the narrow ravine and adjacent upland forest along Browns Creek, Deerlick Run, and the dense hemlock-covered slope southwest of County Memorial Park Cemetery.

BURLINGTON TOWNSHIP MAP

HIGHLAND WETLANDS (Burlington Township)

This wetland complex contains three main wetland habitats; two bog-like shrub-herbaceous openings, and one artificially created lake. Much of this wetland complex has a wide forested buffer from adjacent residential and agricultural activities. This wetland complex provides important habitat for an array of marsh and wetland dependent wildlife species including **Northern Harrier (*Circus cyaneus*) a G5, S3BS4N animal species of concern**. Breeding occurrences of Harriers (also known as Marsh Hawks) had been slowly declining throughout North America between the mid-1960's and the mid-1980's due primarily to loss of wetlands and old field habitat (Brauning 1992). Harriers tend to nest in dense shrubs in otherwise open habitat such as marshes, shrub swamps and old fields where the vegetation is stunted. Harriers can be seen flying low over agricultural fields and wetlands, hunting for small mammals. Hay fields in the area provide good foraging areas for this species.

Threats and Disturbances:

One of the wetlands has been artificially dammed to create a pond-like habitat. This has essentially submerged the wetland habitat for an indeterminate period of time. Nest locations for Northern Harriers are susceptible to disturbance. Logging of the perimeter of the wetlands could detrimentally impact the nesting location. Removal of the forested buffer could also result in increased sedimentation runoff into the wetlands, leading to reduced water quality. Conversion of the adjacent land from forested and agricultural to residential development would likely negatively impact the wetland natural community.

Conservation Recommendations:

Maintain the wetland hydrology of the unmodified wetlands. The temporary periodic flooding and draining due to beaver activity will likely keep these wetlands in various states of succession. Permanent flooding or draining would likely destroy this natural community. Avoid building dams. Maintain large undisturbed forested buffers around these wetlands. This will help prevent the disturbance of nest locations for the Northern Harrier, as well as provide for filtration of runoff entering the wetlands. If the land changes from its present use as forested woodland to residential development, a 100-meter undisturbed forested buffer is encouraged around this wetland. Additional surveys for species of concern in these and adjacent wetlands, and to monitor known populations, are encouraged.

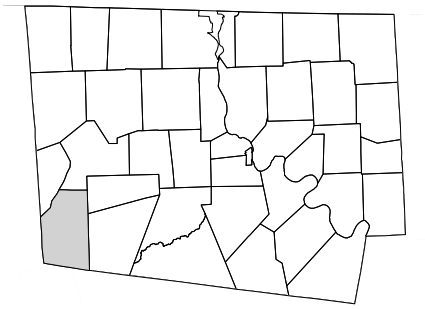
CANTON TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen (y-m-d)	Quality**
Lye Run Wetlands	Animal species of concern	G5	S3S4	N	2004-7-29	E
	Animal species of concern	G5	S3S4	N	2004-7-29	E
Canton Mud Pond	Natural Community: Water-willow (*Decodon veticillatus*) Shrubland	G?	S3	N	2003-7-29	E

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks

Locally Significant: Grover Wetlands
North Branch Towanda Creek

Managed Lands: State Game Lands #12
Tioga State Forest



Canton Township sits in a cleft between two portions of the High Glaciated Plateau Section of the Allegheny Plateaus Physiographic Province. The southeast corner of the Township rises a thousand feet in elevation and becomes increasingly forested as it does so. With most of the Township in the more fertile Low Glaciated Plateau Section, the Township is appropriately dominated by agricultural activities. Route 14 and Route 414 cross in the Borough of Canton, becoming a hub of activity in western Bradford County. Future land use trends will likely see the abandonment of some farms, and their conversion to commercial and residential development. Local planning in advance of these changes can help preserve the rural character and the best natural areas of the Township from haphazard development. Flooding or draining of wetlands by dam or channel construction should be avoided. Development should be steered away from wetlands, floodplains and their forested buffers. New roads and residences should be discouraged in and through large blocks of forest to avoid fragmentation of the natural landscape. As land changes from agricultural to residential and commercial development, buildings and new roads should be discouraged along streams and creeks, and forested buffers created where they are missing. Future ground surveys could focus on the string of wetlands between Alba and Grandville Summit, the wetland headwaters of Towanda Creek east of Grover, and the forested streamside corridors of Beech Flats Creek and Williams Hollow. Conservation efforts could focus on reforesting portions of Towanda and Alba Creeks that lack forested buffer strips. The Township contains portions of State Game Lands #12 and Tioga State Forest.

CANTON TOWNSHIP MAP

LYE RUN WETLANDS (Canton and Leroy Townships, and Sullivan County)

This site includes an artificially created open water pond and several areas of dense shrub swamp, and one herbaceous-dominated wetland. The northern edge of the man-made pond at this site still contains some characteristic acidic bog plant species. **Two aquatic animal species of concern** were documented at this site. These two species are under the jurisdiction of the PA Fish and Boat Commission, and their names cannot be released under a data sharing agreement. These species use the wetlands as their primary habitat. Reduction of wetland quality by changes in hydrology (permanent draining or flooding), or degradation of water quality could severely impact these populations. This site occurs primarily on State Game Lands #12.

Threats and disturbances:

These wetlands have all likely been modified repeatedly in the past by the cyclic dam building activities of beavers. An open water pond has been created by the construction of a permanent dam. Removal of the present forested buffer would likely cause detrimental changes to the chemical and vegetative composition of this wetland natural community.

Conservation Recommendations:

The temporary periodic flooding and draining due to beaver activity will likely keep this wetland in various states of succession. Permanent flooding or draining would likely diminish the quality of these wetland natural communities. The bog natural community at the current open-water pond would benefit from a slight reduction in the water level. A reduced water level would accelerate the revegetation process of the wetland. Maintain a wide undisturbed-forested buffer around the wetland. Avoid building dams, drainage channels, roads or residences in the vicinity that may impact the hydrology of the wetlands. Additional surveys for species of concern in these and adjacent wetlands are encouraged.

CANTON MUD POND (Canton Township)

The wetland at this site is an open-water pond that has pronounced 'bulls-eye' ring zones of vegetation. The perimeter of the pond is dominated by graminoids such as wool grass, three-way sedge and reed-canary grass. Inside, is a moat of deep water dominated by the floating aquatic plant, yellow pond lily. A ring of floating islands occurs further towards the center of the pond. This ring of islands is a near monoculture of water-willow (*Decodon verticillatus*), forming a **Water-willow (*Decodon veticillatus*) Shrub Wetland Natural Community.** Inside the ring of water-willow islands is a circular area of open water, which is likely a very deep central zone in this pond. The southwestern portion of the wetland is dominated by cattails and may indicate an influx of nutrients into this otherwise isolated wetland.

Threats and disturbances:

This wetland sits perched on a hill and does not receive much influx of groundwater runoff. This provides for exceptional hydrologic isolation. Removal of the present forested buffer would likely cause detrimental changes to the chemical and vegetative composition of this wetland natural community.

Conservation Recommendations:

Maintain a wide undisturbed-forested buffer around the wetland. Avoid building dams, drainage channels, roads or residences in the vicinity that may impact the hydrology of this wetland.

Locally Significant Site:

Grover Wetlands (Canton Township)

This **locally significant site** includes the wetlands along Route 14 in the southwest corner of Canton Township, which were likely created or enhanced by the construction of the now-abandoned railroad grade along the headwaters of Lycoming Creek. The extensive shrub and herbaceous wetland has formed between Grover and the Bradford/Lycoming/Tioga County line as the water draining off the eastern slopes is trapped at the base of the railroad grade. This wetland provides good quality habitat for wetland dependent species of plants and animals.

Threats and disturbances:

Despite this wetland's proximity to Route 14, the railroad grade provides a buffer from non-point sources of pollution entering the wetland from the road. Removal of the present forested buffer to the east would likely cause detrimental changes to the chemical and vegetative composition of this wetland habitat.

Conservation Recommendations:

Maintain a wide undisturbed-forested buffer around the wetland. Avoid building dams, drainage channels, or residences in the vicinity that may impact the hydrology of this wetland.

North Branch Towanda Creek (Canton, Granville and Troy Townships)

This **locally significant site** was determined from aerial photo interpretation. The North Branch Towanda Creek between Granville Summit and Alba forms a series of narrow curves and oxbows within its relatively flat floodplain. There is a railroad bed roughly following the course of the wetland that may have been a component of its formation. Wide shrub swamps, marshes and forested wetlands border the creek in many places. A series of open water ponds occur sporadically along the length of the creek, presumably the result of beaver activity, but several of these are likely man-made. This linear wetland habitat provides a natural landscape corridor, an essential element for wildlife movement through the area.

Threats and disturbances:

Some portions of the creek are well buffered by forest, while agricultural fields border other sections. Conversion from the present agricultural and forest land use to residential development could fragment this habitat, weakening its quality as a wildlife corridor.

Conservation Recommendations:

Maintain the wetland hydrology along the creek by avoiding permanent flooding or draining of this habitat. Preserve and expand the forested buffer along the creek. Should the surrounding land change from agricultural to residential development, a 100 meter undisturbed buffer around the wetlands is encouraged.

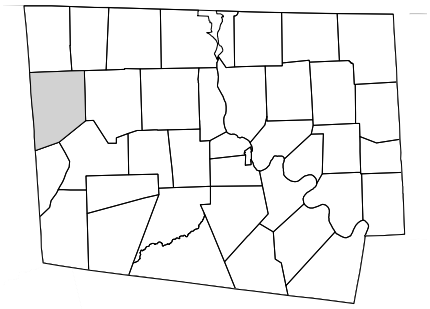
Canton Mud Pond, Canton Township

Mud Pond is a common name in northeastern PA. This pond, near Canton, when viewed from the air has a distinct series of vegetation rings typical of bog habitats (above). A Decodon (water willow) shrubland dominates the floating vegetation ring, the center zone is open water (left). The outer portion of the pond is dominated by yellow pond lily (below). Photos: PA Science Office of The Nature Conservancy

COLUMBIA TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen	Quality**
North Branch Sugar Creek	Animal: Great Blue Heron (*Ardea herodias*)	G5	S3S4BS4N	N	2004?	C
Rt-6 County Line Wetlands	Plant: Soft-leaved sedge (*Carex disperma*)	G5	S3	PR	2003-8-06	E
	Natural Community: Hemlock Palustrine Forest	G?	S3	N	2003-8-06	E

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks.



Locally Significant: None

Managed Lands: None

Columbia Township is almost completely in the Low Glaciated Plateau Section of the Allegheny Plateaus Physiographic Province. There is a 1000-foot rise in elevation in the short distance from Sylvania along Morgan Creek to the ridgeline of Armenia Mountain in the southern tip of the Township. Most of the Township is a patchwork of agricultural fields and variously sized woodlots. The meandering floodplains of Sugar Creek and North Branch Sugar Creek are exceedingly flat, causing the creeks to form a series of tight folds and curves, frequently resulting in oxbows. Portions of these creeks have very good forested buffers, while other portions are in need of forest buffer repair and expansion. One nearly continuous band of forest follows the North Branch from its confluence with Sugar Creek near Troy, then arching west past Columbia Cross Roads, continuing to Austinville and the Tioga County Border. This presents a natural landscape corridor that supports the movement of wildlife across the Township and this portion of the County. Local planning can help preserve these essential wildlife corridors by avoiding unnecessary fragmentation of the Township's largest remaining forest blocks. Future ground surveys could focus on the various forested wetlands, Wolfe Hollow and the Morgan Creek ravine.

NORTH BRANCH SUGAR CREEK (Columbia and Troy Townships)

This site contains a large nesting colony of **Great Blue Herons (*Ardea herodias*), a G5, S3S4BS4N animal species of concern.** At least thirty Great Blue Heron nests were seen from a distance adjacent to Route 14. This area is a large forested slope along North Branch Sugar Creek in a mixed deciduous/coniferous forest dominated by sugar maple, eastern hemlock and white pine.

Threats and Disturbances:

This area is located in close proximity to Route 14, which is a busy road. Logging is a potential threat, which may cause the herons to abandon this rookery. Conversion of the site from its present forested use to residential and commercial development would also likely result in the abandonment of this nesting site.

Conservation Recommendations:

Logging should be avoided within the immediate area of the rookery. Any nearby logging activities should take place in fall and early winter to avoid the most active spring and summer nesting season. Rookeries are extremely sensitive to logging and will be abandoned if such disturbances continue. Great Blue Herons are known to be facultative in terms of selecting nest sites, and it is possible that this site will be abandoned within a few years. More surveys are needed of this site to determine whether the herons maintain site fidelity to this area.

RT-6 COUNTY LINE WETLANDS (Columbia Township and Tioga County)

This site contains forested wetlands that support a good–quality population of the **soft-leaved sedge (*Carex disperma*) a G5, S3 PA-rare plant species of concern.** This site has richly diverse vegetation that includes a **Hemlock Palustrine Forest Natural Community**. This wet forested type is characterized by the dominance of hemlock in saturated soils. The hemlocks are raised on their moss-covered roots out of the thick muddy substrate in typical mound and pool topography. A rare fern species, Clinton's shield fern (*Dryopteris clintoniana*), was last documented from this site in 1935. This fern was not relocated at this site in 2003.

Threats and Disturbances:

The potential of logging within this wetland poses a threat to the integrity of the habitat at this location. Changes in the hydrology (damming or draining) would destroy the forested wetland occurring at this site. Runoff from the roadway and adjacent rest stop could contribute to degradation of the water quality.

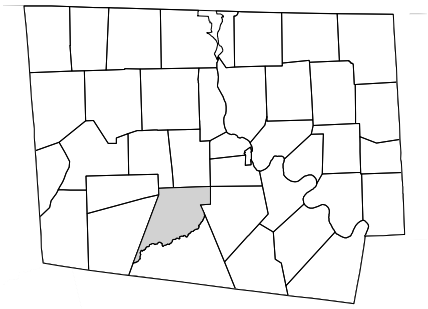
Conservation Recommendations:

Logging should be avoided within and adjacent to the forested wetland. Some areas adjacent to the wetland may require additional forested buffers to minimize the impact of non-point sources of pollution. Forested buffers provide critical protection to streams by reducing nutrient, sediment and toxic runoff from roads, residences and agricultural fields. Monitoring for invasive species of plants is also recommended. Removal of invasive species as they first appear is easier and more cost effective than removal of established populations.

FRANKLIN TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen (y-m-d)	Quality**
Carbon Run Wetlands	Animal: Bog Copper (*Lycaena epixanthe*)	G4G5	S2	N	1988-07-03	BC
	Animal: Northern Harrier (*Circus cyaneus*)	G5	S3B,S4N	N	2003-07-24	A
	Animal species of concern	G5	S2	N	1987-07-04	A
	Animal species of concern	G5	S2	N	1993-06-27	E
	Animal species of concern	G4	S1	N	1997-08-31	A
	Animal species of concern	G5	S2	N	1993-07-23	E
	Animal species of concern	G5	S2	N	1993-07-18	E
Coal Run	Plant: Great-spurred violet (*Viola selkirkii*)	G5	S1	N	2004-05-12	B
Lower Schrader Creek	Animal: Great Blue Heron (*Ardea herodias*)	G5	S3B	N	2004-05-11	E

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks.



Locally Significant: Cash Pond
East Holcomb Pond Wetlands
Falls Creek Wetlands
State Game Land #36 Reclaimed Strip Mine
Swimming Dam Bog

Managed Lands: State Game lands #12
State Game Lands #36

Other: Coal Run: High Quality Cold Water Fishery entire basin
Schrader Creek: Exceptional Value Stream from the source to Coal Run
Schrader Creek: High Quality Cold Water Fishery from Coal Run to Towanda Creek

FRANKLIN TOWNSHIP MAP

FRANKLIN TOWNSHIP

Franklin Township is divided nearly equally between the High and Low Glaciated Plateau Sections of the Allegheny Plateaus Physiographic Province, with a 1000-foot change in elevation between the two sections. The Low Section of the Township is dominated by agricultural activities, while the High Section is part of an extensive forested block covering the southern quarter of the county. Active coal mines used to dominate the highlands of Franklin Township, with bustling towns at Laquin, Barclay and Carbon. Some acid mine drainage affects the water quality of the highlands. Most of the former coal company lands have since become public property in State Game Lands #12 and #36. The flat plateau-like expanses of the highlands are dotted with a variety of wetlands, including bogs, shrub swamps, forested wetlands, graminoid marshes, ponds and artificially created lakes. Most of these wetlands occur in an excellent continuously forested context. Most have likely been subject to a repeated cycle of flooding and drying due to beaver activity. These wetlands will likely remain in various states of succession due to the fluctuating hydrologic regime. Permanent modification of these wetlands by dams or draining should be avoided. These wetlands are high-quality habitats in an excellent isolated forest context and should be considered of exceptional ecological value by the Township and the County. Local planning should discourage fragmentation of this large forested block by new roads and buildings. The entire highlands of Bradford County are an exceptional natural feature, and the Franklin Township portion deserves a much more thorough ground survey. Inventory efforts should be concentrated on wetlands, rock outcrops, ravines, steep cliffs, waterfalls, and streams throughout the Township.

CARBON RUN WETLANDS (Franklin and Leroy Townships)

Several shrub swamps and an artificially impounded pond occupy the core habitat of this site. The surrounding landscape bears the scars of past mining operations, but the area has since reverted to forest. A total of seven animal species of concern have been documented at this location. All utilize the wetlands as their primary habitat. **Northern Harriers (*Circus cyaneus*) a G5, S3B, S4N PA animal species of concern** have been documented as breeding at this site since they were added to the PA species of concern list in 1985. Breeding occurrences of Harriers had been slowly declining throughout North America between the mid-1960's and the mid-1980's due primarily to loss of wetlands and old field habitat (Brauning 1992). Harriers tend to nest in dense shrubs in otherwise open habitat such as marshes, shrub swamps and old fields where the vegetation is stunted. Harriers can be seen flying low over agricultural fields and wetlands, hunting for small mammals. A good-quality population of **a terrestrial invertebrate species of concern, the G4G5, S2 bog copper butterfly (*Lycaena epixanthe*)**, was also documented from this site. The host plant of this species, cranberry, occurs frequently throughout these wetlands. A host plant specialist, the distribution of bog copper is linked directly to the habitat of the cranberry. Loss of cranberry wetlands can severely diminish occurrences of this species. **Five other aquatic species of concern** were also documented at this location. These five species are under the jurisdiction of the PA Fish and Boat Commission, and their names cannot be released under a data sharing agreement. These species use the wetlands as their primary habitat. Reduction of wetland quality by changes in hydrology (permanent draining or flooding), or degradation of water quality could severely impact these populations.

Threats and Disturbances:

Nest locations for Northern Harriers are susceptible to disturbance. Logging of the perimeter of the wetlands could detrimentally impact the nesting location. Removal of the forested buffer could also result in increased sedimentation runoff into the wetlands, leading to reduced water quality. Acid mine drainage from past mining activity may be impacting these wetlands and the watershed at large. Degradation of the water quality of this watershed could lead to a decline in the five

aquatic animal species of concern. Norway spruce and other exotic conifers have been planted extensively along the roadways in this area.

Conservation Recommendations:
Maintain the current wetland hydrology. The temporary periodic flooding and draining due to beaver activity will likely keep these wetlands in various states of succession. Permanent flooding or draining would likely destroy these natural communities. Avoid the construction of dams. Maintain large undisturbed forested buffers around these wetlands. This will help prevent the disturbance of nest locations for the Northern Harrier, as well as provide for filtration of runoff entering the wetlands. Avoid the use of non-native species when replanting throughout the forest.

COAL RUN (Franklin Township)

Coal Run is considered a **High Quality Cold Water Fishery** from its source of Swimming Dam to its confluence with Schrader Creek. Sugar maple, white ash, black birch, basswood, beech and a few hemlocks dominate the rich, moist, northern hardwood forested slopes. The slopes of the run have a very good variety of spring ephemeral wildflowers including the **G5, S1 plant species of concern, great-spurred violet (*Viola selkirkii*).** This species is of a more northern affinity, occurring more frequently to the north of Pennsylvania, which may be at a southern border of the range for this species. This site is within State Game Lands #36.

Threats and Disturbances:
No disturbances were noted at this site. There was a noteworthy absence of introduced species of plants (no weeds). Intensive logging of the slopes could detrimentally impact the habitat of this species. The spread of invasive species of plants could severely degrade this habitat.

Conservation Recommendations:
Maintain the undisturbed forest cover along the slopes of this high-quality stream. Care should be taken during nearby logging operations to avoid introducing invasive species of plants into this largely unfragmented forest block. Machinery should be thoroughly rinsed to avoid transferring invasive plant seeds and other exotic pests and pathogens from other locations.

LOWER SCHRADER CREEK (Franklin, Monroe and Overton Townships)

This site contains a rookery of **Great Blue Herons (*Ardea herodias*), a G5, S3B animal species of concern.** Twenty nests of this species were found in white pines in a slightly fragmented forest dominated by white pine with a few eastern hemlock and sparse understory layer. Schrader Creek is also designated a **High Quality Cold Water Fishery** from Coal Run to Towanda Creek (Department of Environmental Protection 1999).

Threats and Disturbances:
Threats of this area include logging of the immediate nesting area, development, acid mine drainage degradation within the watershed and continued human disturbance.

Conservation Recommendations:
Logging activities should be avoided within the immediate area of the rookery. Rookeries are extremely sensitive to logging and will be abandoned if such disturbances continue. Great Blue Herons are known to be facultative in terms of selecting nest sites, and it is possible that this site will be abandoned within a few years. More surveys are needed of this site to determine whether the herons maintain site fidelity to this area.

Locally Significant Sites:

Cash Pond (Franklin Township)

This **locally significant site** includes the headwater wetlands of Long Valley Run and Cash Pond. These mostly open water ponds have apparently been flooded by beaver activity. The largest pond to the north is a drowned forest, with many dead standing trees in the pond. The other two ponds are less flooded and appear to have more variety of wetland vegetation. Cash Pond is an artificially enhanced open water wetland created by a road-dam crossing the southern outflow of the wetland. This pond retains some of its former wetland vegetation at its northern inflow. Migrating waterfowl, particularly ducks and geese, likely use the open water habitat at this site. This site is primarily in State Game Lands #36.

Threats and Disturbances:

These habitats have good forested buffers without much obvious disturbance besides past mining and logging operations. Beaver activity has apparently flooded a swamp forest at one of the ponds. The cyclic flooding and drying due to a fluctuation beaver population will likely keep these wetlands in various states of succession. Permanent changes in the hydrology such as dams or drainage channels would decrease the quality of these natural communities. Logging of the forested buffer could also detrimentally impact these wetlands.

Conservation Recommendations:

Maintain the wetland hydrology. Avoid building permanent dams or drainage channels. Preserve the undisturbed forested buffer surrounding the wetlands. Logging operations should refrain from cutting within 100 meters of the wetland edge.

East Holcomb Pond Wetlands (Franklin and Leroy Townships)

This **locally significant site** was identified from aerial photo interpretation. A series of small wetlands drain north towards Holcomb Pond and off the steep side of the plateau. The wetlands appear to contain a variety of habitat types including shrub swamps, conifer forested wetlands, herbaceous wetlands and open water. Holcomb Pond appears to be dominated by herbaceous vegetation with a small amount of open water. All of the wetlands are likely to have past or current beaver impoundments. The drainage continues northward off the steep mountainside, likely creating waterfalls along its rapid descent. This site is primarily on State Game Lands #12, but also includes some private land.

Threats and Disturbances:

These habitats appear to have good forested buffers without much obvious disturbance.

Conservation Recommendations:

Maintain the current wetland hydrology. The temporary periodic flooding and draining due to beaver activity will likely keep these wetlands in various states of succession. Permanent flooding or draining would likely destroy these natural communities. Avoid the construction of dams. Maintain the undisturbed forested buffer surrounding the wetlands. If the land changes from its present use as forested woodland to residential development, a 100-meter undisturbed forested buffer is encouraged around these wetlands. Surveys for species of concern and exemplary natural communities are encouraged.

Falls Creek Wetlands (Franklin Township)

Most of this **locally significant site** was identified from aerial photo interpretation. Falls Creek drains southward into Schrader Creek, creating a series of waterfalls along steep portions of its descent. The headwaters are a series of expansive wetlands, which appear to vary from thick shrub swamps to more open herbaceous-dominated wetlands and one large artificially impounded open water pond. A portion of this site is in State Game Lands #36.

Threats and Disturbances:

Portions of the headwaters of this watershed have evidence of impairment by acid mine drainage. Residential development has fragmented some portions of the site. Building residences and roads along the wetland edge could allow invasive species of plants to colonize these wetland habitats. Permanent changes in the wetland hydrology by either flooding or draining could severely degrade the quality of these natural communities.

Conservation Recommendations:

Maintain the current wetland hydrology. The temporary periodic flooding and draining due to beaver activity will likely keep these wetlands in various states of succession. Permanent flooding or draining would likely destroy these natural communities. Avoid the construction of dams. Maintain the undisturbed forested buffer surrounding the wetlands. If the land changes from its present use as forested woodland to residential development, a 100-meter undisturbed forested buffer is encouraged around these wetlands. Local planning should discourage building additional roads and residences on the perimeter of these wetlands. Additional surveys for species of concern in these and adjacent wetlands, as well as the narrow ravine to the south, are encouraged.

SGL #36 Reclaimed Strip Mine (Franklin Township)

A former strip-mine, this **locally significant site** is a large, open area that has been successfully reclaimed with plantings of a variety of grasses and low shrubs to create an open savannah-like habitat. This type of habitat provides exceptional surroundings for a large diversity of early successional and grassland-dependent bird species. This area is probably the best reclaimed strip mine in the county and possibly the best in the region. The bird list is extensive in this area. Birds found include at least three singing male Henslow's Sparrow (*Ammodramus henslowii*), a former Pennsylvania animal species of concern. Other bird species found at this site included Grasshopper Sparrow (*Ammodramus savannarum*), Song Sparrow (*Melospiza melodia*), Savannah Sparrow (*Passerculus sandwichensis*), Vesper Sparrow (*Pooecetes gramineus*), Field Sparrow (*Spizella pusilla*), Bobolink (*Dolichonyx oryzivorus*), Common Yellowthroat (*Geothlypis trichas*), Prairie Warbler (*Dendroica discolor*), Eastern Bluebird (*Sialia sialis*), American Goldfinch (*Carduelis tristis*), and Indigo Bunting (*Passerina cyanea*). A female Northern Harrier (*Circus cyaneus*) was seen flying around the area, but the nesting location was not found. However, it is very feasible that the species is nesting in this reclaimed strip mine. Other species seen include American Woodcock (*Scolopax minor*) and Red-shouldered Hawk (*Buteo lineatus*). This area occurs on State Game Lands #36.

Threats and Disturbances:

The main threat to this area is natural succession, and the planting of shrubs and trees accelerates this process.

Conservation Recommendations:

This site has regional conservation importance for uncommon bird species such as Henslow's Sparrow, Grasshopper Sparrow, Prairie Warbler, and Vesper Sparrow. The presence of Henslow's Sparrow indicates that the species may be increasing in this region, and more surveys of this area should be conducted within every year of the current breeding bird atlas to gain a more comprehensive species list and abundance of these species. This area also has the potential for breeding Pennsylvania species of concern, such as Northern Harrier and perhaps, Dickcissel (*Spiza americana*). It is strongly recommended that management plans for this site consider the current conservation importance of this area and that steps be taken to ensure the integrity of the grassland habitat in its present state. This could include an infrequent mowing regime or occasional prescribed burning. Extensive tree or shrub planting should be discouraged.

Swimming Dam Bog (Franklin Township)

This **locally significant site** contains an artificial pond with an earthen dam at one end. A former bog, the remnants of this habitat type persist as a large area of floating mats of vegetation buoyed by thick accumulations of sphagnum moss. The floating mats are dominated by characteristic bog species of plants that are adapted to the acidic conditions typically encountered in these habitats. These include the insectivorous sundews and pitcher plants, as well as cranberries and a thick tangle of leatherleaf. An active beaver population further raises the water level of the man-made dam by continually blocking the dam's outlet pipe.

Threats and Disturbances:

At the time of this survey, beaver had clogged the outflow pipe of the pond, further flooding the wetland. Much of the vegetation was submerged, growing up through the elevated water levels. Much of this vegetation will not be able to endure for extended periods of time submerged and will die back. The floating portions will likely persist under these conditions.

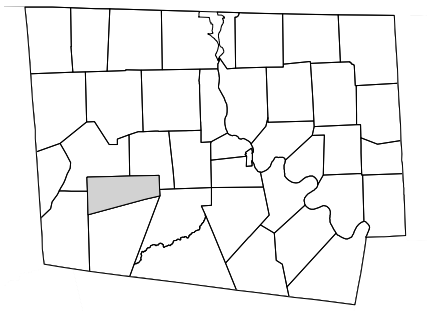
Conservation Recommendations:

A careful slight reduction in the water level may allow more of the wetland to revert to bog vegetation. Installation of a pond leveler like that developed by Clemson University's Department of Aquaculture, Fisheries and Wildlife (http://virtual.clemson.edu/groups/psapublishing/PAGES/AFW/afw1.pdf) may help alleviate some problems associated with beavers. Maintain the undisturbed forested buffer surrounding the wetland. Additional surveys for species of concern on the floating vegetation mats as well as the perimeter of the pond are encouraged.

GRANVILLE TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen	Quality**
None						

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks.



Locally Significant: North Branch Towanda Creek

Managed Lands: None

Granville Township lies completely within the Low Glaciated Plateau Section of the Allegheny Plateaus Physiographic Province. The virgin forests of the valley were cleared for farming and settlement in the early 1800's. Agriculture persists as the dominant activity in the Township. Few wetlands dot the Township relative to the rest of the County, but several larger woodlots remain. North Branch Towanda Creek flows eastward through the Township with some portions of its banks well buffered from agricultural activities. Other portions could use an increased forested buffer to protect water quality from non-point sources of pollution. There were no high quality natural areas identified in Granville Township as a result of this study, but several areas could be the focus of future ground surveys in the Township. A large shrub wetland complex south of Windfall appears to have had little disturbance, but also has little forested buffer from agricultural activities. An undisturbed forested buffer of 50 to 100 meters should be encouraged around this wetland if the surrounding land changes from agricultural to residential land use. The current wetland hydrology should be maintained by discouraging the construction of dams and drainage channels. Large forested blocks should be preserved intact by discouraging unnecessary fragmentation of the landscape with additional roads and residences. These forested blocks, especially along natural features such as streams and ridgelines, act as wildlife corridors through the Township.

GRANVILLE TOWNSHIP MAP

Locally Significant Site:

North Branch Towanda Creek (Canton, Granville and Troy Townships)

This **locally significant site** was determined from aerial photo interpretation. The North Branch Towanda Creek between Granville Summit and Alba forms a series of narrow curves and oxbows within its relatively flat floodplain. There is a railroad bed roughly following the course of the wetland that may have been a component of its formation. Wide shrub swamps, marshes and forested wetlands border the creek in many places. A series of open water ponds occur sporadically along the length of the creek, presumably the result of beaver activity, but several of these are likely man-made. This linear wetland habitat provides a natural landscape corridor, an essential element for wildlife movement through the area.

Threats and disturbances:

Some portions of the creek are well buffered by forest, while agricultural fields border other sections. Conversion from the present agricultural and forest land use to residential development could fragment this habitat, weakening its quality as a wildlife corridor.

Conservation Recommendations:

Maintain the wetland hydrology along the creek by avoiding permanent flooding or draining of this habitat. Preserve and expand the forested buffer along the creek. Should the surrounding land change from agricultural to residential development, a 100 meter undisturbed buffer around the wetland is encouraged.

HERRICK TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen	Quality**
None						

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
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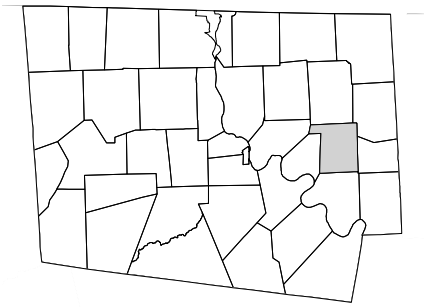


Locally Significant: Cold Creek
Herrickville Wetland

Managed Lands: None

Herrick Township, like most of Bradford County, is a mixture of agricultural fields interspersed with large and small woodlots dotting the rolling hills. There are several large forested blocks and numerous wetlands, many of which have been dammed to create open water ponds in the Township. Priorities for maintaining the native biological diversity of the Township should include maintaining the natural hydrology of the remaining unmodified wetlands and avoiding unnecessary fragmentation of the Township's large forested blocks. Future biological surveys in the Township could focus on these large forested blocks, particularly along Cold Creek, and some of the more natural wetlands, including Totem Lake.

Locally Significant Sites:

Cold Creek (Herrick Township)

This **locally significant site** was determined from aerial photo interpretation. Cold Creek passes through a largely unfragmented forest block south of Herrickville. The flat floodplain of the creek expands periodically into broad herbaceous wetlands, likely the result of past beaver activity. The valley it passes through in this area appears dominated by hemlocks and pines in the northern portion and by hardwoods further downstream. This forested creek floodplain functions as wildlife habitat and a natural wildlife corridor, providing cover and food for wildlife as it passes through the Township. Cold Creek was determined to be one of the highest quality subwatersheds in the Wyalusing Creek watershed based on water quality, macroinvertebrate biology, and general habitat assessment (LeFevre 2004).

Threats and disturbances:

No obvious disturbances are apparent. Conversion from the present forested land use to residential development would fragment this habitat, weakening its quality as a wildlife corridor.

Conservation Recommendations:

Maintain the wetland hydrology along the creek by avoiding permanent flooding or draining of this habitat. Preserve the forested buffer along the creek. Should the surrounding land change from agricultural to residential development, a 100-meter undisturbed buffer along the creek is encouraged. Surveys for species of concern in this habitat are encouraged.

Herrickville Wetland (Herrick and Orwell Townships)

This **locally significant site** was determined from aerial photo interpretation. The wetland at this site appears to have a perimeter of herbaceous vegetation surrounding a central area of open water or floating sphagnum moss. The wetland is buffered by a mostly hemlock and white pine forest, with agricultural fields in portions of the adjacent uplands. This site likely has a characteristic northern acidic wetland plant community, which could include leatherleaf, cranberry and various sedges.

Threats and disturbances:

No obvious disturbances are apparent. Conversion from the present forested land use to residential development would fragment this habitat, weakening its quality as a wildlife corridor.

Conservation Recommendations:

Maintain the wetland hydrology by avoiding permanent flooding or draining of this habitat. Preserve the forested buffer around the wetland. Should the surrounding land change from agricultural and forest to residential development, a 100 meter undisturbed buffer around the wetland is encouraged. Surveys for species of concern in this and adjacent wetlands are encouraged.

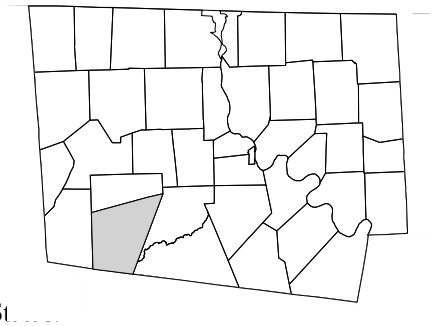
LEROY TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen (y-m-d)	Quality**
Carbon Run Wetlands	Animal: Northern Harrier (*Circus cyaneus*)	G5	S3B, S4N	N	2004	A
	Animal: Bog Copper *(Lycaena epixanthe*)	G4G5	S2	N	1988-07-03	BC
	Animal species of concern	G5	S2	N	1987-07-04	A
	Animal species of concern	G5	S2	N	1993-06-27	E
	Animal species of concern	G4	S1	N	1997-08-31	A
	Animal species of concern	G5	S2	N	1993-07-23	E
	Animal species of concern	G5	S2	N	1993-07-18	E
Lye Run Wetlands	Animal species of concern	G5	S3S4	N	2004-7-29	E
	Animal species of concern	G5	S3S4	N	2004-7-29	E
Marsh Run Bog	Natural Community: Leatherleaf-sedge wetland	G?	S3	N	2003-07-31	AB
McCraney Run Bog	Animal species of concern	G4	S1	N	1992-08-22	C
	Animal species of concern	G5	S2	N	1988-07-03	E
	Animal species of concern	G5	S2	N	1988-08-10	E
Sunfish Pond	Animal species of concern	G4	S2S3	N	1995-08-30	A

Locally Significant: East Holcomb Pond Wetlands
Little Schrader Creek Headwaters
West Holcomb Pond Wetlands
Wolf Run – Rollinson Run Wetlands

Managed Lands: State Game Lands #12 / 36

Other: Schrader Creek: Exceptional Value Water from its source to Coal Run



* Please refer to Appendix IV for an explanation of PNHP Ranks and State St...
**Please refer to Appendix V for an explanation of Quality Ranks.

LEROY TOWNSHIP MAP

LEROY TOWNSHIP

Leroy Township straddles the divide between the High and Low Glaciated Plateau sections of the Allegheny Plateaus Physiographic Province. A 1000-foot difference in elevation separates the two sections of the Township. The low portion is dominated by agriculture along the lowlands of Towanda Creek, which skirts the edge of the toe slopes of the mountain. Many large blocks of forest remain as woodlots on the north side of Route 414 between Wallace Brook and Gulf Brook. Much of Towanda Creek in Leroy Township has a narrow strip of trees buffering the creek from agricultural runoff. Protection and enhancement of this narrow buffer, and reforestation of the creek buffer in areas where it is lacking, will help protect water quality within the Township and the Susquehanna River drainage. The highlands of Leroy Township are part of a very large contiguous forest stretching almost from the Susquehanna River on the east, to Sullivan and Lycoming Counties in the southwestern corner of Bradford County. This southern quarter of Bradford County is dotted with various wetlands, ponds, waterfalls, rock outcrops, cliffs, creeks and streams, all within an excellent nearly unbroken forested context. Most of the highland portion of the Township is in the public domain as part of State Game Lands #12. This region of the county represents one of the highest quality natural areas in the state. One could spend many years conducting a biological inventory of this portion of the county alone.

CARBON RUN WETLANDS (Franklin and Leroy Townships)

Several shrub swamps and an artificially impounded pond occupy the core habitat of this site. The surrounding landscape bears the scars of past mining operations, but the area has since reverted to forest. A total of seven animal species of concern have been documented at this location. All utilize the wetlands as their primary habitat. **Northern Harrier (*Circus cyaneus*), a G5, S3B, S4N PA animal species of concern** has been documented as breeding at this site since they were added to the PA species of concern list in 1985. Breeding occurrences of Harriers (also known as Marsh Hawks) had been slowly declining throughout North America between the mid-1960's and the mid-1980's due primarily to loss of wetlands and old field habitat (Brauning 1992). Harriers tend to nest in dense shrubs in otherwise open habitat such as marshes, shrub swamps and old fields where the vegetation is stunted. Harriers can be seen flying low over agricultural fields and wetlands, hunting for small mammals. Hay fields in the area provide good foraging areas for this species. A good-quality population of **a terrestrial invertebrate species of concern, the G4G5, S2 bog copper butterfly (*Lycaena epixanthe*)**, was also documented from this site. The host plant of this species, cranberry, occurs frequently throughout these wetlands. A host plant specialist, the distribution of the bog copper butterfly is linked directly to the habitat of the cranberry. Loss of cranberry wetlands can severely diminish occurrences of this species. **Five other aquatic species of concern** were also documented at this location. These five species are under the jurisdiction of the PA Fish and Boat Commission, and their names cannot be released under a data sharing agreement. These species use the wetlands as their primary habitat. Reduction of wetland quality by changes in hydrology (permanent draining or flooding), or degradation of water quality could severely impact these populations. This site is entirely within State Game Lands #12.

Threats and Disturbances:

Nest locations for Northern Harriers are susceptible to disturbance. Logging of the perimeter of the wetlands could detrimentally impact the nesting location. Removal of the forested buffer could also result in increased sedimentation runoff into the wetlands, leading to reduced water quality. Acid mine drainage from past mining activity may be impacting these wetlands and the watershed at large. Degradation of the water quality of this watershed could lead to a decline in the five aquatic animal species of concern. Norway spruce and other exotic conifers have been planted extensively along the roadways in this area.

Conservation Recommendations:
Maintain the current wetland hydrology and the undisturbed forested buffer surrounding the wetland. This will help prevent the disturbance of nest locations for the Northern Harrier, as well as provide for filtration of runoff entering the wetlands. Avoid the construction of dams and the use of non-native species when replanting throughout the forest. Additional surveys for species of concern in adjacent wetlands, and to monitor known populations, are encouraged.

LYE RUN WETLANDS (Canton and Leroy Townships, and Sullivan County)
This site includes an artificially created open water pond and several areas of dense shrub swamp, and one herbaceous-dominated wetland. The northern edge of the man-made pond at this site still contains some characteristic acidic bog plant species. **Two aquatic animal species of concern** were documented at this site. These two species are under the jurisdiction of the PA Fish and Boat Commission, and their names cannot be released under a data sharing agreement. These species use the wetlands as their primary habitat. Reduction of wetland quality by changes in hydrology (permanent draining or flooding), or degradation of water quality could severely impact these populations. This site occurs primarily on State Game Lands #12.

Threats and disturbances:
These wetlands have all likely been modified repeatedly in the past by the cyclic dam building activities of beavers. An open water pond has been created by the construction of a permanent dam. Removal of the present forested buffer would likely cause detrimental changes to the chemical and vegetative composition of this wetland natural community.

Conservation Recommendations:
The temporary periodic flooding and draining due to beaver activity will likely keep this wetland in various states of succession. Permanent flooding or draining would likely diminish the quality of these wetland natural communities. The bog natural community at the current open water pond would benefit from a slight reduction in the water level. A reduced water level would accelerate the revegetation process of the wetland. Maintain a wide undisturbed forested buffer around the wetland. Avoid building dams, drainage channels, roads or residences in the vicinity that may impact the hydrology of the wetlands. Additional surveys for species of concern in these and adjacent wetlands are encouraged.

MARSH RUN BOG (Leroy Township)
A **Leatherleaf-sedge Wetland Natural Community**, a component of the Acidic Glacial Peatland Complex (Fike 1999), dominates this particular wetland. This community type is characterized by the clear dominance of leatherleaf, which in this wetland forms an extensive shrubland covering most of the area. This wetland appears to have been impacted by previous and ongoing beaver activity. The southern portion of the wetland has an area dominated by sedges and open water near an old beaver dam. Surrounding the wetland is a nearly impenetrable thicket of highbush blueberry, while the adjacent uplands are heavily forested in hemlock, white pine, red and sugar maple and American beech. The wetland drains both to the north and to the south, the wetland sitting on the divide between the Towanda Creek and Schrader Run watersheds. The northern portion drains off the steep divide between the High and Low Sections of the Glaciated Plateau. This run likely has waterfalls along the course of its rapid decent off the mountain. Waterfalls occasionally harbor specialized species of plants that are well suited to the cool, moist microhabitat found here.

Threats and Disturbances:

There were no disturbances apparent at this wetland complex besides periodic flooding and drying due to a fluctuating beaver population. The adjacent forest appeared to be very well managed. Potential threats include removal of the forested buffer surrounding the wetland, or conversion of the adjacent landscape from its present use to residential development.

Conservation Recommendations:

Maintain the current wetland hydrology. The temporary periodic flooding and draining due to beaver activity will likely keep this wetland in various states of succession. Permanent flooding or draining would likely destroy this natural community. Avoid the construction of dams. Maintain the undisturbed forested buffer surrounding the wetland. If the land changes from its present use as forested woodland to residential development, a 100-meter undisturbed forested buffer is encouraged around this wetland. Additional surveys for species of concern in this and adjacent wetlands, as well as the narrow ravine to the north are encouraged.

McCRANEY RUN BOG (Leroy Township)

This site is a mountaintop beaver meadow that has been flooded and then abandoned by beavers many times over the years. Succession has advanced, only to be set back by flooding from subsequent beaver impoundments. A small stream passes through the wetland, which is presently dominated by spiraea shrubs. **Three aquatic species of concern** were documented at this location. These three species are under the jurisdiction of the PA Fish and Boat Commission, and their names cannot be released under a data sharing agreement. These species use the wetlands as their primary habitat. Reduction of wetland quality by changes in hydrology (permanent draining or flooding) or degradation of water quality could severely impact these populations. This site is primarily private property, but also includes a portion of State Game Lands #12.

Threats and Disturbances:

There were no disturbances apparent at this wetland complex besides periodic flooding and drying due to a fluctuating beaver population. Potential threats include removal of the forested buffer surrounding the wetland or conversion of the adjacent landscape from its present use to residential development.

Conservation Recommendations:

Maintain the current wetland hydrology. The temporary periodic flooding and draining due to beaver activity will likely keep this wetland in various states of succession. Permanent flooding or draining would likely destroy this natural community. Avoid the construction of dams. Maintain the undisturbed forested buffer surrounding the wetland. If the land changes from its present use as forested woodland to residential development, a 100-meter undisturbed forested buffer is encouraged around this wetland.

SUNFISH POND (Leroy Township)

This site includes Sunfish Pond County Park, which is an artificial lake formed by damming a tributary to Little Schrader Creek. The park offers recreational opportunities like fishing, boating, picnicking and camping surrounded by State Game lands #12. A **G4, S2S3 aquatic animal species of concern** was documented at this site in 1995. This species is under the jurisdiction of the PA Fish and Boat Commission, and its name cannot be released under a data sharing agreement. This species uses the wetlands at the pond edge as its primary habitat. Reduction of wetland quality by changes in hydrology (permanent draining or flooding) or degradation of water quality could severely impact this population. A fair–quality population of golden club (*Orontium*

aquaticum), a plant recently removed from the species of concern list, was documented at this site in 2003.

Threats and Disturbances:
The high water level at this artificial lake has crowded most of the wetland vegetation that likely once occupied this site into narrow shoreline margins. The animal species of concern at this location requires continued good water quality. Tree trunks and dead wood in the water and along the lake margin are required for egg laying for this species. Recreational activities at his popular park have disturbed some of the undergrowth in the upland areas and lake shoreline.

Conservation Recommendations:
The species of concern documented at this site have persisted despite these disturbances, and should continue to do so as long as further degradation of the shoreline and water quality does not take place.

Locally Significant Sites:

East Holcomb Pond Wetlands (Franklin and Leroy Townships)

This **locally significant site** was identified from aerial photo interpretation. A series of small wetlands drain north towards Holcomb Pond and off the steep side of the mountain. The wetlands appear to contain a variety of habitat types including shrub swamps, conifer forested wetlands, herbaceous wetlands and open water. Holcomb Pond appears to be dominated by herbaceous vegetation with a small amount of open water. All of the wetlands are likely to have past or current beaver impoundments. The drainage continues northward off the steep mountainside, likely creating waterfalls along its rapid descent. This site is primarily on State Game Lands #12 but also includes some private land.

Threats and Disturbances:
These habitats mostly appear to have good forested buffers without much obvious disturbance.

Conservation Recommendations:
Maintain the current wetland hydrology and the undisturbed forested buffer surrounding the wetlands. Avoid the construction of dams. Surveys for species of concern and exemplary natural communities are encouraged.

Little Schrader Creek Headwaters (Leroy Township)

This **locally significant site** was identified from aerial photo interpretation. This site includes what appears to be a large, open, shrub-swamp wetland that has experienced periodic flooding due to beaver activity. This site includes private land and a portion of State Game Lands #12.

Threats and Disturbances:
These habitats all appear to have good forested buffers without much obvious disturbance.

Conservation Recommendations:
Maintain the undisturbed forested buffer surrounding the wetlands. Avoid the construction of dams. If the land changes from its present use as forested woodland to residential development, a 100-meter undisturbed forested buffer is encouraged around the wetlands and ravine. Surveys for species of concern and exemplary natural communities are encouraged.

West Holcomb Pond Wetlands (Leroy Township)

This **locally significant site** was identified from aerial photo interpretation. Included in this site are what appear to be an open-water, artificially enhanced pond, a shrub swamp and a narrow ravine with waterfalls. This site is primarily private land but also includes a portion of State Game Lands #12.

Threats and Disturbances:

These habitats all appear to have good forested buffers without much obvious disturbance.

Conservation Recommendations:

Maintain the undisturbed forested buffer surrounding the wetlands. If the land changes from its present use as forested woodland to residential development, a 100-meter undisturbed forested buffer is encouraged around the wetlands and ravine. Avoid the construction of dams. Surveys for species of concern and exemplary natural communities are encouraged.

Wolf Run - Rollinson Run Wetlands (Leroy Township)

This **locally significant site** contains several very dense shrub swamps with many plant species that are characteristic of northern acidic wetlands. The wetlands at this site provide excellent habitat for a variety of wildlife. This site is primarily within State Game Lands #12.

Threats and Disturbances:

Beaver have likely impacted these wetlands periodically in the past. The temporary periodic flooding and draining due to beaver activity will likely keep these wetlands in various states of succession. These wetlands have excellent forested buffers without any obvious disturbances.

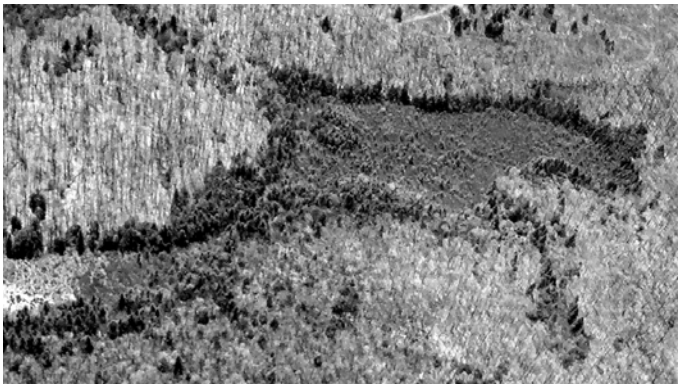
Conservation Recommendations:

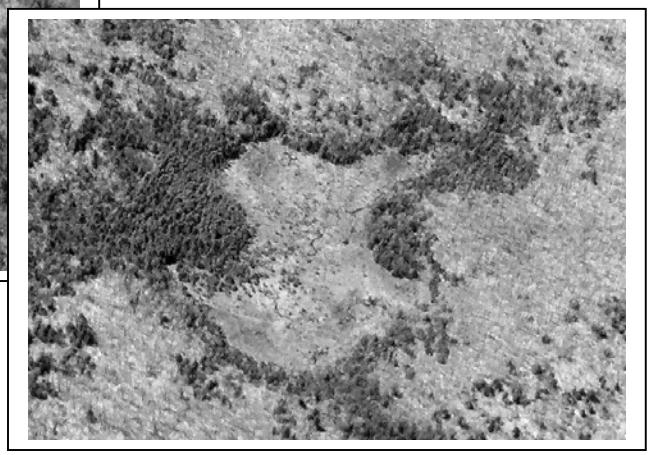
Maintain the current wetland hydrology. Avoid building dams or drainage channels. Maintain the undisturbed forested buffer surrounding the wetlands. Avoid unnecessary fragmentation of the forested matrix. Future logging roads should be directed away from wetlands. Only a small portion of these wetlands was ground surveyed. More thorough surveys are strongly encouraged.

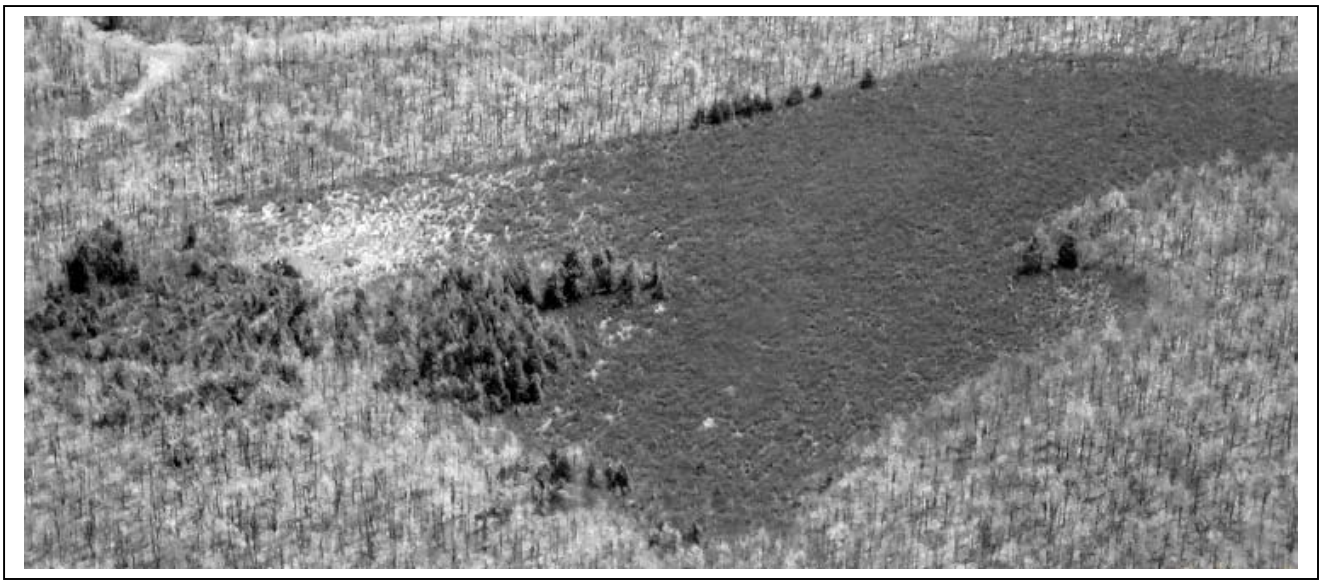
Golden-club (Orontium aquaticum) was documented along the shoreline of Sunfish Pond County Park. This species was recently removed from the PA species of concern list due to updated statewide population estimates. Photo: PA Science Office of The Nature Conservancy

A Great Variety and Quantity of Wetlands, Franklin & Leroy Townships

A great variety and quantity of wetlands in an excellent forested context dot the High Plateau landscape of southern Bradford County. Most of these wetlands occur in State Game Lands #12 & #36 in Franklin and Leroy Townships. Photos: PA Science Office of The Nature Conservancy.







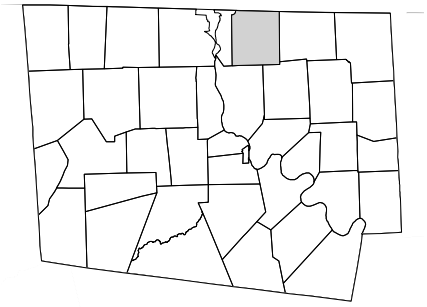
LITCHFIELD TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen (y-m-d)	Quality**
Susquehanna River (Upper section)	Plant: Illinois Pondweed (*Potamogeton illinoensis*)	G5	S3S4	N	2003-8-27	E
	Animal species of concern	G3	S2	N	2003-8-27	E
	Animal species of concern	G3G4	S3S4	N	2003-8-27	E
	Animal species of concern	G4	S4	N	2003-8-27	E
	Animal species of concern	G4	S3S4	N	2003-8-27	E

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks.

Locally Significant: Vawter Wetlands

Managed Lands: None



Litchfield Township, like most of Bradford County, is dominated by a mixture of agricultural fields and large and small woodlots with a peppering of glacially derived wetlands. The Township has a small amount of Susquehanna River frontage. Most of the Township's creeks drain west, directly into the Susquehanna, while Bullard Creek flows southward into Wysox Creek before entering the Susquehanna River. Most of the creeks have good forested buffers, though areas deserve restoration efforts. Several areas should be the focus of future ground surveys. Parks Creek from its source to the Susquehanna River flows through a large uneven-aged forested block. A conifer swamp forest north of Cottons Corners and a similar one north of Vawter Wetlands are likely hemlock palustrine forests. Local planning should discourage unnecessary fragmentation from the construction of new roads and residences in the Township's large forested blocks. Natural wetlands in the Township should likewise be buffered from construction activity.

LITCHFIELD TOWNSHIP MAP

SUSQUEHANNA RIVER (Upper Section) (Athens, Litchfield, Sheshequin and Ulster Townships)

A **G5, S3S4 plant species of concern, Illinois pondweed (*Potamogeton illinoensis*), and four aquatic animal species of concern** were documented in the Susquehanna River near Athens during a survey of this portion of the Susquehanna River in 2003. Additional surveys are recommended to better estimate populations of these species of concern in the river. The river also provides a valuable migration corridor for many bird species, especially aquatic dependent species, but also many neo-tropical passerine migratory species.

The Susquehanna River is subject to frequent flooding and seasonal low water levels. Scouring of the banks and islands by ice and flooding has created pockets of specialized habitats along the river floodplain. Several islands have distinctive "Big bluestem (*Andropogon gerardii*)-Indian grass (*Sorghastrum nutans*) River Grasslands," which are natural tall grassland communities created as the result of these natural disturbances. The two plant species the community type is named for dominate these habitats and also include switch grass (*Panicum virgatum*) and Indian hemp (*Apocynum cannabinum*). The habitat tends to grade into a "Water willow (*Justicia americana*) – smartweed Riverbed Community" on the lowest island elevations, and into a "Black willow Scrub/shrub Wetland", and "River birch – sycamore Floodplain Scrub" as the elevation increases and the habitat becomes drier. These natural communities are part of the "Riverbed – Bank – Floodplain Community Complex" (Fike 1999), a broadly defined mosaic of community types that typify the natural vegetation along the Susquehanna River in Bradford County.

Threats and Disturbances:

There are numerous examples of disturbance along the Susquehanna River. These animal species of concern are affected by non-point sources of pollution including sedimentation from cultivated and developed land along the river, runoff from roadways, pesticide runoff from agricultural fields, discharge of chemical pollutants and thermal pollution. The main threat to these animals is reduction of water quality. The banks, floodplains and islands of the river have the invasive introduced plant species Japanese knotweed (*Polygonum cuspidatum*) and purple loosestrife (*Lythrum salicaria*). Control of established populations of these species is very difficult. Eradication of pioneer populations is the best way to control the spread of these species of plants.

Conservation Recommendations:

Any of the above types of disturbances should be minimized where possible. Also, monitoring of these populations should continue into the future. Loss of individuals and reductions in population sizes should lead to an investigation into possible causes. Water quality should be monitored and pollution sources should be identified where possible. Forested buffers should be maintained and created where absent along the length of the river with logging operations refraining from cutting within 100 meters of the river edge. River bank forests help buffer the watershed from the effects of non-point sources of pollution including runoff from agricultural, residential and roadway settings. In addition, the river floodplain and corridor is usually an area of significantly higher biodiversity than the adjoining uplands. Much of the area's important biodiversity can be preserved by maintaining an intact, forested floodplain along the river. The effectiveness of the forested riverbanks as a habitat corridor would be diminished by fragmentation of the forest continuity by the construction of houses, businesses and additional roadways along the river. Local planning should discourage construction of new structures and roadways along the river, adjacent slopes and floodplain.

Locally Significant Site:

Vawter Wetlands (Litchfield Township)

This **locally significant site** contains a wetland with floating mats of thick sphagnum moss that are dominated by shrubs and small trees. The wetland has an elevated water level, likely due to blocked drainage from an adjacent road. As a result, an open water pond has formed at the eastern end of the wetland while the western end has a flooded shrub swamp and many dead standing trees. A wide border of uneven-aged swampy conifer forest dominated by hemlock and white pine surrounds most of the pond, creating a significant buffer to a portion of this wetland. The floating vegetation mats are quite extensive and unstable. Only a small portion of this habitat was surveyed. One active Great Blue Heron nest was observed at this site with several other vacant nests; however, there must be at least 15 active nests for this site to be considered a rookery.

Threats and Disturbances:

The elevated water level at this site will drown much of the rooted vegetation, while the floating vegetation mats will likely continue to persist. Agricultural fields abut the southeastern edge of the wetland, offering little buffer from nutrient and sediment runoff. Large patches of cattails and a layer of floating duckweed suggest an influx of nutrients into this wetland. Clearing of the forested buffer for agricultural, residential or recreational purposes would degrade the quality of this wetland habitat.

Conservation Recommendations:

A slight reduction in the water level would allow the wetland vegetation to recolonize this site. Avoid further increases in the water level by discouraging dam construction. A forested buffer between the wetland and agricultural fields would help protect the site from non-point sources of pollution. Preserve the remaining forested buffer surrounding the wetland. If the current land use changes from agricultural and forested to residential development, a 100-meter wide undisturbed forested buffer around the wetland is encouraged.

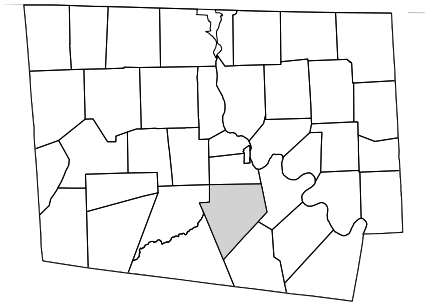
Great Blue Heron Rookeries

Great Blue Herons were in severe decline throughout Pennsylvania for the first half of the 20th century, but have made a remarkable comeback in recent decades. Acid mine drainage (AMD), which kills fish and other aquatic life, may have deprived these birds of their food source in the past. Efforts to mitigate the effects of AMD over the past few decades have likely helped restore life to some of these previously disturbed aquatic habitats. Herons typically form roosting colonies in the tops of trees. Disturbance or destruction of woodland rookeries by logging operations pose the greatest current threat to these nesting sites. Photo: Jeannine Tardiff

MONROE TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen (y-m-d)	Quality**
Kellogg Mountain	Animal species of concern	G4	S3S4	N	2003-03-29	E
Lower Schrader Creek	Animal: Great Blue Heron (*Ardea herodias*)	G5	S3B	N	2004-05-11	E

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks.



Locally Significant: Liberty Corners Wetlands

Managed Lands: State Game Lands #36
Tioga State Forest

Other: Schrader Creek: High Quality–Cold Water Fishery
from Coal Run to Towanda Creek.

Monroe Township is bisected by South Branch Towanda Creek. The northern portion of the Township is dominated by agricultural activities, while the southern portion is part of the extensive forested block of the Glaciated High Plateau Section of the Allegheny Plateaus Physiographic Province, which stretches virtually unbroken westward into Sullivan and Lycoming Counties. The Township contains portions of Tioga State Forest and State Game Lands #36. The sharp rise up the Township's southern slope culminates in rock outcrops along the rim of the flat plateau of Kellogg Mountain.

KELLOGG MOUNTAIN (Monroe Township)

The flat plateau-like top of Kellogg Mountain has many extensive flat rock outcrops and several small shrub-dominated wetlands. This site supports a **G4, S3S4 aquatic animal species of concern**. This species is under the jurisdiction of the PA Fish and Boat Commission, and its name cannot be released under a data sharing agreement. The well-drained top of Kellogg Mountain is dominated by stunted chestnut oak and pitch pine underlain at times by a nearly impenetrable shrub layer of mountain laurel and black huckleberry. The small wetlands drain off the mountain into narrow hemlock ravines into Schrader Creek on the west and into South Branch Towanda Creek on the east.

Threats and Disturbances:

There are numerous communication towers and access roads along the mountaintop. Some logging has occurred in this vast forested area but much remains undisturbed.

Conservation Recommendations:

An undisturbed forested buffer should be maintained around the small wetlands. Rock outcrops in the area should also be buffered from logging activities. Communication towers should be clustered to avoid undue fragmentation of the landscape.

LOWER SCHRADER CREEK (Franklin, Monroe and Overton Townships)

This site contains a rookery of **Great Blue Herons (*Ardea herodias*), a G5, S3B animal species of concern.** Twenty nests of this species were found in white pines in a slightly fragmented forest dominated by white pine with a few eastern hemlock and sparse understory layer. Schrader Creek is also designated a **High Quality Cold Water Fishery** from Coal Run to Towanda Creek by the Department of Environmental Protection.

Threats and Disturbances:

Threats of this area include logging of the immediate nesting area, development, acid mine drainage degradation of the watershed and continued human disturbance.

Conservation Recommendations:

Logging activities should be avoided within the immediate area of the rookery. Rookeries are extremely sensitive to logging and will be abandoned if such disturbances continue. Great Blue Herons are known to be facultative in terms of selecting nest sites, and it is possible that this site will be abandoned within a few years. More surveys are needed of this site to determine whether the herons maintain site fidelity to this area.

Locally Significant Site:

Liberty Corners Wetlands (Asylum and Monroe Townships)

The three wetlands in this **locally significant site** were determined from aerial photo interpretation. Despite the modified nature of the surrounding landscape, these three wetlands appear to have persisted as a variety of wetland types. Coniferous trees had dominated the large southernmost wetland, but the water level has recently been elevated, drowning the trees. An incomplete ring of floating islands persists on the western edge of the wetland, with an open central zone of sphagnum moss and herbaceous vegetation. Until recently, this wetland had appeared to be a good-quality bog natural community. A recent man-made dam appears to have been constructed at the eastern outflow of the bog, elevating the water level. This flooded bog is in

the process of becoming an open water pond, which eliminates the bog natural community. Remnants of the bog habitat will likely persist indefinitely as floating mats, but only rapid restoration of the previous wetland hydrology will prevent the rest of the wetland vegetation from drowning. The other two wetlands may have also been converted to open water ponds recently. These had been more open, herbaceous-dominated sphagnum moss wetlands.

Threats and Disturbances:
A fair amount of the landscape surrounding these wetlands remains forested. These wetlands may have man-made dams that have altered their hydrology. This greatly diminishes the quality of these natural communities. Residential and agricultural activities have removed some of the forested buffer adjacent to the wetlands.

Conservation Recommendations:
Drastic restorative measures may need to be taken to prevent the loss of the bog and wetland habitats. Preserve and repair the forest buffer surrounding the wetlands. Ground surveys of these habitats are encouraged.

Freshwater Mussels in the Susquehanna River

Portions of the Susquehanna River in Bradford County have very good populations of freshwater mussels. One method of surveying for mussels is to look through the bottom of a bucket that has been replaced with plexiglass. This allows for an unobstructed look at the river bottom. All that is typically seen of mussels is the hinge edge, which is barely protruding above the surface of the gravel substrate.

Green Floater

Yellow lamp mussel

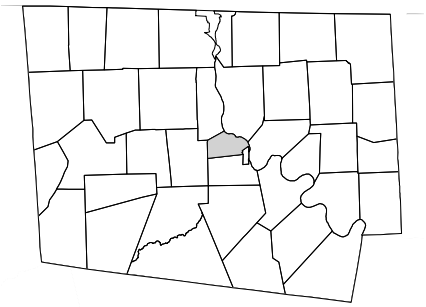
NORTH TOWANDA TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen	Quality**
Susquehanna River (Middle Section)	Animal: Bald Eagle *(Haliaeetus leucocephalus)*	G4	S2B	PE	2004	E
	Animal species of concern	G3G4	S3S4	N	2004	E
	Animal species of concern	G4	S4	N	2004	E
	Animal species of concern	G4	S3S4	N	2004	E
	Animal species of concern	G3	S2	N	2004	E

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks.

Locally Significant: None

Managed Lands: None



Sugar Creek flows through North Towanda Township, where it enters the Susquehanna River. On its way through the Township, the creek makes several sharp bends at the base of steep forested cliffs and outcrops. Evidence of a meandering riverbed is revealed by a number of oxbows that have formed in the wide floodplain. The creek has formed a delta at its confluence with the Susquehanna River, built up from sediment washed down the creek. Much of the floodplain of Sugar Creek in the Township is used for agricultural fields. In many areas, there is little forested buffer between the fields and the creek. Restoration of the forested floodplain would help reduce non-point sources of pollution and sediment entering the creek and the Susquehanna River as it passes through the Township. There are several areas within the Township that could be the focus of future ground surveys. Oxbows can be specialized habitats that are home to uncommon species of plants and animals. The steep forested slopes along Sugar Creek as well as those along the Susquehanna River also have potential to host uncommon species. Local planning can help preserve the Township's remaining large blocks of forest from unnecessary fragmentation by discouraging the construction of new roads and residences in these areas.

SUSQUEHANNA RIVER (Middle Section) (Asylum, North Towanda, Standing Stone, Towanda, and Wysox Townships)

Nesting Bald Eagles, and four aquatic animal species of concern have been documented along this section of the Susquehanna River. The Bald Eagles nest in large trees along the river, and utilize the river as their main food foraging area, feeding on fish and waterfowl. Bald Eagles had been in steep decline throughout Pennsylvania due largely to the poisonous effects of organochlorine insecticides, but recently, habitat loss may have replaced pesticide poisoning as the major threat to eagles (Brauning 1992). Nesting occurrences of Bald Eagles in Pennsylvania have increased in the last two decades, particularly along the Susquehanna River and in northwestern PA. The four aquatic animal species of concern are under the jurisdiction of the PA Fish & Boat Commission, and their names cannot be released under a data sharing agreement. These animal species of concern are affected by non-point sources of pollution including sedimentation from cultivated and developed land along the river, runoff from roadways, pesticide runoff from agricultural fields, discharge of chemical pollutants and thermal pollution.

The Susquehanna River has cut deeply through Bradford County, creating soaring rock outcrops opposite low-lying floodplains. The river is subject to great fluctuations in its water level, from a near trickle during dry periods to severe flooding events. The action of the powerful ebb and flow of the river has created various microhabitats along its length. The steep cliff communities, scoured islands, oxbows and wide floodplains can all have unique assemblages of plants and animals.

Many of the ice and flood scoured islands have distinctive "Big bluestem (*Andropogon gerardii*)-Indian grass (*Sorghastrum nutans*) river grasslands," which are natural tall grassland communities created as the result of these natural disturbances. The two plant species the community type is named for dominate these habitats and also include switch grass (*Panicum virgatum*) and Indian hemp (*Apocynum cannabinum*). The habitat tends to grade into a "Water willow (*Justicia americana*) – smartweed Riverbed Community" on the lowest island elevations, and into a "Black willow Scrub/shrub Wetland," and "River birch – sycamore Floodplain Scrub" as the elevation increases and the habitat becomes drier. These natural communities are part of the "Riverbed – Bank – Floodplain Community Complex" (Fike 1999), a broadly defined mosaic of community types that typify the natural vegetation along the Susquehanna River in Bradford County.

Another important area for conservation in the Township are the forested slopes along the Susquehanna River. These steep ravines and slopes have likely remained forested because of their topography. The direction the slope is facing will have a significant impact on the species composition found there. Forestry practices on these steep slopes should be evaluated to minimize negative effects such as erosion. Additional surveys of forested slopes, ravines and streams in this Township are encouraged.

Threats and Disturbances:

The main threat to these animal species of concern is the reduction of water quality. Activities of industries and landowners along the river can have significant impacts on water quality in the River down to the Chesapeake Bay. Erosion and chemical runoff into the water systems is a serious concern throughout the state. The banks, floodplains and islands of the river have large populations of several aggressive introduced plants including Japanese knotweed (*Polygonum cuspidatum*) and purple loosestrife (*Lythrum salicaria*). Control of established populations of these

species is very difficult. Eradication of pioneer populations is the best way to control the spread of these invasive species.

Conservation Recommendations:

Forested buffers should remain intact for the length of the river with logging operations minimizing cutting within 100 meters of the river bank. Floodplain forests help buffer the watershed from the effects of non-point sources of pollution including runoff from agricultural, residential and roadway settings. In addition, the river floodplain and corridor can be an area of significantly higher biodiversity than the adjoining uplands. Much of the area's important biodiversity can be preserved by maintaining an intact, forested floodplain along the river. The effectiveness of the river as a habitat corridor would be diminished by fragmentation of the forest continuity by the construction of buildings, houses and additional roadways along the river. Local planning should discourage new construction and roadways along the river, adjacent slopes and floodplain.

This common map turtle was found along the Susquehanna River in Bradford County. Though not considered a species of concern in Pennsylvania, its range in PA is restricted primarily to the Susquehanna and Delaware Rivers and their major tributaries. The species' range extends from the Great Lakes Region south to Arkansas and Alabama, and east to the Hudson River in New York.

Hemlock Woolly Adelgid

(Photos: PA Science Office of The Nature Conservancy)

The state tree of Pennsylvania, the Eastern Hemlock (*Tsuga canadensis*), has been under attack by an accidentally introduced insect species, the Hemlock Wooly Adelgid (*Adelges tsugae).* Many of these trees may succumb due to defoliation by these insect pests. The character of these hemlock-dominated habitats will likely change dramatically if continued defoliation occurs. The removal of the hemlock canopy would likely result in a marked decrease in these shade-adapted species and an increase in shade intolerant species, including many species considered invasive. The stable temperatures and hydrology of hemlock-dominated streams are the preferred habitat of native brook trout. Brook trout (*Salvelinus fontinalis*) were found to be two and a half times as likely to occur in hemlock streams than in hardwood streams, and were also found to be twice as abundant in hemlock streams (Snyder & Ross). It is difficult to predict the future consequences of the loss of mature stands of hemlock in these habitats.

Top: The wooly adelgid appears as a cottony mass on the undersides of hemlock branches.

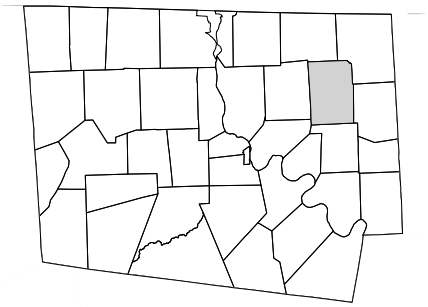
Center: The insect devours the evergreen needles of even the largest trees.

Bottom: Hemlock cannot withstand defoliation, and will die shortly after being stripped of its needles.

ORWELL TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen	Quality**
None						

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks.



Locally Significant: Gulf Pond
Herrickville Wetland

Managed Lands: None

Orwell Township has several large forested blocks, but few wetlands of note. These large forested tracts are extremely important habitats and also function as corridors for movement of animals through the landscape. Large forested areas also provide critical breeding habitat for interior forest birds. Continued preservation of large forested habitats will increase protection for these valuable natural resources in the Township and provide an attractive landscape in which to live and work. If the continuity of this forested corridor is broken by additional roadways and development, the remaining portions would become virtual islands, isolated from the supporting landscape, reducing its viability as a functioning ecosystem. Township planning can preserve the ecological integrity of the large forested blocks by discouraging unnecessary fragmentation of these landscape features. Avoid the construction of new roads and residences in these natural wildlife corridors.

ORWELL TOWNSHIP MAP

Locally Significant Site:

Gulf Pond (Orwell Township)

This **locally significant site** was determined from aerial photo interpretation. This wetland is surrounded primarily by a wide unfragmented forested buffer, which provides excellent protection from non-point sources of pollution, and colonization of invasive species of plants. Within this protective forested matrix is a large open wetland, apparently dominated by short shrubs and herbaceous vegetation. The center of the wetland is likely supported by a thick floating mat of sphagnum moss. The relatively undisturbed surroundings of this wetland and the fact that it seems to have avoided flooding by both humans and beavers are the reasons this is considered a high quality habitat.

Threats and Disturbances:

Changes in the wetland hydrology, flooding or draining, would degrade the quality of this habitat. Removal or fragmentation of the forested buffer surrounding the wetland would also significantly diminish the quality of this habitat.

Conservation Recommendations:

Maintain the current wetland hydrology. Maintain the undisturbed forested buffer surrounding the wetlands. If the land changes from its present use as forested woodland to residential development, a 100-meter undisturbed forested buffer is encouraged around the wetland. Ground surveys for species of concern and exemplary natural communities are encouraged.

Herrickville Wetland (Herrick and Orwell Townships)

This **locally significant site** was determined from aerial photo interpretation. The wetland at this site appears to have a perimeter of herbaceous vegetation surrounding a central area of open water or floating sphagnum moss. The wetland is buffered by a mostly hemlock and white pine forest, with agricultural fields in portions of the adjacent uplands. This site likely has a characteristic northern acidic wetland plant community, which could include leatherleaf, cranberry and various sedges.

Threats and Disturbances:

Most of this portion of the creek is well buffered by forest. No obvious disturbances are apparent. Conversion from the present forested land use to residential development would fragment this habitat, weakening its quality as a wildlife corridor.

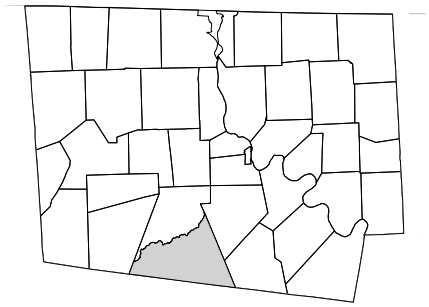
Conservation Recommendations:

Maintain the wetland hydrology by avoiding permanent flooding or draining of this habitat. Preserve the forested buffer around the wetland. Should the surrounding land change from agricultural and forest to residential development, a 100-meter undisturbed buffer around the wetland is encouraged. Surveys for species of concern in this and adjacent wetlands are encouraged.

OVERTON TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen (y-m-d)	Quality**
Lower Schrader Creek	Animal: Great Blue Heron (*Ardea herodias*)	G5	S3B	N	2004-05-11	E
Sugar Run Headwaters	Animal: Northern water shrew (*Sorex palustris albibarbis*)	G5T5	S3	N	2003-07-19	E
	Plant: Great-spurred violet (*Viola selkirkii*)	G5	S1	N	2003-05-21	BC
Williams Lake Wetlands	Animal species of concern:	G5	S2	N	1993-07-05	B
	Animal species of concern:	G5	S2	N	1993-07-05	B

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks.



Locally Significant: Overton Ponds

Managed Lands: State Game Lands #12
State Game Lands #36

Other: Schrader Creek: Exceptional Value Stream from the source to Coal Run
Schrader Creek: High Quality Cold Water Fishery from Coal Run to Towanda Creek

Overton Township is almost entirely within the Glaciated High Plateau Section of the Allegheny Plateaus Physiographic Province. This portion of the Township is part of a large nearly continuously forested expanse of wilderness that stretches virtually unbroken westward into Sullivan and Lycoming Counties. This highlands portion of Bradford County is dotted with large and small wetlands of various types, rock outcrops, waterfalls, steep cliffs, streams and seeps, all within a nearly unbroken forested matrix. The southern lowland portion of the Township is also largely forested with a smaller amount of agricultural lands. The highland portion of the Township flows northward into Schrader Creek, while the southern half of the Township flows southward into the Loyalsock Creek. A large portion of the highland section of the Township is in State Game Lands #36. The section of Schrader Creek running through the Township is considered an Exceptional Value Stream to Coal Run and a High Quality-Cold Water Fishery to Towanda Creek by the Department of Environmental Protection. Much of the Township's native biodiversity can be preserved by avoiding unnecessary fragmentation of landscape features by steering construction of new roads and buildings away from large forest blocks and wetlands. Alteration of wetland hydrology by the construction of permanent dams and drainage channels should also be avoided.

OVERTON TOWNSHIP MAP

OVERTON TOWNSHIP

LOWER SCHRADER CREEK (Franklin, Monroe and Overton Townships)

This site contains a rookery of **Great Blue Herons (*Ardea herodias*), a G5, S3B animal species of concern.** Twenty nests of this species were found in white pines in a slightly fragmented forest dominated by white pine with a few eastern hemlock and sparse understory layer. Schrader Creek is also designated a **High Quality-Cold Water Fishery** from Coal Run to Towanda Creek (Department of Environmental Protection 1999).

Threats and Disturbances:

Threats of this area include logging of the immediate nesting area, development, acid mine drainage within the watershed and continued human disturbance.

Conservation Recommendations:

Logging activities should be avoided within the immediate area of the rookery. Rookeries are extremely sensitive to logging and will be abandoned if such disturbances continue. Great Blue Herons are known to be facultative in terms of selecting nest sites, and it is possible that this site will be abandoned within a few years. More surveys are needed of this site to determine whether the herons maintain site fidelity to this area.

SUGAR RUN HEADWATERS (Overton Township)

This site along Sugar Run is a northern hardwood forest dominated by sugar maple, beech, yellow birch, basswood and hemlock. There is an excellent diversity of spring ephemeral wildflowers including a population of a **G5, S1 plant species of concern, the great–spurred violet (*Viola selkirkii*)**. A small mammal survey of the headwaters of Sugar Run documented a population of the **G5T5, S3 animal species of concern, northern water shrew (*Sorex palustris albibarbis*).** The water shrew is a large, semiaquatic, blackish-gray shrew with a long bicolored tail and large hind feet fringed with short stiff hairs. It is primarily dependent upon aquatic insects and may take small fish and amphibians when available. The water shrew hunts under and on top of water, and may even be seen running across the water surface. The banks along this creek are steep and undercut by the action of the creek. A heavy herbaceous plant layer lines the creek banks with a tree canopy of hemlock and mixed hardwoods. The water shrew is a boreal species, also inhabiting relict habitat in southern mountains. It requires high quality water, preferably mountain streams, and abundant cover such as rocks, logs, or overhanging stream banks. Suitable management consists primarily of maintaining these conditions (NatureServe 2004).

Threats and Disturbances:

There were no disturbances apparent at this site. Potential threats include removal of the forested buffer along the creek edge. Insecticide use along the creek could reduce the availability of the water shrew's food source.

Conservation Recommendations:

Preservation of water quality and suitable riparian habitat conditions through protection of the watershed is a primary consideration. Maintain the undisturbed forested buffer along the length of the creek. Protection of an undisturbed forested buffer within 100 meters from the creek edge is recommended. Streamside forests help buffer the watershed from the effects of non-point sources of pollution including runoff from agricultural, residential and roadway settings. Pesticide use that might impact aquatic/riparian invertebrate populations should be avoided whenever possible.

WILLIAMS LAKE WETLANDS (Overton Township and Sullivan County)

This site includes Williams Lake in Sullivan County and the series of wetlands to the north in Bradford County. Williams Lake is an isolated mountain bog that has received periodic flooding by beaver. There is an area of open water surrounded by thick mats of sphagnum moss, which support characteristic bog species of plants including leatherleaf, wild calla and the insectivorous pitcher plant. The wetlands to the north have areas that are dominated by shrubs as well as areas dominated by herbaceous vegetation. **Two aquatic animal species of concern** were documented at this site in 1993. These two species are under the jurisdiction of the PA Fish and Boat Commission, and their names cannot be released under a data sharing agreement. These species use the wetlands as their primary habitat. Reduction of wetland quality by changes in hydrology (permanent draining or flooding), or degradation of water quality could severely impact these populations. This site is primarily in State Game Lands #12.

Threats and Disturbances:

There were no disturbances apparent at this wetland complex besides periodic flooding and drying due to a fluctuating beaver population. Potential threats include removal of the forested buffer surrounding the wetland.

Conservation Recommendations:

Maintain the current wetland hydrology. The temporary periodic flooding and draining due to beaver activity will likely keep these wetlands in various states of succession. Permanent flooding or draining would likely destroy this natural community. Maintain the undisturbed forested buffer surrounding the wetland.

Locally Significant Site:

Overton Ponds (Overton Township)

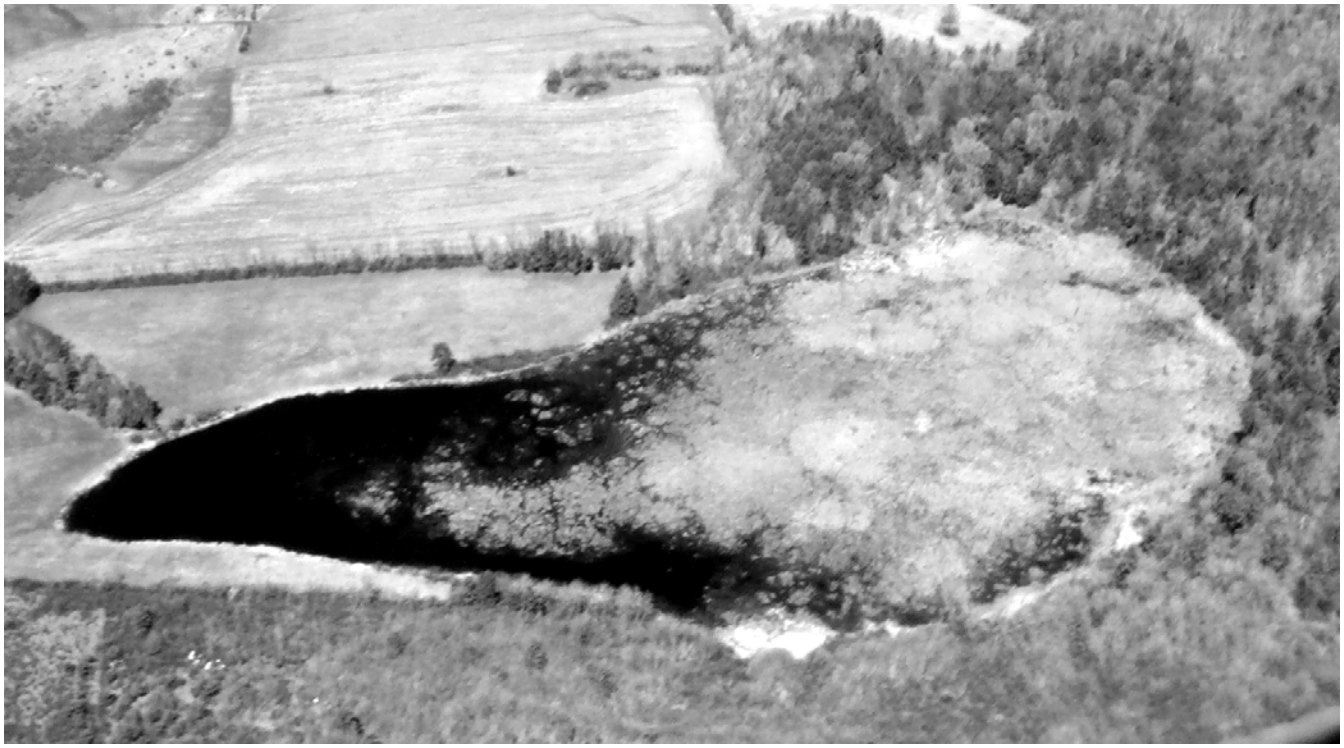
This **locally significant site** was identified from interpretation of aerial photographs. This site contains four open-water ponds and one pond with a floating mat of vegetation. All may have beaver or human created dams, or may be naturally occurring. The landscape context is mostly remote and primarily buffered from human activity by extensive, deciduous forest. These wetlands occur on State Game Lands #36 and private property.

Threats and Disturbances:

Ground surveys need to be conducted to determine the hydrologic conditions of these wetlands. If natural, the wetland hydrology should be maintained. If artificial dams have raised the water level, there remains the possibility of aquatic-dependent species of concern occurring at these ponds. One of the ponds is in more of an agricultural–residential landscape context, with fields adjacent to portions of the wetland's edge. Removal of the forested canopy surrounding the ponds could reduce the quality of these wetland habitats.

Conservation Recommendations:

Conduct ground surveys of these wetlands. The forested buffer surrounding the ponds should be maintained and repaired where necessary to protect these wetlands from non-point sources of pollution and from introduced species of plants. Avoid the construction of dams.



(Above) Floating vegetation on bog near town of Overton, Overton Township. Photo: PA Science Office of The Nature Conservancy

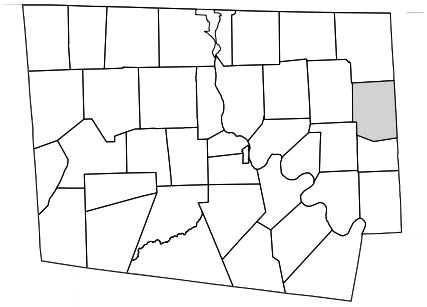
(Left) Schrader Creek is considered an Exceptional Value Stream from its source to its confluence with Coal Run, and a High Quality Cold Water Fishery from Coal Run to its confluence with Towanda Creek by the PA Department of Environmental Protection.

(Above) Small mammal surveys along Sugar Run documented a population of Northern Water Shrew.

PIKE TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen	Quality**
None						

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks.



Locally Significant: Carey Swamp

Managed Lands: None

Pike Township, like most of Bradford County, is made up primarily of agricultural fields interspersed with large and small woodlots. While the Township does not have as many undisturbed wetlands as some other portions of the county, several larger blocks of forest contribute significantly to the Township's native biodiversity. Fragmentation of these large forest blocks should be avoided. Local planning can help discourage unnecessary fragmentation of the landscape by guiding new roads and buildings away from the large forested blocks. Future ground surveys could focus on these large forested blocks, the forested tributaries of Williams and Gaylord Creeks, and to a forested wetland with an herbaceous opening adjacent to Phillips Pond.

Locally Significant Site:

Carey Swamp (Pike and Warren Townships)

This **locally significant site** was determined from aerial photo interpretation. The wetland at this site is primarily open water, with a narrow margin of wetland vegetation. The pond is surrounded by a mostly coniferous forest matrix, with little apparent disturbance. This site may have been flooded by beaver or human dam building activities. This decreases the wetland's quality as a potential important natural community, but the undisturbed forested context of the wetland has likely provided a buffer from invasive species of plants and non-point sources of pollution.

Threats and Disturbances:
There are no obvious disturbances. A small road approaches the northern end of the wetland. Permanent draining or flooding of the wetland or removal or fragmentation of the forested buffer would likely negatively impact the quality of this habitat.

Conservation Recommendations:
A ground survey is necessary to determine if the water level is artificially raised. The water level may need to be lowered slightly to allow the bog vegetation to reclaim this wetland habitat. Maintain the undisturbed forested buffer surrounding the wetlands. If the land changes from its present use as forested woodland to residential development, a 50 to 100-meter undisturbed forested buffer is encouraged around the wetland. Surveys for species of concern and exemplary natural communities are encouraged.

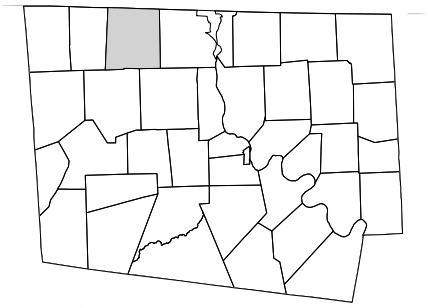
PIKE TOWNSHIP MAP

Three Falls Glen, Ridgebury Township

RIDGEBURY TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen (y-m-d)	Quality**
Three Falls Glen	Plant: Ebony sedge (*Carex eburnea*)	G5	S1	PE	2004-6-17	E

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks.



Locally Significant: None

Managed Lands: State Game Lands #123

Ridgebury Township is more forested than agricultural, with many of the forest blocks connecting to each other to form natural landscape corridors. The Township can best preserve its ecological integrity by avoiding unnecessary fragmentation of these large forested blocks. New roads and developments should be discouraged in large forested blocks, and directed instead towards areas that have seen past disturbance. The Township has few wetlands, and most of those have been dammed to form artificial lakes. Providing a wide undisturbed forested buffer around the remaining unmodified wetlands will provide them the best protection. Future biological surveys in the Township could focus on the forested slopes of Terwiliger Creek, the deep hemlock slopes of Buck Creek near State Game Lands #123, and the woodlands along Miller Run on either side of Miller Pond.

RIDGEBURY TOWNSHIP MAP

THREE FALLS GLEN (Ridgebury and South Creek Townships)

This large unfragmented forested block contains a series of waterfalls from which the creek gets its name. The falls spill through extremely steep sidewalls that are primarily dry outcrops of fossil-bearing shale that contain an interesting mix of vegetation. The area of the cliffs in the spray zone of the falls has a thick moss and algae layer. This site contains a **G5, S1 PA-endangered plant species of concern, ebony sedge (*Carex eburnea*).** This species is primarily restricted to calcareous cliffs and outcrops. Though considered secure at the global level, this plant is currently known from only seven other counties in the state. The forest surrounding the creek and waterfalls is primarily a hemlock–northern hardwood forest, dominated by hemlock, red pine, sugar maple and yellow birch. The shrub and herb layers are rich and well developed. The site also has a good-quality population of American yew, a native shrub species that has recently been removed from the species of concern list based on updated statewide population estimates. Yew has been in decline over much of its range in the state due to habitat loss and over-browsing by deer (Rhoads and Block 2000). Recent documentation of several excellent-quality populations of yew in Bradford County may suggest this species is truly on the rebound.

Threats and Disturbances:

The slopes and uplands adjacent to the falls had been marked for logging at the time of the survey. Logging operations on the very steep slopes or at the edge of the ravine may lead to increased sedimentation runoff, loss of topsoil and increased light penetration to the forest floor, which may encourage the spread of invasive species of plants.

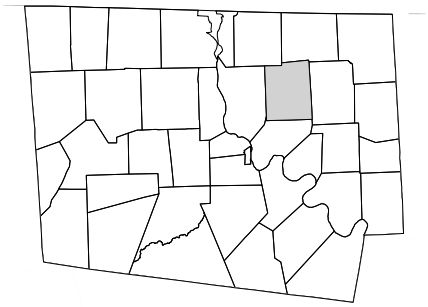
Conservation Recommendations:

Care should be taken during logging operations to avoid introducing invasive species of plants into this largely unfragmented forest block. Machinery should be thoroughly rinsed to avoid transferring invasive plant seeds and other exotic pests and pathogens from other locations. The spread of invasive species of plants could severely degrade this unique habitat. Populations of invasive species removed as they first appear are far more easily and cost effectively eliminated that established populations. Additional surveys for species of concern are encouraged. Local planning should discourage fragmentation of this forested block by additional roads.

ROME TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen	Quality**
None						

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks.



Locally Significant: None

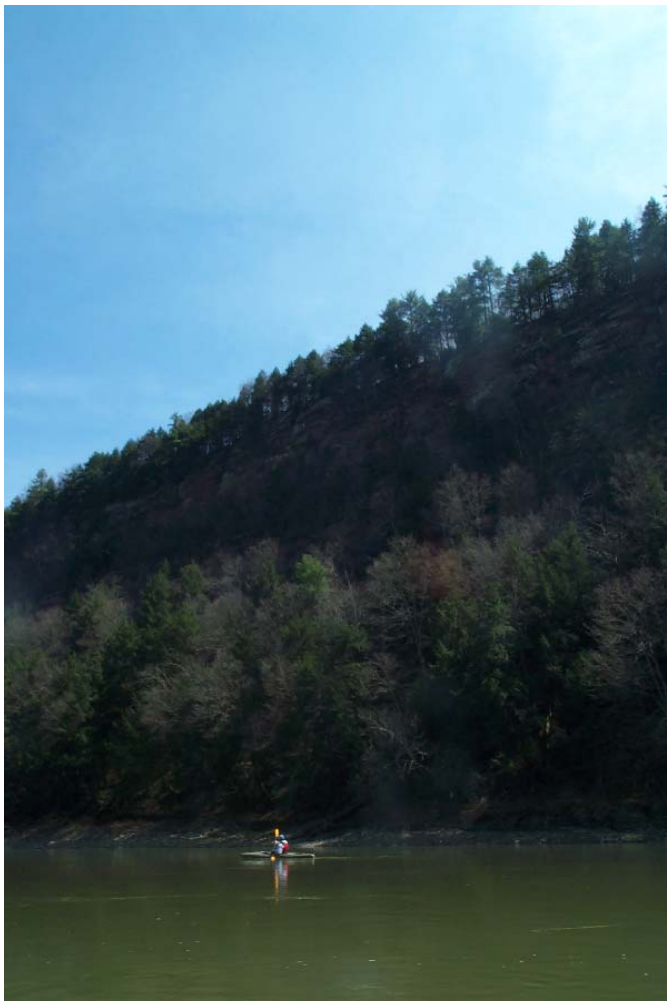
Managed Lands: None

No species of concern or high quality natural areas were identified in Rome Township as a result of this biological inventory. Large and small forested blocks are interspersed with agricultural fields throughout the Township. Many of these woodlots are connected into natural wildlife corridors. These corridors can be maintained by avoiding unnecessary fragmentation of the landscape with additional roads and building developments in the larger forested blocks. Portions of the small section of Wysox Creek running through the Township could use streamside buffer restoration, where agricultural fields are directly adjacent to the creek. Streamside buffers help filter non-point sources of pollution from entering the creek, protecting water quality through the Township and the Susquehanna River drainage. The need for forested buffers along waterways applies equally to the smaller creeks in the Township such as Bullard Creek, Parks Creek, Johnson Creek, Hicks Creek and Dry Run.

ROME TOWNSHIP MAP

Susquehanna River

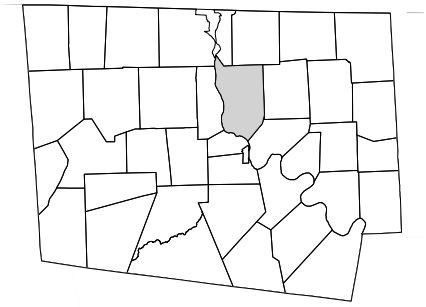
Steep forested slopes and rocky outcrops alternate with low, scoured floodplains along the Susquehanna River in Bradford County. Photos: PA Science Office of The Nature Conservancy



SHESHEQUIN TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen (y-m-d)	Quality**
Deer Lick Woods	Plant: Wild-pea (*Lathyrus ochroleucus*)	G4G5	S1	PT	2004-6-08	C
Susquehanna River (Upper section)	Plant: Illinois Pondweed (*Potamogeton illinoensis*)	G5	S3S4	N	2003-8-27	E
	Animal species of concern	G3	S2	N	2003-8-27	E
	Animal species of concern	G3G4	S3S4	N	2003-8-27	E
	Animal species of concern	G4	S4	N	2003-8-27	E
	Animal species of concern	G4	S3S4	N	2003-8-27	E

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks.



Locally Significant: None

Managed Lands: None

Sheshequin Township borders the Susquehanna River. Where the floodplain is wide and flat, the river typically has a narrow strip of trees between adjacent agricultural fields and the river edge. Conversely, they are deeply forested where extreme slopes have prevented agriculture. Forested buffers should be maintained, widened and created where absent along the length of the river with logging operations refraining from cutting within 100 meters of the river edge. Floodplains along the Susquehanna River should be excluded from future development. Maintaining an intact, forested floodplain along the river can preserve much of the Township's important biodiversity. The Township also has several large blocks of unfragmented forest, many of which connect to form portions of natural wildlife corridors through the Township. These large blocks of forest should be preserved intact by avoiding unnecessary fragmentation of the landscape with additional roads and building developments. Future biological surveys in the Township could focus on these large forested blocks, especially those along Spaulding Creek and Snyder Creek. Oxbows and islands along the Susquehanna River floodplain are also high priorities for future biological surveys.

SHESHEQUIN TOWNSHIP MAP

DEER LICK WOODS (Sheshequin Township)

A fair-quality population of a **G4G5, S1 PA-threatened plant species of concern, wild pea (*Lathyrus ochroleucus*)**, occurs on loose shale substrate primarily along the road in this area. This species prefers the slightly open canopy of rock outcrops and steep creek banks, as well as artificially created openings such as roadway and powerline cuts. The forest along Deer Lick Creek and the adjacent slopes is dominated by hemlock and mixed hardwoods, with a thick understory of mountain-laurel. The creek has cut deeply into the bank in several locations exposing shale bedrock ledges, which contain an interesting diversity of plants. This area is also the approximate location of a historical occurrence of the G5, S1 plant species western hairy rock-cress (*Arabis hirsuta*), which was last documented near this location in 1955. This species was not found during recent surveys, but additional surveys in this area for western hairy rock-cress and wild pea are recommended.

Threats and Disturbances:

No disturbances were observed during the survey. This occurrence of wild pea could be severely impacted by road maintenance activities. The current practice of occasional roadside mowing and tree removal likely favors the habitat for this species, but herbicide applications or road widening operations could severely diminish this population.

Conservation recommendations:

Continue with low-impact roadside mowing maintenance, but avoid herbicide applications. Road improvement options on this road (widening, paving) should avoid impacting the wild pea occurring at this location. Additional surveys for species of concern in this area are recommended.

SUSQUEHANNA RIVER (Upper Section) (Athens, Sheshequin and Ulster Townships)

A **G5, S3S4 plant species of concern, Illinois pondweed (*Potamogeton illinoensis*), and four aquatic animal species of concern** were documented in the Susquehanna River near Athens during a survey of this portion of the Susquehanna River in 2003. Additional surveys are recommended to better estimate populations of these species of concern in the river. The river also provides a valuable migration corridor for many bird species, especially aquatic dependent species, but also many neo-tropical passerine migratory species.

The Susquehanna River is subject to frequent flooding and seasonal low water levels. Scouring of the banks and islands by ice and flooding has created pockets of specialized habitats along the river floodplain. Several islands have distinctive "Big bluestem (*Andropogon gerardii*)-Indian grass (*Sorghastrum nutans*) River Grasslands," which are natural tall grassland communities created as the result of these natural disturbances. The two plant species the community type is named for dominate these habitats and also include switch grass (*Panicum virgatum*) and Indian hemp (*Apocynum cannabinum*). The habitat tends to grade into a "Water willow (*Justicia americana*)–smartweed Riverbed Community" on the lowest island elevations, and into a "Black willow Scrub/shrub Wetland," and "River birch–sycamore Floodplain Scrub" as the elevation increases and the habitat becomes drier. These natural communities are part of the "Riverbed–Bank–Floodplain Community Complex" (Fike 1999), a broadly defined mosaic of community types that typify the natural vegetation along the Susquehanna River in Bradford County.

Threats and Disturbances:

There are numerous examples of disturbance along the Susquehanna River. These animal species of concern are affected by non-point sources of pollution including sedimentation from cultivated

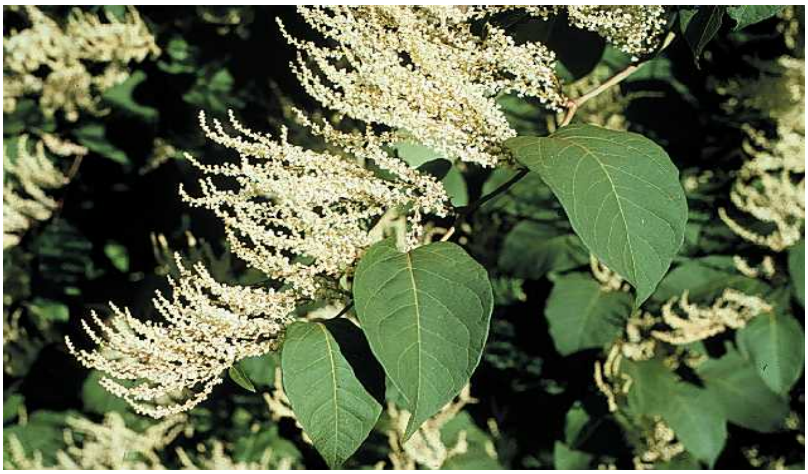
and developed land along the river, runoff from roadways, pesticide runoff from agricultural fields, discharge of chemical pollutants and thermal pollution. The main threat to these animals is reduction of water quality. The banks, floodplains and islands of the river have several invasive introduced plant species including Japanese knotweed (*Polygonum cuspidatum*) and purple loosestrife (*Lythrum salicaria*). Control of established populations of these species is very difficult. Eradication of pioneer populations is the best way to control the spread of these species of plants.

Conservation Recommendations:

Any of the above types of disturbances should be minimized where possible. Also, monitoring of these populations should continue into the future. Loss of individuals and reductions in population sizes should lead to an investigation into possible causes. Water quality should be monitored and pollution sources should be identified where possible. Forested buffers should be maintained and created where absent along the length of the river with logging operations refraining from cutting within 100 meters of the river edge. River bank forests help buffer the watershed from the effects of non-point sources of pollution including runoff from agricultural, residential and roadway settings. In addition, the river floodplain and corridor is usually an area of significantly higher biodiversity than the adjoining uplands. Much of the area's important biodiversity can be preserved by maintaining an intact, forested floodplain along the river. The effectiveness of the forested riverbanks as a habitat corridor would be diminished by fragmentation of the forest continuity by the construction of houses, businesses and additional roadways along the river. Local planning should discourage construction of new structures and roadways along the river, adjacent slopes and floodplain.

Invasive Plant Species

Among the most aggressive introduced plant species in Pennsylvania include the following four top offenders of natural areas. These species are not kept in check by natural predators, and out-compete native species. Once established, they can be very difficult and time consuming to remove. Natural Areas should be monitored regularly for pioneer populations of these species. Small populations, once encountered, should be eradicated to help ensure the continued viability of natural areas. Photos: PA Department of Agriculture



Japanese Knotweed (*Polygonum cuspidatum*)

Tree of Heaven (*Ailanthus altissima*)

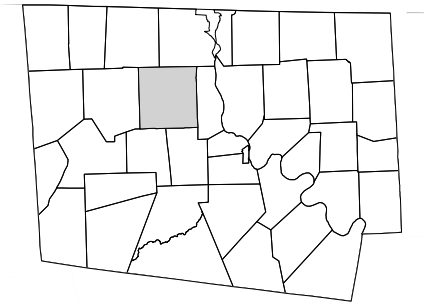
Purple loosestrife (*Lythrum salicaria*)

Multiflora rose (*Rosa multiflora*)

SMITHFIELD TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen (y-m-d)	Quality**
None						

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks.



Locally Significant: Balsam Pond

Managed Lands: Mount Pisgah State Park

Smithfield Township has numerous interesting small wetlands of various types interspersed among the agricultural fields and relatively small, isolated woodlots. These wetlands include forested swamps, shrub swamps, graminoid marshes and herbaceous dominated wetlands, most of which are in an agricultural context with little forested buffer. Many of these have seen past or present beaver activity. The temporary periodic flooding and draining due to beaver activity will likely keep these wetlands in various states of succession. Permanent flooding or draining would likely destroy these habitats. Avoid the construction of dams or drainage channels. Maintain large undisturbed forested buffers around these wetlands. Should land use change from agricultural and forested to residential development, a wide undisturbed forested buffer should be maintained around wetlands to preserve their hydrologic and ecologic integrity. Most of the Township has a network of small roads that have divided the landscape into many smaller blocks, severing natural wildlife corridors. The remaining large forested blocks in the Township could be preserved intact by avoiding unnecessary fragmentation with new roads and residential development. Wildlife corridors can be repaired by restoring forested buffers where absent along Tomjack Creek, Peas Creek, Browns Creek, Wallace Run and their tributaries in the Township. Streamside buffers help filter non-point sources of pollution from entering the creek, protecting water quality through the Township and the Susquehanna River drainage.

Balsam Pond (Smithfield and Ulster Townships)

This **locally significant site** was delineated from aerial photo interpretation. This wetland, at the headwaters of Cash Creek, has likely been flooded by a man-made dam, though the dam is not apparent in the aerial photo. A cluster of floating islands is at the northern end of the pond, and likely includes an assemblage of characteristic northern acidic bog species of plants.

Threats and Disturbances:

This wetland is mostly surrounded by a good forested buffer. A road borders the south and east edges of the pond and may be responsible for the elevated water level. Conversion of the surrounding land from agricultural and forested to residential development could degrade the quality of this wetland habitat.

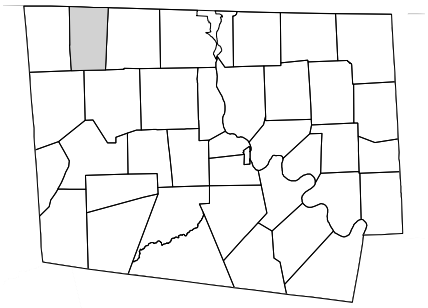
Conservation Recommendations:

Maintain and improve the undisturbed forested buffer surrounding the wetlands. If the land changes from its present use as agricultural and woodland to residential development, a 100-meter undisturbed forested buffer around these wetlands is encouraged. A slight reduction in the water level would encourage reestablishment of the wetland vegetation. Avoid the construction of additional dams. Surveys for species of concern in this and adjacent wetlands are recommended.

SOUTH CREEK TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen	Quality**
Three Falls Glen	Plant: Ebony sedge (*Carex eburnea*)	G5	S1	PE	2004-6-17	E

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks.



Locally Significant: South Creek Floodplain at Dunning
Three Falls Glen

Managed Lands: State Game Lands #123

South Creek Township is divided by South Creek and Route 14, which runs along its floodplain. Route 14 is a primary north-south corridor through Bradford County, and will likely see new development along its length in the future. New development should be steered away from wetlands, floodplains and their forested buffers. New roads and residences should be discouraged in and through large blocks of forest to avoid fragmentation of the natural landscape. As land changes from agricultural to residential and commercial development, buildings and new roads should be discouraged along streams and creeks, and forested buffers should be restored where they are missing. Future ground surveys could focus on the various wetlands of State Game Lands #123. Conservation efforts could focus on reforesting portions of South Creek, Justice Run and Roaring Run that lack forested buffer strips.

THREE FALLS GLEN (Ridgebury and South Creek Townships)

This large unfragmented forested block contains a series of waterfalls from which the creek gets its name. The falls spill through extremely steep sidewalls that are primarily dry outcrops of fossil-bearing shale that contain an interesting mix of vegetation. The area of the cliffs in the spray zone of the falls has a thick moss and algae layer. This site contains a **G5, S1 PA-endangered plant species of concern, ebony sedge (*Carex eburnea*).** This species is primarily restricted to calcareous cliffs and outcrops. Though considered secure at the global level, this plant is currently known from only seven other counties in the state. The forest surrounding the creek and waterfalls is primarily a hemlock–northern hardwood forest, dominated by hemlock, red pine, sugar maple and yellow birch. The shrub and herb layers are rich and well developed. The site also has a good-quality population of American yew, a native shrub species that has recently been removed from the species of concern list based on updated statewide population estimates. Yew has been in decline over much of its range in the state due to habitat loss and over-browsing by deer (Rhoads and Block 2000). Recent documentation of several excellent-quality populations of yew in Bradford County may suggest this species is truly on the rebound.

Threats and Disturbances:

The slopes and uplands adjacent to the falls had been marked for logging at the time of the survey. Logging operations on the very steep slopes or at the edge of the ravine may lead to increased sedimentation runoff, loss of topsoil and increased light penetration to the forest floor, which may encourage the spread of invasive species of plants.

Conservation Recommendations:

Care should be taken during logging operations to avoid introducing invasive species of plants into this largely unfragmented forest block. Machinery should be thoroughly rinsed to avoid transferring invasive plant seeds and other exotic pests and pathogens from other locations. The spread of invasive species of plants could severely degrade this unique habitat. Removal of invasive species as they first appear is easier and more cost effective than removal of established populations. Additional surveys for species of concern are encouraged. Local planning should discourage fragmentation of this forested block by additional roads.

Locally Significant Sites:

South Creek Floodplain at Dunning (South Creek Township)

This **locally significant site**, a portion of the South Creek floodplain near Dunning, is an extensive shrub swamp mostly within State Game Lands #123. South Creek runs through this wetland, which is surrounded by some nearly impenetrable shrub thickets. The inner, wetter portions appear to be dominated by grasses and sedges, with some areas of open water. This area provides cover, food and a valuable wildlife corridor for many species of plants and animals. Wetland and forested buffers to South Creek also help filter non-point sources of pollution from entering the creek, protecting water quality throughout the Township.

Threats and disturbances:

Despite this wetland's proximity to Route 14, the railroad grade provides a buffer from non-point sources of pollution entering the wetland from the road. Removal of the present forested buffer to the east would likely cause detrimental changes to the chemical and vegetative composition of this wetland natural community.

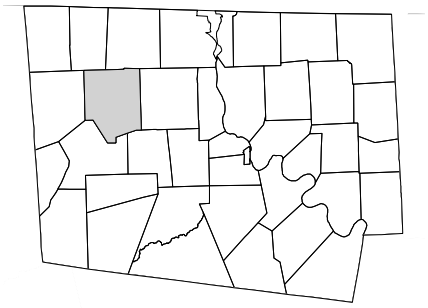
Conservation Recommendations:

Maintain a wide undisturbed-forested buffer around the wetland. Avoid building dams, drainage channels, or residences in the vicinity that may impact the hydrology of this wetland floodplain. Additional surveys for species of concern in this extensive wetland are encouraged.

SPRINGFIELD TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen (y-m-d)	Quality**
Lake Ondawa Headwaters	Plant: Soft-leaved sedge (*Carex disperma*)	G5	S3	PR	2004-6-21	E

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks.



Locally Significant: Big Pond Wetlands
Little Pond

Managed Lands: Mount Pisgah County Park
Mount Pisgah State Park
State Game Lands #123

Springfield Township has a good mix of large forested blocks, wetlands and agricultural fields. The most prominent feature of the Township is Mount Pisgah, which rises 1000 feet in elevation from the adjacent lowlands. On clear days, views from the peak are spectacular. Most of this mountain is in Mount Pisgah County Park, with a smaller portion in Mount Pisgah State Park. This forested block is the largest of several in the Township that provide the core backbone of a natural landscape corridor for the movement of wildlife through the Township. Maintaining connectivity between these large forested blocks will help prevent them from becoming isolated islands of wildlife habitat. Connectivity can be most easily provided by encouraging forested buffers along streams and creeks within the Township. Restoration of forested buffers where needed along Mill Creek, Brace Creek Leonard Creek and their tributaries will do much to help preserve the biodiversity of the Township.

LAKE ONDAWA HEADWATERS (Springfield Township)

Wetlands at this site include a hemlock palustrine forest, in which a population of a **G5, S3 PA-rare plant species of concern, soft-leaved sedge (*Carex disperma*)** was documented. This species was found on elevated hummocks of sphagnum moss and moss covered logs within the muck saturated soils of this forested wetland. Hemlock and red maple dominate the forest, but also included are black ash, white pine and yellow birch. The shrub and herb layers are thick in portions of the forested swamp and sparse in others. Also included in this site is an open-water pond dominated by yellow water lily, some areas of shrub swamp, and a successional bog. The bog contains typical nutrient-poor habitat specialists such as grass-pink, cotton-grass, wild calla and the insectivorous pitcher plant.

Threats and Disturbances:

Permanent changes in the hydrology of these wetlands (draining, flooding) or logging of the wetlands could severely decrease the suitable habitat for the soft-leaved sedge. Invasive species of plants occur in the surrounding upland areas and will not likely pose a threat to this habitat until disturbances such as draining or logging occur.

Conservation Recommendations:

Maintain the current wetland hydrology. Provide for additional forested buffer around these wetlands if the land changes from agricultural to residential use. Monitor for and remove invasive species of plants as they appear. Infestations of aggressive plant species will become difficult to remove once they become established. Additional surveys for species of concern in this and nearby wetlands are encouraged.

Locally Significant sites:

Big Pond Wetlands (Springfield Township)

This **locally significant site** is interesting for its variety of wetland habitats that provide a quality environment for numerous wetland plant and animal species. A portion of this site has recently been flooded by an active beaver population, in effect, temporarily drowning portions of the wetland vegetation. This open water portion of the wetland is dominated by floating aquatic vegetation like yellow water-lily and pond weeds (*Potamogeton spp*.). A shallow emergent marsh occurs on the edges of the open water pond along with some floating mats of vegetation buoyed by a thick layer of sphagnum moss. The marsh grades into a shrub swamp and a swamp forest with an interesting diversity of vegetation. Much of the wetland is buffered by a hemlock-northern hardwoods forest.

Threats and Disturbances:

A nearby wetland has been dammed for the creation of an artificial lake and ringed with residences. The temporary periodic flooding and draining due to beaver activity will likely keep these wetlands in various states of succession. Permanent changes in the hydrology of these wetlands (draining, flooding) or logging of the forested buffer would decrease the quality of this natural community. Development of the upland forested buffer would likely modify the chemical and vegetative makeup of these wetland habitats, severely diminishing their quality.

Conservation Recommendations:
Preserve the wetland hydrology by avoiding the construction of dams and drainage channels. Maintain large undisturbed forested buffers around the wetlands. Eliminate small populations of invasive species of plants as they occur to avoid hard-to-eradicate infestations.

Little Pond (Springfield Township)

This **locally significant site** was determined from aerial photo interpretation. This pond has a ring of floating vegetation islands, characteristic of a flooded bog. Sitting relatively high in the drainage of this watershed this wetland receives little groundwater flow. Combined with a relatively intact forested buffer, this hydrologic isolation likely protects this bog remnant from non-point sources of pollution, and from introduced species of plants, both of which would degrade the quality of this natural community. The floating rings could be composed primarily of the short shrubs leatherleaf or water willow. The open water areas are likely dominated by yellow water-lily and other emergent aquatic vegetation.

Threats and Disturbances:
No disturbances are obvious around this wetland. Permanent changes in the hydrology of this wetland, (draining, flooding), or logging of the wetland perimeter could severely decrease the quality of this natural community.

Conservation Recommendations:
Maintain the current wetland hydrology. Monitor for and remove invasive species of plants as they appear. Infestations of aggressive plant species will become difficult to remove once they become established. Additional surveys for species of concern in this and nearby wetlands are encouraged. If the land changes from its present use as agriculture and forested woodland to residential development, a 50 to 100-meter undisturbed forested buffer is encouraged around the wetland. Surveys for species of concern and exemplary natural communities are encouraged.

Big Pond, Lake Ondawa Headwaters, Springfield Township

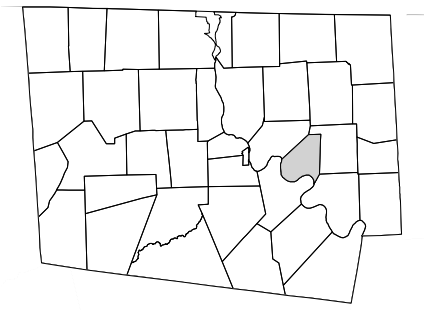
Portions of Big Pond (left) support extensive shrub swamps and floating aquatic vegetation, while other portions are open water. Photo: David Werier

The headwaters of Lake Ondawa (left) contain a matrix of wetland types. The soft-leaved sedge (Carex disperma) (above) was found growing on elevated hummocks and decomposing fallen logs in a forested portion of the wetland. Photos: David Werier

STANDING STONE TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen (y-m-d)	Quality**
Limehill	Plant: Wild–pea (*Lathyrus ochroleucus*)	G4G5	S1	PT	1989-06-29	C
Standing Stone Marsh	Animal: Sora (*Porzana carolina*)	G5	S3B	N	2004-06-11	E
	Animal: Virginia Rail (*Rallus limicola*)	G5	S3B	N	2004-06-11	E
Susquehanna River (Middle Section)	Animal species of concern: Bald Eagle *(Haliaeetus leucocephalus)*	G4	S2B	PE	2004	E
	Animal species of concern:	G3G4	S3S4	N	2004	E
	Animal species of concern:	G4	S4	N	2004	E
	Animal species of concern:	G4	S3S4	N	2004	E
	Animal species of concern:	G3	S2	N	2004	E

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks.



Locally Significant: None

Managed Lands: State Game Lands #237

Standing Stone Township borders a portion of the Susquehanna River, with Vought Creek, King Creek and Rummerfield Creek draining into it. The Township is primarily agricultural, though several large forested blocks remain intact, several of which connect to form natural wildlife corridors through the Township to the Susquehanna River. Future biological surveys in the Township could focus on these forested blocks, particularly along Rummerfield Creek and its tributaries, and the steep slopes along the Susquehanna River south of Rummerfield.

STANDING STONE TOWNSHIP MAP

LIMEHILL (Standing Stone and Wyalusing Townships)

A fair-quality population of a **G4G5, S1 PA-threatened plant species of concern, wild pea (*Lathyrus ochroleucus*),** occurs on loose shale substrate primarily along the road in this area. This species prefers the slightly open canopy of rock outcrops and steep creek banks, as well as artificially created openings such as roadway and powerline cuts.

Threats and disturbances:

No disturbances were observed during the survey. This occurrence of wild pea could be severely impacted by road maintenance activities. The current practice of occasional roadside mowing and tree removal likely favors the habitat for this species, but herbicide applications or road widening operations could severely diminish this population.

Conservation recommendations:

Continue with low-impact roadside mowing maintenance, but avoid herbicide applications. Road improvement options on this road (widening, paving) should avoid impacting the wild pea occurring at this location. Additional surveys for species of concern in this area are recommended.

STANDING STONE MARSH (Standing Stone Township)

There are several wetlands within an agricultural context at this location. Breeding populations of **two bird species of concern the G5, S3B Sora (*Porzana carolina),* and the G5, S3B Virginia Rail *(Rallus limicola)*** were documented at this site. The wetlands provide essential habitat for these marsh dependent species. Both bird species prefer to breed in freshwater marshes with an abundance of cattails, sedges and coarse grasses. Both Soras and Virginia Rails have been in a sharp decline in the past 25 years, largely due to the loss of suitable habitat (Brauning 1992).

Threats and Disturbances:

The wetlands have very little or no forested buffer at this location with agricultural fields directly adjacent to the wetlands in most portions of this site. Conversion from agricultural use to residential development would likely further impair the quality of these wetlands.

Conservation Recommendations:

These wetlands would benefit from the hydrologic isolation provided by forested buffers. Forested buffers help filter surface water runoff, preventing many non-point sources of pollution from entering wetlands. If this land changes from agricultural to residential development, a 50 meter forested buffer is encouraged around these wetlands.

SUSQUEHANNA RIVER (Middle Section) (Asylum, North Towanda, Standing Stone, Towanda, and Wysox Townships)

Nesting Bald Eagles and four aquatic animal species of concern have been documented along this section of the Susquehanna River. The Bald Eagles nest in large trees along the river and utilize the river as their main food foraging area, feeding on fish and waterfowl. Bald Eagles had been in steep decline throughout Pennsylvania due largely to the poisonous effects of organochlorine insecticides, but recently, habitat loss may have replaced pesticide poisoning as the major threat to eagles (Brauning 1992). Nesting occurrences of Bald Eagles in Pennsylvania have increased in the last two decades, particularly along the Susquehanna River and in northwestern PA. The four aquatic animal species of concern are under the jurisdiction of the PA Fish & Boat Commission, and their names cannot be released under a data sharing agreement. These animal species of concern are affected by non-point sources of pollution including sedimentation from

cultivated and developed land along the river, runoff from roadways, pesticide runoff from agricultural fields, discharge of chemical pollutants and thermal pollution.

The Susquehanna River has cut deeply through Bradford County, creating soaring rock outcrops opposite low-lying floodplains. The river is subject to great fluctuations in its water level, from a near trickle during dry periods to severe flooding events. The action of the powerful ebb and flow of the river has created various microhabitats along its length. The steep cliff communities, scoured islands, oxbows and wide floodplains can all have unique assemblages of plants and animals.

Many of the ice and flood scoured islands have distinctive "Big bluestem (*Andropogon gerardii*)-Indian grass (*Sorghastrum nutans*) River Grasslands," which are natural tall grassland communities created as the result of these natural disturbances. The two plant species the community type is named for dominate these habitats and also include switch grass (*Panicum virgatum*) and Indian hemp (*Apocynum cannabinum*). The habitat tends to grade into a "Water willow (*Justicia americana*) – smartweed Riverbed Community" on the lowest island elevations, and into a "Black willow Scrub/shrub Wetland," and "River birch – sycamore Floodplain Scrub" as the elevation increases and the habitat becomes drier. These natural communities are part of the "Riverbed – Bank – Floodplain Community Complex" (Fike 1999), a broadly defined mosaic of community types that typify the natural vegetation along the Susquehanna River in Bradford County.

Another important area for conservation in the township are the forested slopes along the Susquehanna River. These steep ravines and slopes have likely remained forested because of their topography. The direction the slope is facing will have a significant impact on the species composition found there. Forestry practices on these steep slopes should be evaluated to minimize negative effects such as erosion. Additional surveys of forested slopes, ravines and streams in this township are encouraged.

Threats and Disturbances:

The main threat to these animal species of concern is the reduction of water quality. Activities of industries and landowners along the river can have significant impacts on water quality in the River down to the Chesapeake Bay. Erosion and chemical runoff into the water systems is a serious concern throughout the state. The banks, floodplains and islands of the river have large populations of several aggressive introduced plants including Japanese knotweed (*Polygonum cuspidatum*) and purple loosestrife (*Lythrum salicaria*). Control of established populations of these species is very difficult. Eradication of pioneer populations is the best way to control the spread of these invasive species.

Conservation Recommendations:

Forested buffers should remain intact for the length of the river with logging operations minimizing cutting within 50 to 100 meters of the river bank. Floodplain forests help buffer the watershed from the effects of non-point sources of pollution including runoff from agricultural, residential and roadway settings. In addition, the river floodplain and corridor can be an area of significantly higher biodiversity than the adjoining uplands. Much of the area's important biodiversity can be preserved by maintaining an intact, forested floodplain along the river. The effectiveness of the river as a habitat corridor would be diminished by fragmentation of the forest continuity by the construction of buildings, houses and additional roadways along the river. Local planning should discourage new construction and roadways along the river, adjacent slopes and floodplain.

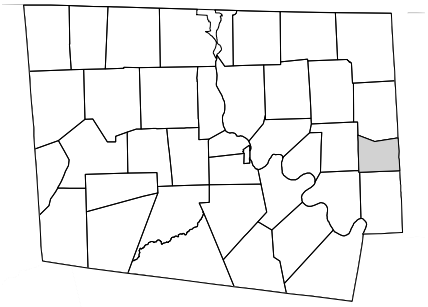
Marsh Run Bog, Leroy Township

An expansive thicket of the evergreen shrub leatherleaf, a common component of acidic wetland complexes, dominates the shrub wetland at the headwaters of Marsh Run, forming a Leatherleaf-sedge Wetland Natural Community. A blueberry thicket surrounds portions of the wetland. Photos: PA Science Office of The Nature Conservancy

STEVENS TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen	Quality**
None						

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks.



Locally Significant: Beaver Meadow Wetlands

Managed Lands: None

Stevens Township is divided by the Wyalusing Creek. The Township has few wetlands, but has several large forested blocks interspersed with agricultural fields. Most of the large forest blocks occur on ridge tops, and act as north-south wildlife corridors through the Township. Wyalusing Creek in the Township has occasional oxbows created by the creek shifting across the floodplain over time. Oxbows can be specialized habitats that are home to uncommon species of plants and animals. Much of the floodplain of the Wyalusing Creek is utilized as agricultural fields. Restoration of a forested buffer along the creek is encouraged where it is lacking. Forested buffers help filter surface water runoff, preventing many non-point sources of pollution from entering waterways, protecting water quality in the Township and the Susquehanna River basin. In addition, reforestation of creek and stream banks can help link larger forested blocks together, contributing to their utility as a natural wildlife corridor. Oxbows along the Wyalusing Creek and the larger forested blocks should be part of future biological inventories within the Township.

Locally Significant Site:

Beaver Meadow Wetlands (Stevens and Tuscarora Townships)

This **locally significant site** includes two wetlands connected by a narrow drainage. The southern portion of the wetland has been flooded by the construction of a dam, creating an open-water environment. The upper portion has not been severely impacted by this hydrologic modification, and still supports much of its bog-like vegetation, floating on thick mats of sphagnum moss. This wetland has species of plants characteristic to acidic, nutrient-poor bog habitats such as wild calla, cotton-grass, cranberries and the insectivorous pitcher-plant.

Threats and Disturbances:

This wetland complex is mostly within a forested context, which provides an excellent buffer from non-point sources of pollution and the introduction of introduced species of plants. Draining, flooding, or removal of the forested buffer would diminish the quality of this natural community. Conversion from the present forested land use to residential development would also likely detrimentally impact this habitat.

Conservation Recommendations:

Maintain the current wetland hydrology. Permanent flooding or draining would likely destroy this natural community. Maintain the undisturbed forested buffer surrounding the wetland. If the land changes from its present use as forested woodland to residential development, a 100-meter undisturbed forested buffer is encouraged around this wetland. Additional surveys for species of concern in this and adjacent wetlands are encouraged.

Beaver Meadows Wetlands is an open water pond at its southern end, while the northern end contains floating vegetation mats characteristic of bog habitats. Reducing the water level in the southern section may help accelerate its recolonization by bog vegetation. The surrounding forested buffer and wetland hydrology should be preserved in this wetland habitat. Photo: PA Science Office of The Nature Conservancy

TERRY TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen (y-m-d)	Quality**
Coyles Corners Wetlands	Animal species of concern	G5	S2S3	N	2003-7-30	E
Rienze Wetlands	Plant: Backward Sedge (*Carex retrorsa*)	G5	S1	PE	1989-06-29	C
Susquehanna River (Lower Section)	Animal species of concern	G3G4	S3S4	N	2004	E
	Animal species of concern	G3	S2	N	2004	E
	Animal species of concern	G4	S4	N	2004	E
	Animal species of concern	G4	S3S4	N	2004	E
Terrytown Woods	Plant: Wild –pea (*Lathyrus ochroleucus*)	G4G5	S1	PT	1989-06-29	D

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
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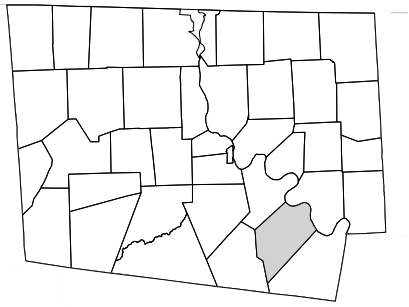


Locally Significant: North Branch Sugar Run

Managed Lands: State Game Lands #142, #172, #237, #250

Terry Township is largely forested, with most of the forest within unfragmented blocks of 250 acres or more. A smaller amount of the Township's area is devoted to agriculture. There are numerous wetlands in the Township, some of which have been dammed to create open water ponds. Priorities for maintaining the native biological diversity of the Township should include maintaining the natural hydrology of the remaining unmodified wetlands and avoiding unnecessary fragmentation of the Township's large forested blocks. Future biological surveys in the Township could focus on these large forested blocks, particularly along North Branch Sugar Run and its tributaries. The islands, shoreline and steep slopes along the Susquehanna River should also be areas of future biological inventories. Where the banks of the river are not steep, there is a narrow band of forest to buffer the river from agricultural runoff, erosion and other non-point sources of pollution. Increasing this riparian buffer will help protect the Susquehanna watershed and ultimately the Chesapeake Bay from water quality degradation.

TERRY TOWNSHIP MAP

COYLES CORNERS WETLANDS (Albany and Terry Townships)

Most of this chain of wetlands has been modified by dams to create a series of open water ponds. The ponds still have remnants of the wetland vegetation in shallow areas along edges and upstream ends of ponds. A **G5, S2S3 aquatic animal species of concern** was documented during a survey of a portion of this site in 2003. This species is under the jurisdiction of the PA Fish and Boat Commission, and its name cannot be released under a data sharing agreement. This species uses the wetlands as its primary habitat. Reduction of wetland quality by degradation of water quality could detrimentally impact these populations. A portion of this site is within State Game Lands #142.

Threats and Disturbances:

Reduction of the forested buffer surrounding these wetlands could lead to increased runoff from agricultural fields, roads and residences resulting in a decrease in water quality.

Conservation Recommendations:

Preserve the wetland's existing forested buffer, and restore buffer where it is lacking. Avoid building dams that would create hydrologic changes in the unaltered portions of this wetland chain.

RIENZE WETLANDS (Terry Township)

This site contains a beaver-impacted wetland with a fair quality population of a **G5, S1 plant species of concern, the backwards sedge (*Carex retrorsa*)**. A small stream meanders through this site, portions of which have been flooded by beaver activity, while other portions are less inundated. Meadow sweet (*Spiraea latifolia*) dominates the edges of the marsh, while Canada bluejoint (*Calamagrostis canadensis*) and cutgrass (*Leersia oryzoides*) are the dominant herbaceous plants. This site also includes an artificially created open water pond. Deeper portions of the pond are dominated by floating leaved aquatic vegetation such as yellow water-lily and water-shield. Shallow portions have a drowned swamp forest with numerous dead standing hemlock trees. This site is partially within State Game Land #250.

Threats and Disturbances:

A man-made dam and recent beaver activity have flooded portions of this wetland complex. These impoundments have created open water habitats attractive to many waterfowl, particularly geese and ducks. Changes in the hydrology (flooding, draining) by human or beaver activity is the primary threat to this habitat. Some temporary flooding due to beaver may not significantly impact this species, but long term flooding or draining of this habitat would likely make this habitat unsuitable for the backward sedge.

Conservation Recommendations:

Avoid building additional dams. Beaver dams may need to be removed periodically to avoid constant flooding. A slight reduction of the water level of the man-made lake would likely encourage a greater diversity of vegetation and wildlife. Leave an undisturbed forested buffer around the wetlands to prevent erosional residue and non-point sources of pollution from impacting the wetlands and water quality.

SUSQUEHANNA RIVER (Lower Section) (Terry, Tuscarora, Wilmot, and Wyalusing Townships)

Four aquatic animal species of concern have been documented along this section of the Susquehanna River. These animal species are under the jurisdiction of the PA Fish & Boat Commission, and their names cannot be released under a data sharing agreement. These animals

are affected by non-point sources of pollution including sedimentation from cultivated and developed land along the river, runoff from roadways, pesticide runoff from agricultural fields, discharge of chemical pollutants and thermal pollution.

The Susquehanna River has cut deeply through Bradford County, creating soaring rock outcrops opposite low-lying floodplains. The river is subject to great fluctuations in its water level, from a near trickle during dry periods to severe flooding events. The action of the powerful ebb and flow of the river has created various microhabitats along its length. The steep cliff communities, scoured islands, oxbows and wide floodplains can all have unique assemblages of plants and animals.

Many of the ice and flood scoured islands have distinctive "Big bluestem (*Andropogon gerardii*)-Indian grass (*Sorghastrum nutans*) River Grasslands," which are natural tall grassland communities created as the result of these natural disturbances. The two plant species the community type is named for dominate these habitats and also include switch grass (*Panicum virgatum*) and Indian hemp (*Apocynum cannabinum*). The habitat tends to grade into a "Water willow (*Justicia americana*) – smartweed Riverbed Community" on the lowest island elevations, and into a "Black willow Scrub/shrub Wetland," and "River birch – sycamore Floodplain Scrub" as the elevation increases and the habitat becomes drier. These natural communities are part of the "Riverbed – Bank – Floodplain Community Complex" (Fike 1999), a broadly defined mosaic of community types that typify the natural vegetation along the Susquehanna River in Bradford County.

Another important area for conservation in the Township are the forested slopes along the Susquehanna River. These steep ravines and slopes have likely remained forested because of their topography. The direction the slope is facing will have a significant impact on the species composition found there. Forestry practices on these steep slopes should be evaluated to minimize negative effects such as erosion. Additional surveys of forested slopes, ravines and streams in this township are encouraged.

Threats and Disturbances:

The main threat to these animal species of concern is the reduction of water quality. Activities of industries and landowners along the river can have significant impacts on water quality in the River down to the Chesapeake Bay. Erosion and chemical runoff into the water systems is a serious concern throughout the state. The banks, floodplains and islands of the river have large populations of several aggressive introduced plants including Japanese knotweed (*Polygonum cuspidatum*) and purple loosestrife (*Lythrum salicaria*). Control of established populations of these species is very difficult. Eradication of pioneer populations is the best way to control the spread of these invasive species.

Conservation Recommendations:

Forested buffers should remain intact for the length of the river with logging operations minimizing cutting within 50 to 100 meters of the river bank. Floodplain forests help buffer the watershed from the effects of non-point sources of pollution including runoff from agricultural, residential and roadway settings. In addition, the river floodplain and corridor can be an area of significantly higher biodiversity than the adjoining uplands. Much of the area's important biodiversity can be preserved by maintaining an intact, forested floodplain along the river. The effectiveness of the river as a habitat corridor would be diminished by fragmentation of the forest

continuity by the construction of buildings, houses and additional roadways along the river. Local planning should discourage new construction and roadways along the river, adjacent slopes and floodplain.

TERRYTOWN WOODS (Terry and Wilmot Townships)

A small population of a **G4G5, S1 PA-threatened plant species of concern, wild pea (*Lathyrus ochroleucus*)**, was documented on loose shale substrate primarily along the road in this area in 1989. A survey in 2004 was unable to relocate this population. A road-widening operation was in progress at the time of the survey, and the population may have been disturbed or eliminated. This species prefers the slightly open canopy of rock outcrops and steep creek banks, as well as artificially created openings such as roadway and powerline cuts. Additional surveys for this species along the road are encouraged.

Threats and Disturbances:

Road maintenance activities at the time of the survey included scraping the bank of the road, and the population may have been disturbed. This activity may not necessarily have destroyed this population of wild pea. This species has the tendency to colonize similarly disturbed sites. Herbicide applications or other road widening operations could severely diminish this population.

Conservation Recommendations:

This site should be resurveyed for wild pea in the next few years to see if the population can be found, and to determine the impact of the road widening activity on this species.

Locally Significant Site:

North Branch Sugar Creek (Terry Township)

This **locally significant site**, which was determined from aerial photo interpretation, contains the beaver impacted floodplain of the North Branch Sugar Run. A portion of the creek floodplain opens up into a herbaceous and shrub dominated wetland, with the creek meandering through. This wetland is well buffered by a large conifer-dominated forested block.

Threats and Disturbances:

No obvious disturbances are evident at this site. Potential threats include permanent alterations of the wetland hydrology (flooding or draining), removal of the forested buffer, and conversion of the forested buffer to residential development.

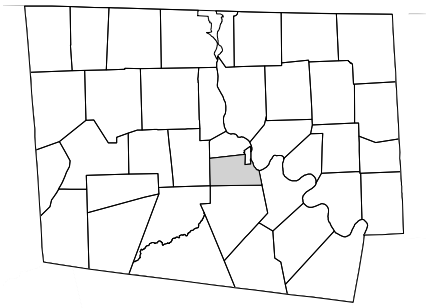
Conservation Recommendations:

Maintain the wetland hydrology. Avoid the construction of dams or drainage channels. Preserve the forested buffer surrounding the wetland. If the current forested land use changes to residential development, a 50-meter undisturbed forested buffer around the wetlands is encouraged.

TOWANDA TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen (y-m-d)	Quality**
Susquehanna River (Middle Section)	Animal: Bald Eagle *(Haliaeetus leucocephalus)*	G4	S2B	PE	2004	E
	Animal species of concern	G3G4	S3S4	N	2004	E
	Animal species of concern	G4	S4	N	2004	E
	Animal species of concern	G4	S3S4	N	2004	E
	Animal species of concern	G3	S2	N	2004	E

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks.



Locally Significant: None

Managed Lands: None

Towanda Township is still largely forested, with the large and small woodlots interrupted by agricultural fields. The Towanda Creek between Monroeton and the Susquehanna River includes a large fertile floodplain known as the Towanda Flats, which ends in a forested delta at its confluence with the Susquehanna River. This section of Towanda Creek has occasional oxbows created by the creek shifting across the wide, flat floodplain over time. Oxbows can be specialized habitats that are home to uncommon species of plants and animals. Much of the floodplain of Towanda Creek is utilized as agricultural fields. Restoration of a forested buffer along the creek is encouraged where it is lacking. Forested buffers help filter surface water runoff, preventing many non-point sources of pollution from entering waterways, protecting water quality in the Township and the Susquehanna River basin. In addition, reforestation of creek and stream banks can help link larger forested blocks together, contributing to their utility as a natural wildlife corridor. Oxbows and forested floodplains along the Towanda Creek and the larger forested blocks should be part of future biological inventories within the Township.

TOWANDA TOWNSHIP MAP

SUSQUEHANNA RIVER (Middle Section) (Asylum, North Towanda, Standing Stone, Towanda, and Wysox Townships)

Nesting Bald Eagles, and four aquatic animal species of concern have been documented along this section of the Susquehanna River. The Bald Eagles nest in large trees along the river and utilize the river as their main food foraging area, feeding on fish and waterfowl. Bald Eagles had been in steep decline throughout Pennsylvania due largely to the poisonous effects of organochlorine insecticides, but recently, habitat loss may have replaced pesticide poisoning as the major threat to eagles (Brauning 1992). Nesting occurrences of Bald Eagles in Pennsylvania have increased in the last two decades, particularly along the Susquehanna River and in northwestern PA. The four aquatic animal species of concern are under the jurisdiction of the PA Fish & Boat Commission, and their names cannot be released under a data sharing agreement. These animal species of concern are affected by non-point sources of pollution including sedimentation from cultivated and developed land along the river, runoff from roadways, pesticide runoff from agricultural fields, discharge of chemical pollutants and thermal pollution.

The Susquehanna River has cut deeply through Bradford County, creating soaring rock outcrops opposite low-lying floodplains. The river is subject to great fluctuations in its water level, from a near trickle during dry periods to severe flooding events. The action of the powerful ebb and flow of the river has created various microhabitats along its length. The steep cliff communities, scoured islands, oxbows and wide floodplains can all have unique assemblages of plants and animals.

Many of the ice and flood scoured islands have distinctive "Big bluestem (*Andropogon gerardii*)-Indian grass (*Sorghastrum nutans*) River Grasslands," which are natural tall grassland communities created as the result of these natural disturbances. The two plant species the community type is named for dominate these habitats and also include switch grass (*Panicum virgatum*) and Indian hemp (*Apocynum cannabinum*). The habitat tends to grade into a "Water willow (*Justicia americana*) – smartweed Riverbed Community" on the lowest island elevations, and into a "Black willow Scrub/shrub Wetland," and "River birch – sycamore Floodplain Scrub" as the elevation increases and the habitat becomes drier. These natural communities are part of the "Riverbed – Bank – Floodplain Community Complex" (Fike 1999), a broadly defined mosaic of community types that typify the natural vegetation along the Susquehanna River in Bradford County.

Another important area for conservation in the Township are the forested slopes along the Susquehanna River. These steep ravines and slopes have likely remained forested because of their topography. The direction the slope is facing will have a significant impact on the species composition found there. Forestry practices on these steep slopes should be evaluated to minimize negative effects such as erosion. Additional surveys of forested slopes, ravines and streams in this township are encouraged.

Threats and Disturbances:

The main threat to these animal species of concern is the reduction of water quality. Activities of industries and landowners along the river can have significant impacts on water quality in the River down to the Chesapeake Bay. Erosion and chemical runoff into the water systems is a serious concern throughout the state. The banks, floodplains and islands of the river have large populations of several aggressive introduced plants including Japanese knotweed (*Polygonum*

cuspidatum) and purple loosestrife (*Lythrum salicaria*). Control of established populations of these species is very difficult. Eradication of pioneer populations is the best way to control the spread of these invasive species.

Conservation Recommendations:

Forested buffers should remain intact for the length of the river with logging operations minimizing cutting within 50 to 100 meters of the river bank. Floodplain forests help buffer the watershed from the effects of non-point sources of pollution including runoff from agricultural, residential and roadway settings. In addition, the river floodplain and corridor can be an area of significantly higher biodiversity than the adjoining uplands. Much of the area's important biodiversity can be preserved by maintaining an intact, forested floodplain along the river. The effectiveness of the river as a habitat corridor would be diminished by fragmentation of the forest continuity by the construction of buildings, houses and additional roadways along the river. Local planning should discourage new construction and roadways along the river, adjacent slopes and floodplain.

Terwiliger Creek, Ridgebury Township

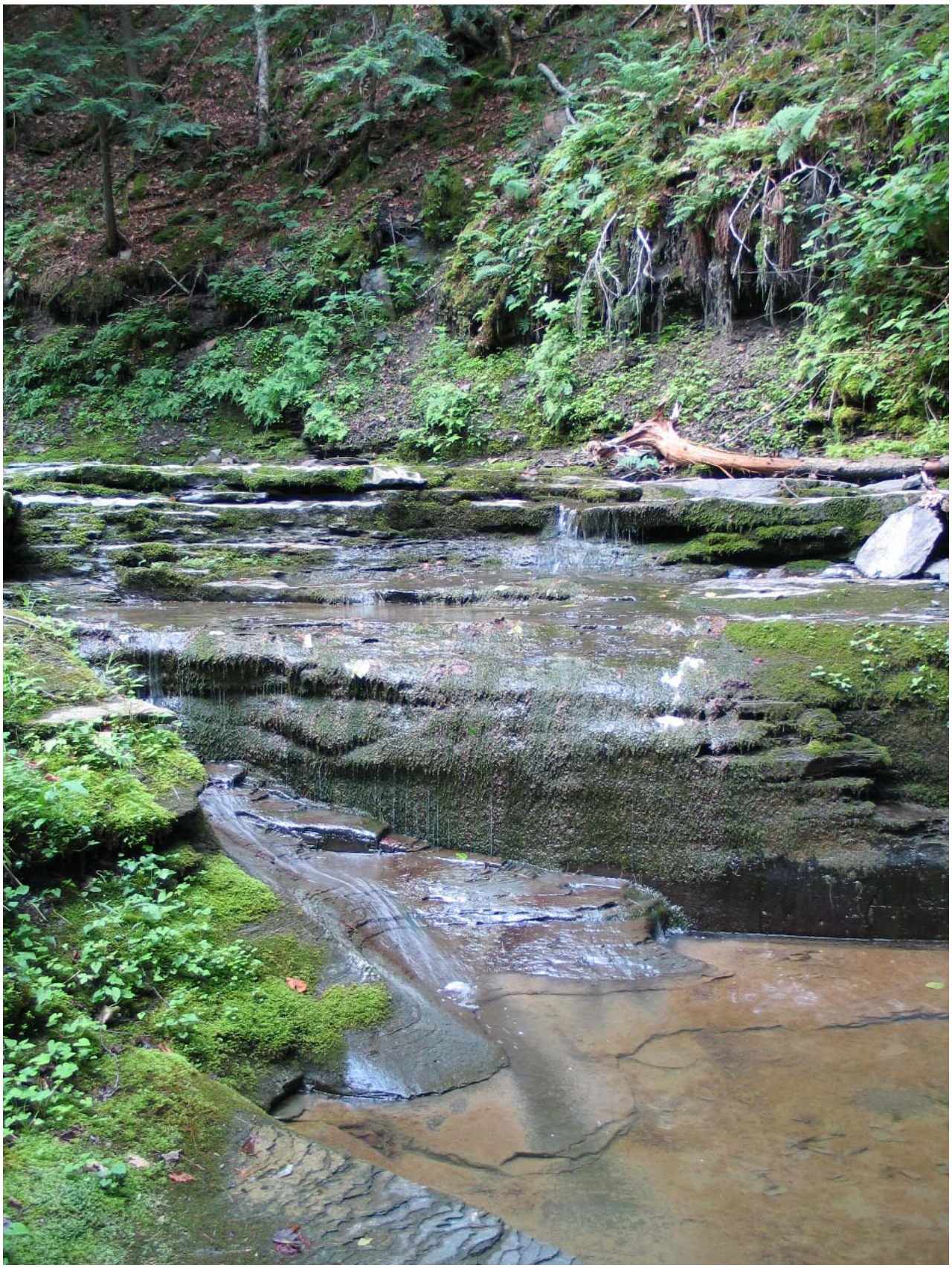
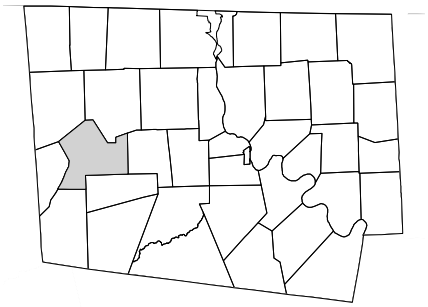


Photo: David Werier

TROY TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen	Quality**
North Branch Sugar Creek	Animal: Great Blue Heron (*Ardea herodias*)	G5	S3S4BS4N	N	2004?	C

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks.



Locally Significant: Armenia Mountain Ravines
Case Glen & Headwaters
North Branch Towanda Creek

Managed Lands: Mount Pisgah County Park
Mount Pisgah State Park

Troy Township is primarily within the Low Glaciated Plateau Section of the Allegheny Plateaus Physiographic Province, with its western edge climbing up the 1000-foot change in elevation to the High Glaciated Plateau Section. The Township is primarily agricultural but has a few large unfragmented forest blocks remaining. Besides the steep slope of Armenia Mountain, Oak Hill is a noteworthy block of unfragmented forest that straddles the Springfield Township line. Route 14 and Route 6 cross in the borough of Troy, a hub of activity in western Bradford County. Future land use trends will likely see the abandonment of some farms, and their conversion to commercial and residential development. Local planning in advance of these changes can help preserve the rural character and the best natural areas of the Township from haphazard development. Flooding or draining of wetlands by dam or channel construction should be avoided. Development should be steered away from wetlands, floodplains and their forested buffers. New roads and residences should be discouraged in and through large blocks of forest to avoid fragmentation of the natural landscape. As land changes from agricultural to residential and commercial development, buildings and new roads should be discouraged along streams and creeks, and forested buffers created where they are missing. Future ground surveys could focus on the step ravines draining off of Armenia Mountain and the floodplains of North Branch Towanda Creek and North Branch Sugar Creek. Conservation efforts could focus on reforesting portions of Sugar, Towanda and South Creeks that lack forested buffer strips. The Township contains small portions of Mount Pisgah County Park and Mount Pisgah State Park.

NORTH BRANCH SUGAR CREEK (Columbia and Troy Townships)

This site contains a large nesting colony of **Great Blue Herons (*Ardea herodias*), a G5, S3S4BS4N animal species of concern.** At least thirty Great Blue Heron nests were seen from a distance adjacent to Route 14. This area is a large forested slope along North Branch Sugar Creek in a mixed deciduous/coniferous forest dominated by sugar maple, eastern hemlock and white pine.

Threats and Disturbances:

This area is located in close proximity to Route 14, which is a busy road. Logging is a potential threat, which may cause the herons to abandon this rookery. Conversion of the site from its present forested use to residential and commercial development would also likely result in the abandonment of this nesting site.

Conservation Recommendations:

Logging should be avoided within the immediate area of the rookery. Any nearby logging activities should take place in fall and early winter to avoid the most active spring and summer nesting season. Rookeries are extremely sensitive to logging and will abandon a site if such disturbances continue. Great Blue Herons are known to be facultative in terms of selecting nest sites, and it is possible that this site will be abandoned within a few years. More surveys are needed of this site to determine whether the herons maintain site fidelity to this area.

Locally Significant Sites:

Armenia Mountain Ravines (Armenia and Troy Townships)

The two steep ravines in this **locally significant site** were determined from aerial photo interpretation. These hemlock-dominated ravines likely have waterfalls along the course of their very rapid decent. These habitats may harbor species adapted to the high moisture environment found here, especially where the falls cut through calcareous bedrock parent material.

Threats and Disturbances:

The very steep slopes of these ravines prevent most uses, but logging of these slopes would likely result in excessive erosion, a decrease in downstream water quality and degradation of this habitat.

Conservation Recommendations:

An undisturbed forested buffer should be maintained on the slopes of these ravines. Surveys for species of concern in these ravines, particularly in the vicinity of waterfalls are encouraged.

Case Glen & Headwaters (Armenia and Troy Townships)

This **locally significant site**, identified from aerial photography and roadside surveys, contains the extremely steep ravine known as Case Glen, and the headwater wetlands of the West Branch of Sugar Creek. Case Glen occurs at the interface of the Low and High Sections of the Glaciated Plateau Physiographic Province. The softer bedrock material of the Low Section has eroded more quickly than the harder bedrock of the High Section resulting in an extreme rise in elevation between the two sections. This hemlock-dominated ravine likely has waterfalls along the course of its very rapid decent. These habitats may harbor species adapted to the high moisture environment found here, especially where the falls cut through calcareous bedrock parent material. The groundwater feeding the headwaters of West Branch Sugar Creek originate in an extensive wetland

that has been artificially divided into two portions. The southern portion has been modified by a dam into an open water pond, while the northern portion appears to have been unaltered, retaining its natural bog habitat. The bog is likely dominated by a mixture of characteristic bog vegetation including high-bush blueberry, leatherleaf, cranberries and the insectivorous pitcher-plant.

Threats and Disturbances:
The steep ravine has experienced some dumping activity, but its steepness prevents most activities. The bog remnant at this site is in a forested context, some of which consists of conifer plantations. The hydrology of the southern portion of this bog natural community has already been altered to create an open-water recreational environment. Logging of the forested buffer surrounding the wetland would likely decrease the quality of the habitat. Conversion from a forested to residential development would also likely detrimentally impact this natural community.

Conservation Recommendations:
The bog natural community would benefit from a slight reduction in the water level of the southern open water portion of this wetland complex. Avoid building dams or draining the more natural northern portion of this wetland complex. If the land changes from its present use as forested woodland to residential development, a 100-meter undisturbed forested buffer is encouraged around this wetland. Surveys for species of concern in this and adjacent wetlands are encouraged.

North Branch Towanda Creek (Canton, Granville and Troy Townships)

This **locally significant site** was determined from aerial photo interpretation. The North Branch Towanda Creek between Granville Summit and Alba forms a series of narrow curves and oxbows within its relatively flat floodplain. There is a railroad bed roughly following the course of the wetland that may have been a component of its formation. Wide shrub swamps, marshes and forested wetlands border the creek in many places. A series of open water ponds occur sporadically along the length of the creek, presumably the result of beaver activity, but several of these are likely man-made. This linear wetland habitat provides a natural landscape corridor, an essential element for wildlife movement through the area.

Threats and Disturbances:
Some portions of the creek are well buffered by forest, while agricultural fields border other sections. Conversion from the present agricultural and forested land use to residential development could fragment this habitat, weakening its quality as a wildlife corridor.

Conservation Recommendations:
Maintain the wetland hydrology along the creek by avoiding permanent flooding or draining of this habitat. Preserve and expand the forested buffer along the creek. Should the surrounding land change from agricultural to residential development, a 100 meter undisturbed buffer around the wetlands is encouraged.

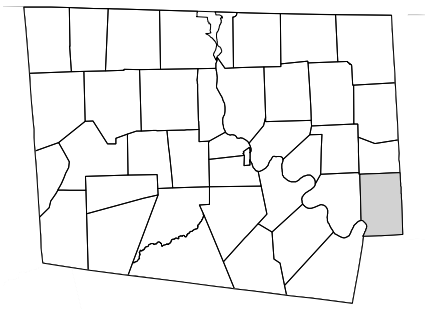
Susquehanna River

The Susquehanna River is subject to extreme water level fluctuation. At times it is low enough to walk across, while at other times it overflows its banks, flooding low-lying areas. The scouring effects of flood and ice have sculpted the islands and shorelines of the river creating specialized habitat for disturbance dependant species of plants. Unfortunately, most non-native invasive species of plants are also adapted to colonize disturbed habitats.
Photos: PA Science Office of The Nature Conservancy

TUSCARORA TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen (y-m-d)	Quality**
Edinger School Wetlands	Plant: Lesser panicled sedge (*Carex diandra*)	G5	S2	PT	2003-6-12	E
Mill Creek Wetlands	Animal: Sedge Skipper (*Euphyes dion*)	G4	S1	N	2003-7-30	E
	Animal species of concern	G5	S3?	N	2003-7-30	E
Susquehanna River (Lower Section)	Animal species of concern	G3G4	S3S4	N	2004	E
	Animal species of concern	G3	S2	N	2004	E
	Animal species of concern	G4	S4	N	2004	E
	Animal species of concern	G4	S3S4	N	2004	E

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks.



Locally Significant: Ackley Pond
Beaver Meadow Wetlands

Managed Lands: None

Tuscarora Township contains a mixture of agricultural fields and forested woodlots. The forested blocks are largely unfragmented, forming a nearly continuously forested natural wildlife corridor following Mill Creek and Tuscarora Creek through the Township. Future land use trends will likely see the abandonment of some farms, and their conversion to commercial and residential development. Local planning in advance of these changes can help preserve the rural character and the best natural areas of the Township from haphazard development. Flooding or draining of wetlands by dams or channels should be avoided. Development should be steered away from wetlands, floodplains and their forested buffers. New roads and residences should be discouraged in and through large blocks of forest to avoid unnecessary fragmentation of the natural landscape. As land changes from agricultural to residential and commercial development, buildings and new roads should be discouraged along streams and creeks, and forested buffers created where they are missing. Future ground surveys could focus on the forested floodplains and slopes of Mill Creek and Tuscarora Creek, and on the least modified wetlands remaining in the Township. The steep forested slopes, islands and banks of the Susquehanna River should also be considered in future biological inventories.

TUSCARORA TOWNSHIP MAP

EDINGER SCHOOL WETLANDS (Tuscarora Township)

A bog remnant at this site contains a small population of the **lesser-panicled sedge (*Carex diandra*)** a G5, S2 PA-threatened plant species of concern. This small circular wetland has floating mats of diverse vegetation buoyed by thick accumulations of sphagnum moss. This site includes typical acid-loving bog species such as leatherleaf, but also has poison sumac, a plant frequently associated with less acidic conditions. The lesser-panicled sedge was found growing on a small floating hummock of cinnamon fern and sphagnum moss.

Threats and Disturbances:

The surface of the pond was covered with duckweed (*Lemna sp.)* and ringed with cattails (*Typha latifolia*), and the presence of poison sumac suggests an increased level of nutrients. The pond is adjacent to agricultural fields, and may require additional forested buffers to adequately protect the pond from sediment, nutrient and agricultural chemical runoff. Elevated water levels have drowned much of the forest edge and surrounding vegetation anchored to the substrate, while the vegetation mats persist by floating.

Conservation Recommendations:

Some areas adjacent to the wetland require additional forested buffers to minimize the impact of non-point sources of pollution. Forested buffers provide critical protection to streams by reducing nutrient, sediment and toxic runoff from roads, residences and agricultural fields. Monitoring for invasive species of plants is also recommended. Removal of invasive species as they first appear is easier and more cost effective than removal of established populations. Removal of beaver dams may be necessary to reduce the water level of this system to reduce the subsequent drowning of the adjacent habitat.

MILL CREEK WETLANDS (Tuscarora Township)

This site contains two artificially dammed lakes, and one beaver-impacted wetland. The two lakes were likely beaver-modified wetlands in the past that have since been turned into lakes by permanent man-made dams. The raised water levels have submerged all but the edges of the wetland vegetation. These are less interesting than the more natural, though beaver-impacted wetland. This area had been flooded by beaver in the recent past, but has since been abandoned. This area is dominated by a fresh growth of sedges and grasses that have lain dormant in the seedbank since the last drying cycle of this wetland. The **sedge skipper (*Euphyes dion*), a G4, S1 animal species of concern** was documented at this site. This butterfly species uses sedges as its primary food source. There is only one other known record for this species in Pennsylvania. Also documented at this site was a **G5, S2S3 aquatic animal species of concern**. This species is under the jurisdiction of the PA Fish and Boat Commission, and its name cannot be released under a data sharing agreement. This species uses the wetlands as its primary habitat. Reduction of wetland quality by degradation of water quality could detrimentally impact these populations.

Threats and Disturbances:

A road runs along the eastern edge of the beaver-impacted wetland. Permanent changes in the hydrology of this wetland (draining or flooding) would likely destroy the habitat for this species. The hydrology of the other two wetlands has been altered with the construction of permanent dams. Potential threats include removal of the forested buffer surrounding the wetland, or conversion of the adjacent landscape from its present forested use to residential development.

Conservation Recommendations:
Maintain the current wetland hydrology. The temporary periodic flooding and draining due to beaver activity will likely keep this wetland in a continuous state of succession. Permanent flooding or draining would likely destroy this habitat. Maintain the undisturbed forested buffer surrounding the wetland. If the land changes from its present use as forested woodland to residential development, a 100-meter undisturbed forested buffer is encouraged around this wetland. Additional surveys for species of concern in this and adjacent wetlands are encouraged.

SUSQUEHANNA RIVER (Lower Section) (Terry, Tuscarora, Wilmot, and Wyalusing Townships)
Four aquatic animal species of concern have been documented along this section of the Susquehanna River. These animal species are under the jurisdiction of the PA Fish & Boat Commission, and their names cannot be released under a data sharing agreement. These animals are affected by non-point sources of pollution including sedimentation from cultivated and developed land along the river, runoff from roadways, pesticide runoff from agricultural fields, discharge of chemical pollutants and thermal pollution.

The Susquehanna River has cut deeply through Bradford County, creating soaring rock outcrops opposite low-lying floodplains. The river is subject to great fluctuations in its water level, from a near trickle during dry periods to severe flooding events. The action of the powerful ebb and flow of the river has created various microhabitats along its length. The steep cliff communities, scoured islands, oxbows and wide floodplains can all have unique assemblages of plants and animals.

Many of the ice and flood scoured islands have distinctive "Big bluestem (*Andropogon gerardii*)-Indian grass (*Sorghastrum nutans*) River Grasslands," which are natural tall grassland communities created as the result of these natural disturbances. The two plant species the community type is named for dominate these habitats and also include switch grass (*Panicum virgatum*) and Indian hemp (*Apocynum cannabinum*). The habitat tends to grade into a "Water willow (*Justicia americana*) – smartweed Riverbed Community" on the lowest island elevations, and into a "Black willow Scrub/shrub Wetland," and "River birch – sycamore Floodplain Scrub" as the elevation increases and the habitat becomes drier. These natural communities are part of the "Riverbed – Bank – Floodplain Community Complex" (Fike 1999), a broadly defined mosaic of community types that typify the natural vegetation along the Susquehanna River in Bradford County.

Another important area for conservation in the Township are the forested slopes along the Susquehanna River. These steep ravines and slopes have likely remained forested because of their topography. The direction the slope is facing will have a significant impact on the species composition found there. Forestry practices on these steep slopes should be evaluated to minimize negative effects such as erosion. Additional surveys of forested slopes, ravines and streams in this township are encouraged.

Threats and Disturbances:
The main threat to these animal species of concern is the reduction of water quality. Activities of industries and landowners along the river can have significant impacts on water quality in the River down to the Chesapeake Bay. Erosion and chemical runoff into the water systems is a serious concern throughout the state. The banks, floodplains and islands of the river have large populations of several aggressive introduced plants including Japanese knotweed (*Polygonum*

cuspidatum) and purple loosestrife (*Lythrum salicaria*). Control of established populations of these species is very difficult. Eradication of pioneer populations is the best way to control the spread of these invasive species.

Conservation Recommendations:
Forested buffers should remain intact for the length of the river with logging operations minimizing cutting within 50 to 100 meters of the river bank. Floodplain forests help buffer the watershed from the effects of non-point sources of pollution including runoff from agricultural, residential and roadway settings. In addition, the river floodplain and corridor can be an area of significantly higher biodiversity than the adjoining uplands. Much of the area's important biodiversity can be preserved by maintaining an intact, forested floodplain along the river. The effectiveness of the river as a habitat corridor would be diminished by fragmentation of the forest continuity by the construction of buildings, houses and additional roadways along the river. Local planning should discourage new construction and roadways along the river, adjacent slopes and floodplain.

Locally Significant Sites:

Ackley Pond (Tuscarora Township)

This **locally significant site** was identified from aerial photo interpretation. Viewed from the air, this wetland has distinct ringed zones of vegetation characteristic of a kettlehole bog. The outer edges of a bog are typically dominated by water tolerant trees, diminishing to shrubs and herbaceous vegetation on top of a thick layer of sphagnum moss. There is frequently a water-filled moat surrounding a ring of floating islands dominated by low shrubs and herbaceous vegetation. The center of a bog is typically an area of deep open water. This wetland appears to have these characteristics. The southern portion of the wetland appears to have a hemlock swamp forest outside the bog perimeter.

Threats and Disturbances:
This bog liess within an agricultural context with little buffer, and likely receives nutrient runoff from farm related activities. Draining, flooding, or removal of the remaining forested buffer would further diminish the natural conditions of this community type.

Conservation Recommendations:
The wetland could be protected by creation of a forested buffer around this habitat. If the land changes from its present farming use to residential development, an additional forested buffer should be created and maintained around this wetland. Maintain the current wetland hydrology. This site should be surveyed for species of concern.

Beaver Meadow Wetlands (Stevens and Tuscarora Townships)

This **locally significant site** includes two wetlands connected by a narrow drainage. The southern portion of the wetland has been flooded by the construction of a dam, creating an open-water environment. The upper portion has not been severely impacted by this hydrologic modification, and still supports much of its bog-like vegetation, floating on thick mats of sphagnum moss. This wetland has species of plants characteristic to acidic, nutrient-poor bog habitats such as wild calla, cotton-grass, cranberries and the insectivorous pitcher-plant.

Threats and Disturbances:
This wetland complex is located mostly within a forested context, which provides an excellent buffer from non-point sources of pollution and the introduction of introduced species of plants. A road and several residences occur along the southwestern edge of the wetland complex. Draining, flooding, or removal of the forested buffer would diminish the quality of this habitat. Conversion from the present forested land use to residential development may also detrimentally impact this habitat.

Conservation Recommendations:
Maintain the current wetland hydrology. Permanent flooding or draining would likely destroy this natural community. Maintain the undisturbed forested buffer surrounding the wetland. If the land changes from its present use as forested woodland to residential development, a 100-meter undisturbed forested buffer around this wetland is encouraged. Additional surveys for species of concern in this and adjacent wetlands are recommended.

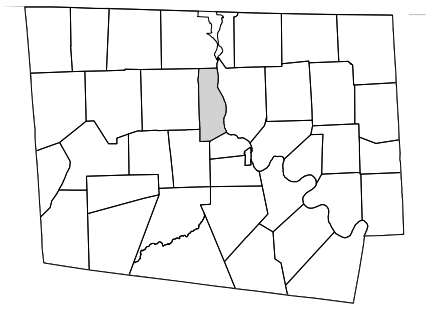
Edinger School Wetland, Tuscarora Township

Floating vegetation rings are one of the telltale signs of a bog habitat. In this case, remnants of typical acid bog vegetation such as leatherleaf and pitcher plants are being replaced by cat-tails and duckweed, which are more typical of nutrient enriched waters. These islands also have a thick tangle of poison sumac. This bog remnant would benefit from a slight reduction in its water level, which has been raised by beavers. Repairing the forested buffer around the wetland where it is lacking could reduce the nutrient and sediment enrichment of the wetland. Photos: PA Science Office of The Nature Conservancy

ULSTER TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen (y-m-d)	Quality**
Susquehanna River (Upper section)	Plant: Illinois Pondweed (*Potamogeton illinoensis*)	G5	S3S4	N	2003-8-27	E
	Animal species of concern	G3	S2	N	2003-8-27	E
	Animal species of concern	G3G4	S3S4	N	2003-8-27	E
	Animal species of concern	G4	S4	N	2003-8-27	E
	Animal species of concern	G4	S3S4	N	2003-8-27	E

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks.



Locally Significant: Balsam Pond
Saco Wetlands

Managed Lands: None

Ulster Township is approximately half forested and half agricultural, with prominent unfragmented forest blocks running north to south through the Township. These large blocks of forest should be preserved intact by avoiding unnecessary fragmentation of the landscape with additional roads and building developments. Ulster Township borders the Susquehanna River, and has a responsibility to avoid decreasing water quality as it passes through the Township. Where the floodplain is wide and flat like the broad Sheshequin Valley floodplain, the river typically has a narrow strip of trees between adjacent agricultural fields and the river's edge. Conversely, the river's edge is deeply forested where extreme slopes have prevented agriculture. Forested buffers should be maintained, widened and created where absent along the length of the river with logging operations minimizing logging within 100 meters of the river edge. Floodplains along the Susquehanna River should be excluded from future development. Maintaining an intact, forested floodplain along the river can preserve much of the Township's important biodiversity. Future biological surveys in the Township could focus on these large forested blocks, the bog-like habitats of Balsam Pond and Saco Wetlands, as well as the islands, floodplains, oxbows and steep slopes along the Susquehanna River.

ULSTER TOWNSHIP MAP

SUSQUEHANNA RIVER (Upper Section) (Athens, Sheshequin and Ulster Townships)

A **G5, S3S4 plant species of concern, Illinois pondweed (*Potamogeton illinoensis*), and four aquatic animal species of concern** were documented in the Susquehanna River near Athens during a survey of this portion of the Susquehanna River in 2003. Additional surveys are recommended to better estimate populations of these species of concern in the river. The river also provides a valuable migration corridor for many bird species, especially aquatic dependent species, but also many Neo-tropical passerine migratory species.

The Susquehanna River is subject to frequent flooding and seasonal low water levels. Scouring of the banks and islands by ice and flooding has created pockets of specialized habitats along the river floodplain. Several islands have distinctive "Big bluestem (*Andropogon gerardii*)-Indian grass (*Sorghastrum nutans*) River Grasslands," which are natural tall grassland communities created as the result of these natural disturbances. The two plant species the community type is named for dominate these habitats and also include switch grass (*Panicum virgatum*) and Indian hemp (*Apocynum cannabinum*). The habitat tends to grade into a "Water willow (*Justicia americana*) – smartweed Riverbed Community" on the lowest island elevations, and into a "Black willow Scrub/shrub Wetland," and "River birch – sycamore Floodplain Scrub" as the elevation increases and the habitat becomes drier. These natural communities are part of the "Riverbed – Bank – Floodplain Community Complex" (Fike 1999), a broadly defined mosaic of community types that typify the natural vegetation along the Susquehanna River in Bradford County.

Threats and Disturbances:

There are numerous examples of disturbance along the Susquehanna River. These animal species of concern are affected by non-point sources of pollution including sedimentation from cultivated and developed land along the river, runoff from roadways, pesticide runoff from agricultural fields, discharge of chemical pollutants and thermal pollution. The main threat to these animals is reduction of water quality. The banks, floodplains and islands of the river have the invasive introduced plant species Japanese knotweed (*Polygonum cuspidatum*) and purple loosestrife (*Lythrum salicaria*). Control of established populations of these species is very difficult. Eradication of pioneer populations is the best way to control the spread of these species of plants.

Conservation Recommendations:

Any of the above types of disturbances should be minimized where possible. Also, monitoring of these populations should continue into the future. Loss of individuals and reductions in population sizes should lead to an investigation into possible causes. Water quality should be monitored and pollution sources should be identified where possible. Forested buffers should be maintained and created where absent along the length of the river with logging operations minimizing their impact within 100 meters of the river edge. Riverbank forests help buffer the watershed from the effects of non-point sources of pollution including runoff from agricultural, residential and roadway settings. In addition, the river floodplain and corridor is usually an area of significantly higher biodiversity than the adjoining uplands. Much of the area's important biodiversity can be preserved by maintaining an intact, forested floodplain along the river. The effectiveness of the forested riverbanks as a habitat corridor would be diminished by fragmentation of the forest continuity by the construction of houses, businesses and additional roadways along the river. Local planning should discourage construction of new structures and roadways along the river, adjacent slopes and floodplain.

Locally Significant Sites:

Balsam Pond (Smithfield and Ulster Townships)

This **locally significant site** was delineated from aerial photo interpretation. This wetland at the headwaters of Cash Creek has likely been flooded by a man-made dam, though the dam is not apparent in the aerial photo. A cluster of floating islands is at the northern end of the pond and likely includes an assemblage of characteristic northern acidic bog species of plants.

Threats and Disturbances:

This wetland is mostly surrounded by a good forested buffer. A road borders the south and east edges of the pond and may be responsible for the elevated water level. Conversion of the surrounding land from agricultural and forested to residential development could degrade the quality of this wetland habitat.

Conservation Recommendations:

Maintain and improve the undisturbed forested buffer surrounding the wetlands. If the land changes from its present use as agricultural and woodland to residential development, a 100-meter undisturbed forested buffer around these wetlands is encouraged. A slight reduction in the water level would encourage reestablishment of the wetland vegetation. Avoid the construction of additional dams. Surveys for species of concern in this and adjacent wetlands are recommended.

Saco Wetlands (Ulster Township)

This **locally significant site** was delineated from aerial photo interpretation. The mostly open-water wetland at this site appears to have an area of shallow water with emergent vegetation or floating mats of vegetation buoyed by thick mats of sphagnum moss at its western end. The lake itself is likely the result of a man-made dam. Most of the lake has a poor buffer from adjacent agricultural fields, but the western end has a thick coniferous canopy, likely a mixture of hemlock and white pine. A smaller wetland southwest of the lake appears to be dominated by a thick shrub layer, which may be floating on a layer of sphagnum moss. These wetlands may have a good diversity of characteristic northern acidic wetland plant species such as leatherleaf, cotton-grass, and pitcher-plants.

Threats and Disturbances:

A lack of forested buffers along most portions of these wetlands may have impacted their water quality and plant species composition. Conversion of the surrounding land from agricultural and forested to residential development could further degrade the quality of these wetland habitats. Impoundment of the unmodified portions of these wetlands would submerge the wetland habitat.

Conservation Recommendations:

Maintain and improve the undisturbed forested buffer surrounding the wetlands. If the land changes from its present use as agricultural and woodland to residential development, a 100-meter undisturbed forested buffer around these wetlands is encouraged. Avoid the construction of additional dams. Surveys for species of concern in this and adjacent wetlands are recommended.

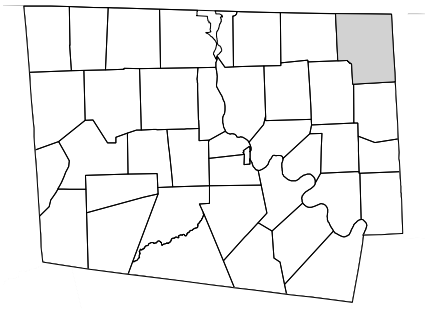
Lake of the Meadows, Warren Township

Small floating remnants are all that remain of the former bog vegetation that once likely covered most of this lake (above). Acid bog shrubs such as leatherleaf, cranberry (left), poison sumac and bog rosemary (below) dominate these floating islands.
Top photo: US Geological Survey
Other photos: PA Science Office of The Nature Conservancy

WARREN TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen	Quality**
Corbin Creek Wetlands	Plant: Soft-leaved sedge (*Carex disperma*)	G5	S3	PR	2004-6-16	E
	Natural Community: Hemlock Palustrine Forest	G?	S3	N	2004-6-16	E
Lake of the Meadows	Plant: Bog rosemary (*Andromeda polifolia*)	G5	S3	PR	2004-7-7	B
	Natural Community: Leatherleaf-bog rosemary Peatland	G?	S2	N	2004-7-7	D

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks.



Locally Significant: Carey Swamp

Managed Lands: State Game Lands #219

Warren Township is a mixture of agricultural fields and woodland blocks, many of which connect to form large interior forest habitats for wildlife and act as natural corridors for the movement of wildlife through the Township. State Game Land #219 falls entirely within the Township and occupies as much as 20% of the Township. Flooding or draining of the Township's remaining undisturbed wetlands by dams or channels should be avoided. Development should be steered away from wetlands, floodplains and their forested buffers. New roads and residences should be discouraged in and through large blocks of forest to avoid fragmentation of the natural landscape. As land changes from agricultural to residential and commercial development, buildings and new roads should be discouraged along streams and creeks, and forested buffers created where they are missing. Future ground surveys could focus on the hemlock ravines of Babcock Run and an unnamed tributary to Wappasening Creek north of West Warren, the forested floodplain of Pendleton Creek and the bog-like wetland at Carey Swamp. Conservation efforts could focus on reforesting portions of Wappasening Creek that lack forested buffers.

CORBIN CREEK WETLANDS (Warren Township)

Corbin Creek has experienced periodic modification by beaver, which have created a series of pools and shrub meadows in various states of succession. A **G5, S3 PA-rare plant species of concern, soft-leaved sedge (*Carex disperma*)**, was documented along the creek in a **Hemlock Palustrine Forest Natural Community**. The hemlock palustrine forest is the preferred habitat of the soft-leaved sedge, where it occurs perched on the raised bases of hemlocks and pines with sphagnum moss. A high diversity of plant and animal life is generated by the diversity of habitats created by the fluctuating beaver activity. The areas where beaver are currently most established have open water ponds where fish, amphibians, and the birds that prey on them reside. Beaver will abandon an area after they have depleted their preferred food source, saplings. Abandoned beaver dams decay, allowing the open water area to be colonized by herbaceous vegetation persisting in the seed bank. Shrubs encroach in the wetland as conditions become favorable, to be replaced by young trees as the drying process continues. With the return of tree saplings as a food source, beaver move back in, completing the cycle. Most of the creek in this area is well buffered by undisturbed forest.

Threats and Disturbances:

There were no disturbances apparent at this wetland complex besides periodic flooding and drying due to a fluctuating beaver population. The adjacent forest appeared to be well managed. Potential threats include removal of the forested buffer surrounding the wetland and conversion of the adjacent landscape from its present forested use to residential development.

Conservation Recommendations:

Maintain the current wetland hydrology. The temporary periodic flooding and draining due to beaver activity will likely keep this wetland complex in various states of succession. Permanent flooding or draining would likely destroy this natural community. Maintain the undisturbed forested buffer surrounding the wetland. If the land changes from its present use as forested woodland to residential development, a 50-meter undisturbed forested buffer is encouraged along the creek edge. Additional surveys for species of concern in this and adjacent wetlands are encouraged.

LAKE OF THE MEADOWS (Warren Township and Susquehanna County)

This lake, straddling the Bradford-Susquehanna County border, is a flooded bog remnant. The floating vegetation mats in the lake are the relics of the vegetation that historically covered much more of this lake. Beaver activity frequently plays a part in partially drowning this fragile habitat type, relegating the bog vegetation to a floating ring within the lake. Enhancement of beaver dams by human activity has reduced this bog habitat to a few floating islands. The floating islands are buoyed by thick layers of sphagnum moss, and dominated by a tangle of the short shrub, leatherleaf. Also on the floating mats is a small population of the **G5, S3 PA-rare plant species of concern, bog rosemary (*Andromeda polifolia*).** Together with the leatherleaf, this characterizes a **Leatherleaf-bog rosemary Peatland Natural Community.** Associated plant species included cotton grass, swamp rose, cranberries, poison sumac and the insectivorous pitcher plant.

Threats and Disturbances:
This bog wetland has been severely impacted by artificial flooding, resulting in small floating remnants of the past natural community. Houses line the southern edge of the wetland. Much of the forested buffer has been removed or fragmented by roads and residences.

Conservation Recommendations:
The floating mats will likely persist as remnants of the bog habitat as long as the water quality is not severely altered. Creation and preservation of a forested buffer around this wetland could help protect the water quality. Much of the bog vegetation can persist in the seedbank of the habitat between beaver induced flooding cycles. Reduction of the water level, if unobjectionable to the landowners, may allow much of the bog vegetation to recolonize its historic habitat.

Locally Significant Site:

Carey Swamp (Pike and Warren Townships)
This **locally significant site** was determined from aerial photo interpretation. The wetland at this site is primarily open water, with a narrow margin of wetland vegetation. The pond is surrounded by a mostly coniferous forest matrix with little apparent disturbance. This site may have been flooded by beaver or human dam building activities. This decreases the wetland's quality as a potential important natural community, but the undisturbed forested context of the wetland has likely provided a buffer from invasive species of plants and non-point sources of pollution.

Threats and Disturbances:
There are no obvious disturbances. A small road approaches the northern end of the wetland. Permanent draining or flooding of the wetland or removal or fragmentation of the forested buffer would likely negatively impact the quality of this habitat.

Conservation Recommendations:
A ground survey is necessary to determine if the water level is artificially raised. The water level may need to be lowered slightly to allow the bog vegetation to reclaim this wetland habitat. Maintain the undisturbed forested buffer surrounding the wetlands. If the land changes from its present use as forested woodland to residential development, a 50-to-100-meter undisturbed forested buffer is encouraged around the wetland. Surveys for species of concern and exemplary natural communities are encouraged.

Corbin Creek Wetlands, Warren Township

Soft-leaved sedge (*Carex disperma*)

Beaver dam

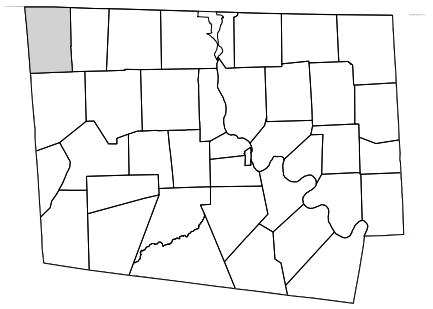
Area recovering from beaver dam flooding

Hemlock Palustrine Forest

WELLS TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen	Quality**
None						

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks.



Locally Significant: None

Managed Lands: None

Wells Township meets Tioga County along the New York Border in the northwestern corner of Bradford County. Although no high quality natural areas were identified in Wells Township as a result of this study, there are several large unfragmented forest blocks in the Township; two that are over one square mile in area, and several others that are between a half-mile and one mile in area. Many of these blocks are adjacent to each other with narrow Township roads splitting the blocks. Steering future road and building projects away from these large forest blocks and avoiding unnecessary fragmentation of the landscape can best protect the Township's native biodiversity. There are a few relatively unmodified wetlands in the Township. Further modification of these remaining wetlands by permanent draining or damming should be avoided, and forested buffers should be preserved, or enhanced, where lacking. Portions of many of the creeks in the Township lack adequate forested buffers from non-point sources of pollution such as agricultural, residential, and roadway runoff. Conservation efforts in the Township could focus on reforesting creek banks lacking forested buffers, especially along Seeley and Beckwith Creeks.

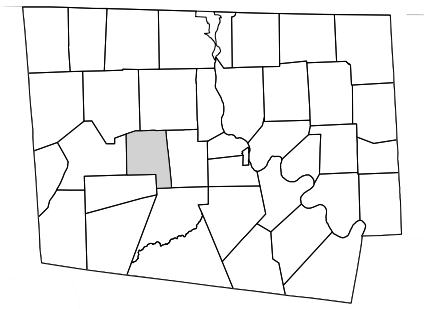
Swimming Dam, Leroy Township

Swimming Dam is one of many bog-like wetland habitats on the High Glaciated Plateau of southern Bradford County. This wetland has been flooded by a man-made dam and accelerated by beaver activity. The floating islands at this site are buoyed by centuries-old accumulations of sphagnum moss. The islands are dominated by the common acid-loving bog species leatherleaf, which forms a nearly impenetrable monoculture. Small openings in the shrub thicket contain other typical acid wetland species including cranberries, sedges, bogbean, sundews and pitcher plants. A reduction of the water level may help to allow other bog species to recolonize this habitat.
Photos: PA Science Office of
The Nature Conservancy

WEST BURLINGTON TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen	Quality**
None						

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks.



Locally Significant: Mount Selleck Wetland

Managed Lands: Mount Pisgah State Park
State Game Lands #289

West Burlington Township is divided by Sugar Creek and contains a mixture of agricultural fields and forested hills. The forested blocks of the Township are surprisingly unfragmented. The Township contains a portion of Mount Pisgah State Park, which connects with Mount Pisgah County Park in Troy and Springfield Townships to form a large unfragmented forested block with an area of almost five square miles. The Township also contains State Game Land #289, which includes portions of two large unfragmented forested blocks over two square miles in area that are divided by a road along West Branch Mill Creek. Much of the native biodiversity of the Township can be preserved by avoiding fragmentation the Township's large forested blocks with additional roads and buildings. Care should be taken during logging operations to avoid introducing invasive species of plants into the largely unfragmented forest blocks. Machinery should be thoroughly rinsed to avoid transferring invasive plant seeds and other exotic pests and pathogens from other locations. The spread of invasive species of plants could severely degrade the forests of the Township. Removal of invasive species as they first appear is easier and more cost effective than removal of established populations. Timber-oriented tree farms should be planted in species native to Bradford County to avoid the accidental spread of introduced species of trees. Conservation efforts within the Township could concentrate on reforesting portions of Sugar Creek that lack adequate forested buffers from non-point sources of pollution such as agricultural, residential, and roadway runoff.

Locally Significant Site:

Mount Selleck Wetland (West Burlington Township)

This **locally significant site** was determined from aerial photo interpretation. This large shrub dominated wetland has likely seen past or current beaver activity. This periodic hydrologic disturbance helps to keep this wetland in a successional stage. This wetland likely has an assemblage of plants characteristic of northern acidic wetlands such as leatherleaf, cotton-grass, and highbush blueberry.

Threats and Disturbances:

This wetland has a good forested buffer on its eastern edge, while the western edge has agricultural fields abutting the wetland edge. Removal of the remaining forested buffer would likely lead to a decline in water quality in this wetland. The temporary periodic flooding and draining due to beaver activity will likely keep this wetland in various states of succession. Permanent flooding or draining would likely diminish the quality of these wetland natural communities. Conversion of the adjacent land from forested and agricultural to residential development would likely decrease the quality of this wetland habitat.

Conservation recommendations:

Maintain the current wetland hydrology. Avoid building dams or drainage channels. Preserve and repair where necessary the forested buffer surrounding this wetland. If the land changes from agricultural and forested to residential land use, a 100-meter forested buffer around this wetland is encouraged. Biological surveys of this area are recommended.

Excellent quality populations of American yew (*Taxus canadensis*) were found in several locations in Bradford County. This species was recently removed form the PA species of concern list due to updated statewide population estimates.

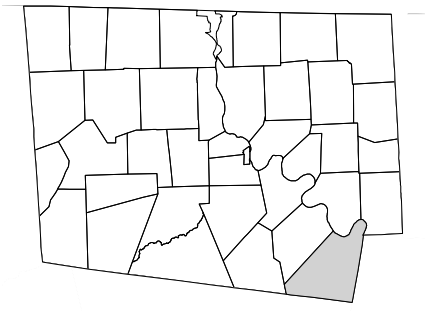
WILMOT TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen (y-m-d)	Quality**
County Line Bogs	Plant: Lesser panicled sedge (*Carex diandra*)	G5	S2	PT	2004-6-15	B
	Plant: Slender sedge (*Carex lasiocarpa*)	G5	S3	PR	2004-6-15	E
	Animal: Bog copper (*Lycaena epixanthe*)	G5	S2	N	2004-6-15	E
Quicks Bend	Plant: White trout-lily (*Erythronium albidum*)	G5	S3	N	2004-4-20	E
Sugar Run Creek	Animal: Great Blue Heron Rookery (*Ardea herodias*)	G5	S3S4BS4N	N	2004-4-20	E
Susquehanna River (Lower Section)	Animal species of concern	G3G4	S3S4	N	2004	E
	Animal species of concern	G3	S2	N	2004	E
	Animal species of concern	G4	S4	N	2004	E
	Animal species of concern	G4	S3S4	N	2004	E
Terrytown Woods	Plant: Wild–pea (*Lathyrus ochroleucus*)	G4G5	S1	PT	1989-6-20	D

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks.

<u>Locally Significant</u>: Crane Swamp
Cumiskey Wetlands

<u>Managed Lands</u>: State Game lands #172



<u>WILMOT TOWNSHIP MAP</u>

County Line Bogs, Wilmot Township

The island-like vegetation mats floating on these bogs are somewhere between land and water. Buoyed by centuries-old accumulations of sphagnum moss, they support a variety of plant species specially adapted to this naturally acidic environment. Shown are rose pogonia (left), marsh cinquefoil (bottom-left), pitcher-plant (bottom-center) and tufted loosestrife (bottom-right). Photos: PA Science Office of The Nature Conservancy

WILMOT TOWNSHIP

Wilmot Township is largely forested, with a smaller percentage of its area in agricultural production. Much of the Township's forested area is in large unfragmented forest blocks over one square mile in area. Steering new road and building projects away from these areas and protecting wetlands from permanent flooding or draining can go a long way towards preserving much of the Township's native biodiversity. Development should be steered away from wetlands, floodplains and their forested buffers. New roads and residences should be discouraged in and through large blocks of forest to avoid fragmentation of the natural landscape. The islands, shoreline and steep slopes along the Susquehanna River could be areas of future biological inventories. Where the banks of the river are not steep, there is a narrow band of forest to buffer the river from agricultural runoff, erosion and other non-point sources of pollution. Increasing this riparian buffer will help protect the Susquehanna watershed and ultimately the Chesapeake Bay from water quality degradation.

COUNTY LINE BOGS (Wilmot Township and Wyoming County)

The series of wetlands identified in this site are bogs in which the water levels have been elevated in recent years by beaver and human activity. Bogs are naturally nutrient poor, acidic wetlands that have resulted from glacial activity. Species found in these specialized environments are adapted to the extreme environmental conditions present. Two plants and one animal species of concern were documented from this site. The **G5, S2 lesser panicled sedge (*Carex diandra*)** and the **G5, S3 slender sedge (*Carex lasiocarpa*)** were found in these wetlands along with other plant species typical of acidic bog habitats such as the insectivorous pitcher plant and cranberries. A butterfly species that feeds exclusively on cranberry plants during its larval stage, the **G5, S2 bog copper butterfly (*Lycaena epixanthe*),** was found among dense patches of cranberries at this site. The bog habitat that remains at these sites is primarily restricted to floating mats of thick sphagnum moss that have been colonized by herbs, shrubs and trees. These floating mats are the fragile remains of the bog system that used to characterize these wetlands prior to raised water levels.

Threats and disturbances:

The primary threat to these wetlands would be further alterations in the hydrology. Both flooding and draining can be detrimental to these fragile wetland systems. Removal of the forested buffer around these wetlands may allow nutrient-laden runoff from adjacent agricultural fields, roads and homes to impact this natural community. Nutrient enrichment of this naturally nutrient poor ecosystem can change the chemical conditions of this unique habitat. Enrichment may allow invasive and introduced species of plants to out-compete native plant populations.

Conservation recommendations:

In order to allow the bogs to return to a more natural condition, the water levels could be reduced slightly. The shallow bogs would likely become unsuitable for boating, but would expand the area suitable for this unique natural community. Forested buffers should remain intact around the perimeter of the wetlands with logging operations refraining from cutting within 100 meters of the wetland bank. Wetland edge forests help buffer the watershed from the effects of non-point sources of pollution, including runoff from agricultural, residential and roadway settings. Maintaining an intact, forested margin around wetlands can help preserve much of the area's important biodiversity.

QUICKS BEND (Wilmot Township)

A fair-quality population of the **G5, S3 plant species of concern, white trout-lily (*Erythronium albidum*)** was documented along the banks of the Susquehanna River at Quicks Bend. Though yellow trout-lilies are quite common in Pennsylvania, white trout-lilies are uncommon. Though there are several historical records for this species in other northern portions of the state, this population in Wilmot Township may be the northernmost known existing location for this species in Pennsylvania. The white trout-lily was found in rich deciduous woods along the floodplain of the Susquehanna River. A good diversity of native spring wildflowers carpet the ground beneath a tree canopy dominated by silver maple, hackberry and box elder. A good-quality population of the relatively uncommon shrub species American yew was also documented along the steep, forested, hemlock-covered slopes in this area. This species was recently removed from the plant species of concern list based on updated statewide population estimates. Yew has been in decline over much of its range in the state due to habitat loss and over-browsing by deer (Rhoads and Block 2000). Recent documentation of several excellent-quality populations of yew in Bradford County may suggest this species is truly on the rebound.

Threats and Disturbances:

The shoreline of the Susquehanna River endures frequent periodic disturbance in the form of floods and ice scour. This natural fluctuation in water level has created a floodplain habitat perfect for white trout-lily and other native wildflower species. Unfortunately, this disturbance also creates conditions favorable for aggressive introduced species of plants such as Japanese knotweed (*Polygonum cuspidatum*) and garlic mustard (*Alliaria petiolata*). These introduced plants have formed dense colonies in portions of the floodplain, competing with, and displacing native species. Removal of the forested buffer along the river shore could also detrimentally impact this habitat.

Conservation Recommendations:

The spread of invasive species of plants could severely degrade this river floodplain natural community. Management plans should include provisions for the control and removal of invasive species of plants. Removal of invasive species as they first appear is easier and more cost effective than removal of established populations. Forested buffers should remain intact for the length of the river with logging operations refraining from cutting within 100 meters of the bank. Floodplain forests help buffer the watershed from the effects of non-point sources of pollution including runoff from agricultural, residential and roadway settings. In addition, the river floodplain and corridor is usually an area of significantly higher biodiversity than the adjoining uplands. Maintaining an intact, forested floodplain along the river can preserve much of the area's important biodiversity. The effectiveness of the river as a habitat corridor could be diminished by fragmentation of the forest continuity by the construction of houses and additional roadways along its banks. Local planning should discourage construction of new residences and roadways along the river shore, adjacent slopes and floodplain. Additional surveys for this species in adjacent floodplains and upland wooded areas are encouraged.

SUGAR RUN CREEK (Wilmot Township)

A nesting colony of **Great Blue Herons (*Ardea herodias*), a G5, S3S4BS4N animal species of concern**, was documented at this forested site. This species had been in severe decline throughout Pennsylvania at the turn of the century and for 50 years after, but has made a remarkable comeback in recent decades (Brauning 1992). Great Blue Herons frequently nest in treetops of undisturbed forests far from their aquatic feeding grounds. The Herons at this site are likely traveling to the Susquehanna River and other nearby wetlands for feeding. Acid mine drainage (AMD), which kills fish and other aquatic organisms, may have deprived these birds of much of

their food source in the past. Recent efforts to mitigate the effects of AMD across the state have likely helped restore life to some of these previously disturbed aquatic habitats. A good-quality population of the relatively uncommon shrub species American yew was also documented along the steep, forested, hemlock-covered slopes in this area. This species was recently removed from the plant species of concern list based on updated statewide population estimates.

Threats and disturbances:
No disturbances of the nesting area of this colony were observed. Potential threats include disturbing the colony by logging the site and conversion from its present forested use to residential development.

Conservation recommendations:
The nesting site should be protected from disturbance by respecting an undisturbed forested buffer of 100 to 200 meters around the nest colony. Logging operations in the nest vicinity should be scheduled to occur in the fall and early winter to avoid the early spring and summer nesting activities of this species. New roads and other building activities should be avoided within at least 200 meters of the nest colony.

SUSQUEHANNA RIVER (Lower Section) (Terry, Tuscarora, Wilmot, and Wyalusing Townships)

Four aquatic animal species of concern have been documented along this section of the Susquehanna River. These animal species are under the jurisdiction of the PA Fish & Boat Commission, and their names cannot be released under a data sharing agreement. These animals are affected by non-point sources of pollution including sedimentation from cultivated and developed land along the river, runoff from roadways, pesticide runoff from agricultural fields, discharge of chemical pollutants and thermal pollution.

The Susquehanna River has cut deeply through Bradford County, creating soaring rock outcrops opposite low-lying floodplains. The river is subject to great fluctuations in its water level, from a near trickle during dry periods to severe flooding events. The action of the powerful ebb and flow of the river has created various microhabitats along its length. The steep cliff communities, scoured islands, oxbows and wide floodplains can all have unique assemblages of plants and animals.

Many of the ice and flood scoured islands have distinctive "Big bluestem (*Andropogon gerardii*)-Indian grass (*Sorghastrum nutans*) River Grasslands," which are natural tall grassland communities created as the result of these natural disturbances. The two plant species the community type is named for dominate these habitats and also include switch grass (*Panicum virgatum*) and Indian hemp (*Apocynum cannabinum*). The habitat tends to grade into a "Water willow (*Justicia americana*) – smartweed Riverbed Community" on the lowest island elevations, and into a "Black willow Scrub/shrub Wetland," and "River birch – sycamore Floodplain Scrub" as the elevation increases and the habitat becomes drier. These natural communities are part of the "Riverbed – Bank – Floodplain Community Complex" (Fike 1999), a broadly defined mosaic of community types that typify the natural vegetation along the Susquehanna River in Bradford County.

Another important area for conservation in the Township are the forested slopes along the Susquehanna River. These steep ravines and slopes have likely remained forested because of their topography. The direction the slope is facing will have a significant impact on the species composition found there. Forestry practices on these steep slopes should be evaluated to minimize

negative effects such as erosion. Additional surveys of forested slopes, ravines and streams in this Township are encouraged.

Threats and Disturbances:
The main threat to these animal species of concern is the reduction of water quality. Activities of industries and landowners along the river can have significant impacts on water quality in the River down to the Chesapeake Bay. Erosion and chemical runoff into the water systems is a serious concern throughout the state. The banks, floodplains and islands of the river have large populations of several aggressive introduced plants including Japanese knotweed (*Polygonum cuspidatum*) and purple loosestrife (*Lythrum salicaria*). Control of established populations of these species is very difficult. Eradication of pioneer populations is the best way to control the spread of these invasive species.

Conservation Recommendations:
Forested buffers should remain intact for the length of the river with logging operations minimizing cutting within 100 meters of the river bank. Floodplain forests help buffer the watershed from the effects of non-point sources of pollution including runoff from agricultural, residential and roadway settings. In addition, the river floodplain and corridor can be an area of significantly higher biodiversity than the adjoining uplands. Much of the area's important biodiversity can be preserved by maintaining an intact, forested floodplain along the river. The effectiveness of the river as a habitat corridor would be diminished by fragmentation of the forest continuity by the construction of buildings, houses and additional roadways along the river. Local planning should discourage new construction and roadways along the river, adjacent slopes and floodplain.

TERRYTOWN WOODS (Terry and Wilmot Townships)

A small population of a **G4G5, S1 PA-threatened plant species of concern, wild pea (*Lathyrus ochroleucus*)**, was documented on loose shale substrate primarily along the road in this area in 1989. A survey in 2004 was unable to relocate this population. A road-widening operation was in progress at the time of the survey, and the population may have been disturbed or eliminated. This species prefers the slightly open canopy of rock outcrops and steep creek banks, as well as artificially created openings such as roadway and powerline cuts. Additional surveys for this species along the road are encouraged.

Threats and disturbances:
Road maintenance activities at the time of the survey included scraping the bank of the road, and the population may have been disturbed. This activity may not necessarily have destroyed this population of wild pea. This species has the tendency to colonize similarly disturbed sites. Herbicide applications or other road widening operations could severely diminish this population.

Conservation recommendations:
This site should be resurveyed for wild pea in the next few years to see if the population can be found and to determine the impact of the road widening activity on this species.

Locally Significant Sites:

Crane Swamp (Wilmot Township)

This **locally significant site** is well known for having a good diversity of wetland dependent and pond bird species and is commonly visited by birders. This area contains a large wetland with shrub swamps and herbaceous openings and lots of aquatic vegetation. This site showed signs of beaver activity and probably has been flooded recently.

Threats and Disturbances:

Beaver activity is a disturbance to this site and will likely change the nature of the swamp/marsh in future years. In the absence of beaver activity, a large marsh may develop that provides critical habitat to marsh dependent birds such as rails and marsh wrens. Non-point sources of pollution such as agricultural, residential and roadway runoff can diminish the water quality at this site. Exotic plant species such as multiflora rose and autumn olive are slowly gaining abundance in the marsh.

Conservation Recommendations:

Exotic plant species should be controlled before they threaten the ecological integrity of the site. The forested buffer around the perimeter of the swamp/marsh should be preserved and enhanced to best protect the area. Additional surveys are recommended to determine if bird species such as Common Moorhens and American Coots are using this wetland as a breeding site.

Cumiskey Wetlands (Wilmot Township)

This **locally significant site** was determined from aerial photo interpretation from 1994 photos and may have had recent hydrologic changes. This wetland site appears to have been periodically influenced by beaver activity. A large, open shrub and herbaceous dominated wetland occupied the central portion of this wetland complex. An open water channel winds through the wetland. A conifer-dominated swamp forest appears to have dominated the eastern and northern edges of the open wetland.

Threats and Disturbances:

This wetland complex is partly within a forested context, which provides a buffer from non-point sources of pollution and the introduction of invasive species of plants. Small roads and several residences occur along the west and south edges of the wetland complex. Draining or flooding of the wetland, or removal of the forested buffer would diminish the quality of this natural community. Conversion from the present forested land use to residential development may also detrimentally impact this habitat.

Conservation Recommendations:

Maintain the current wetland hydrology. Permanent flooding or draining would likely destroy this habitat. Maintain and repair the undisturbed forested buffer surrounding the wetland. If the land changes from its present use as forested woodland and agriculture to residential development, a 100-meter undisturbed forested buffer around this wetland is encouraged. Surveys for species of concern in this and adjacent wetlands are recommended.

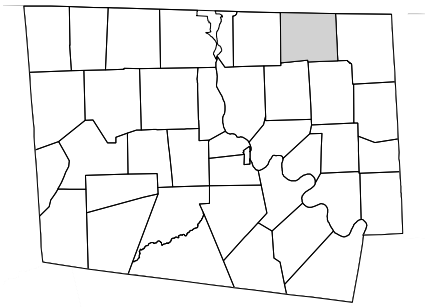
Crane Swamp USGS Aerial Photo: 5-1-1993

Cumiskey Wetlands USGS Aerial Photo: 4-18-1994

WINDHAM TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen	Quality**
None						

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks.



Locally Significant: West Branch Parks Creek
Windham Summit Wetland
Managed Lands: None

The Wappasening Creek flows northward through the agricultural fields and forested hills of Windham Township. Much of the Township is forested, with several large unfragmented forested blocks over a square mile in area occurring within the Township. Much of the native biodiversity of the Township can be preserved by avoiding draining or damming wetlands, and by preserving forested buffers around all wetlands. Avoid fragmenting the Township's large forested blocks with additional roads. Care should be taken during logging operations to avoid introducing invasive species of plants into the largely unfragmented forest blocks. Machinery should be thoroughly rinsed to avoid transferring invasive plant seeds and other exotic pests and pathogens from other locations. The spread of invasive species of plants could severely degrade the forest quality of the Township. Removal of invasive species as they first appear is easier and more cost effective than removal of established populations. Timber-oriented tree farms should be planted in species native to Bradford County to avoid the accidental spread of introduced species of trees. Future biological inventories in the Township could focus on the forested floodplains along the Wappasening Creek near Windham, the floodplain of West Branch Parks Creek and the forested ravines of Cold Brook, Spring Run and Little Falls Creek. Conservation efforts within the Township could concentrate on replanting forested buffers along the Wappasening Creek where they are lacking.

Locally Significant Sites:

West Branch Parks Creek (Windham Township)

This **locally significant site** was delineated from aerial photo interpretation. This area includes the beaver influenced wetland along the floodplain of West Branch Parks Creek and the adjacent conifer dominated forest. The wetland at this site appears to be fairly diverse, with sections of herbaceous openings and shrub dominated areas interrupted by open water ponds, with the creek meandering through the broad, flat floodplain. The wetland opening is bordered by a dense conifer forest that may have waterlogged soils, creating a hemlock palustrine forest. This section of the creek has an excellent undisturbed forested buffer.

Threats and Disturbances:

There are no apparent disturbances at this wetland complex besides periodic flooding and drying due to a fluctuating beaver population. Potential threats include removal of the forested buffer surrounding the wetland.

Conservation Recommendations:

Maintain the current wetland hydrology. The temporary periodic flooding and draining due to beaver activity will likely keep this wetland in various states of succession. Permanent flooding or draining would likely destroy this habitat. Maintain the undisturbed forested buffer surrounding the wetland. Surveys for species of concern are recommended.

Windham Summit Wetland (Windham Township)

This **locally significant site** was determined from aerial photo interpretation. This large open wetland appears to be largely dominated by herbaceous and short shrub vegetation. There has likely been past or ongoing beaver influence on the hydrology. The eastern side of the wetland appears to have a good-quality conifer dominated forested buffer, while the western side has a thin, younger, mostly deciduous buffer that may be used as pasture. The conifer forest on the northern edge of the wetland may have saturated soils, grading into a hemlock palustrine forest.

Threats and Disturbances:

There are no apparent disturbances at this wetland complex besides periodic flooding and drying due to a fluctuating beaver population. Potential threats include removal of the forested buffer surrounding the wetland, and permanent flooding or draining due to man-made dams or drainage channels.

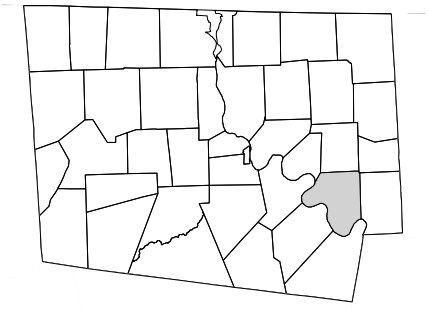
Conservation Recommendations:

Maintain the current wetland hydrology. The temporary periodic flooding and draining due to beaver activity will likely keep this wetland in various states of succession. Permanent flooding or draining would likely destroy this habitat. Avoid building dams or drainage channels. Maintain, and replant where missing, the undisturbed forested buffer surrounding the wetland. Surveys of this wetland natural community for species of concern are recommended.

WYALUSING TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen (y-m-d)	Quality**
Limehill	Plant: Wild–pea (*Lathyrus ochroleucus*)	G4G5	S1	PT	1989-06-29	C
Susquehanna River (Lower Section)	Animal species of concern	G3G4	S3S4	N	2004	E
	Animal species of concern	G3	S2	N	2004	E
	Animal species of concern	G4	S4	N	2004	E
	Animal species of concern	G4	S3S4	N	2004	E
Wyalusing Rocks	Geologic Feature: Erosional Remnant	N/A	N/A	N	N/A	N/A
	Plant: Appalachian Sand Cherry (*Prunus pumila var. susquehanae*)	G5T4	S2	N	2003-07-30	E

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks.



Locally Significant: None

Managed Lands: None

Wyalusing Township borders the Susquehanna River. Where the floodplain is wide and flat, the river typically has a narrow strip of trees between adjacent agricultural fields and the river edge. Conversely, the river banks are deeply forested where extreme slopes have prevented agriculture. Floodplains along the Susquehanna River should be excluded from future development. Maintaining an intact, forested floodplain along the river can preserve much of the Township's important biodiversity. Forested buffers should be maintained, widened and created where absent along the length of the river with logging operations minimizing cutting within 100 meters of the river edge. The Township also has several large blocks of unfragmented forest, many of which connect to form portions of natural wildlife corridors through the Township. These large blocks of forest should be preserved intact by avoiding unnecessary fragmentation of the landscape with additional roads and building developments. Future biological surveys in the Township could focus on these large forested blocks. Oxbows, islands and steep slopes along the Susquehanna River and Wyalusing Creek floodplains are also high priorities for future biological surveys. Conservation efforts within the Township could focus on reforesting portions of the banks of Wyalusing Creek and Susquehanna River that lack adequate forested buffers.

WYALUSING TOWNSHIP MAP

LIMEHILL (Standing Stone and Wyalusing Townships)

A fair-quality population of a **G4G5, S1 PA-threatened plant species of concern, wild pea (*Lathyrus ochroleucus*),** occurs on loose shale substrate primarily along the road in this area. This species prefers the slightly open canopy of rock outcrops and steep creek banks, as well as artificially created openings such as roadway and powerline cuts.

Threats and disturbances:

No disturbances were observed during the survey. This occurrence of wild pea could be severely impacted by road maintenance activities. The current practice of occasional roadside mowing and tree removal likely favors the habitat for this species, but herbicide applications or road widening operations could severely diminish this population.

Conservation recommendations:

Continue with low-impact roadside mowing maintenance, but avoid herbicide applications. Road improvement options on this road such as widening and paving should avoid impacting the wild pea occurring at this location. Additional surveys for species of concern in this area are recommended.

SUSQUEHANNA RIVER (Lower Section) (Terry, Tuscarora, Wilmot, and Wyalusing Townships)

Four aquatic animal species of concern have been documented along this section of the Susquehanna River. These animal species are under the jurisdiction of the PA Fish & Boat Commission, and their names cannot be released under a data sharing agreement. These animals are affected by non-point sources of pollution including sedimentation from cultivated and developed land along the river, runoff from roadways, pesticide runoff from agricultural fields, discharge of chemical pollutants and thermal pollution.

The Susquehanna River has cut deeply through Bradford County, creating soaring rock outcrops opposite low-lying floodplains. The river is subject to great fluctuations in its water level, from a near trickle during dry periods to severe flooding events. The action of the powerful ebb and flow of the river has created various microhabitats along its length. The steep cliff communities, scoured islands, oxbows and wide floodplains can all have unique assemblages of plants and animals.

Many of the ice and flood scoured islands have distinctive "Big bluestem (*Andropogon gerardii*)-Indian grass (*Sorghastrum nutans*) River Grasslands," which are natural tall grassland communities created as the result of these natural disturbances. The two plant species the community type is named for dominate these habitats and also include switch grass (*Panicum virgatum*) and Indian hemp (*Apocynum cannabinum*). The habitat tends to grade into a "water willow (*Justicia americana*) – smartweed Riverbed Community" on the lowest island elevations, and into a "Black willow Scrub/shrub Wetland", and "River birch – sycamore Floodplain Scrub" as the elevation increases and the habitat becomes drier. These natural communities are part of the "Riverbed – Bank – Floodplain Community Complex" (Fike 1999), a broadly defined mosaic of community types that typify the natural vegetation along the Susquehanna River in Bradford County.

Another important area for conservation in the township are the forested slopes along the Susquehanna River. These steep ravines and slopes have likely remained forested because of their topography. The direction the slope is facing will have a significant impact on the species

composition found there. Forestry practices on these steep slopes should be evaluated to minimize negative effects such as erosion. Additional surveys of forested slopes, ravines and streams in this township are encouraged.

Threats and Disturbances:

The main threat to these animal species of concern is the reduction of water quality. Activities of industries and landowners along the river can have significant impacts on water quality in the River down to the Chesapeake Bay. Erosion and chemical runoff into the water systems is a serious concern throughout the state. The banks, floodplains and islands of the river have large populations of several aggressive introduced plants including Japanese knotweed (*Polygonum cuspidatum*) and purple loosestrife (*Lythrum salicaria*). Control of established populations of these species is very difficult. Eradication of pioneer populations is the best way to control the spread of these invasive species.

Conservation Recommendations:

Forested buffers should remain intact for the length of the river with logging operations minimizing cutting within 100 meters of the river bank. Floodplain forests help buffer the watershed from the effects of non-point sources of pollution including runoff from agricultural, residential and roadway settings. In addition, the river floodplain and corridor can be an area of significantly higher biodiversity than the adjoining uplands. Much of the area's important biodiversity can be preserved by maintaining an intact, forested floodplain along the river. The effectiveness of the river as a habitat corridor would be diminished by fragmentation of the forest continuity by the construction of buildings, houses and additional roadways along the river. Local planning should discourage new construction and roadways along the river, adjacent slopes and floodplain.

WYALUSING ROCKS (Wyalusing Township)

The dramatic cliffs along the Susquehanna River at the French Azilum Overlook provide a breathtaking view of the Susquehanna River and the valley below. This area is considered an outstanding scenic geologic feature (Gyer & Bolles 1979) and includes some important recently discovered fossils of lobe-finned fish. Exposed rock and rock fragments cover much of the face of the cliff. The rapid precipitation runoff and low permeability of this rock type create a very dry habitat. What vegetation does gain a foothold on the cliff is dominated by species that are the most drought resistant. One such species is the **G5T4, S2 plant species of concern, the Appalachian sand cherry (*Prunus pumila var. susquehanae*)**, which occurs on the rock outcrop at this location. A single clump of this shrub was observed along the cliff edge. This is an extremely steep and extensive rock outcrop. There is likely more of this species on this cliff face and additional safety-conscience surveys are recommended to determine the size of this population. Other species of concern are also likely to inhabit this specialized habitat as well as the adjacent hemlock-dominated ravine. A good-quality population of a dwarfed form of serviceberry (*Amelanchier sp.)* has also been documented at this location. The serviceberries are notoriously difficult to distinguish one from another, and these specimens are still under review. The relatively uncommon evergreen shrub American yew (*Taxus canadensis*) was observed on the steep slopes shaded by overarching hemlocks. This species was recently removed from the plant species of concern list based on updated statewide population estimates. Yew has been in decline over much of its range in the state due to habitat loss and over-browsing by deer (Rhoads and Block 2000). Recent documentation of several excellent quality populations of yew in Bradford County may suggest this species is truly on the rebound.

Threats and Disturbances:

The top of the cliff has a scenic overlook parking lot to allow access to the tremendous view. Some people have abused the site with graffiti and litter, but the primary threat to this area is the aggressive spread of introduced species of plants. An area that has been cleared of trees to allow for better viewing has been colonized by the aggressive weed species tree-of-heaven (*Ailanthus altissima*), autumn olive (*Elaeagnus umbellata*) and spotted knapweed (*Centaurea maculosa*).

Conservation Recommendations:

The spread of invasive species of plants could severely degrade this unique natural area. Management plans should include provisions for the control and removal of invasive species of plants. Populations of invasive species removed as they first appear are far more easily and cost effectively eliminated that established populations. Additional surveys for species of concern are encouraged.

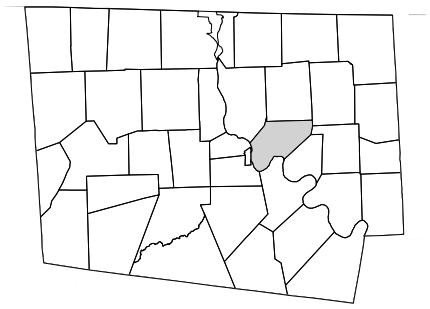
River Island Grassland Communities

The Susquehanna River is subject to frequent flooding and seasonal low water levels. Scouring of the banks and islands by flood events and ice have created distinctive natural tall grassland communities as the result of these natural disturbances.

WYSOX TOWNSHIP

Site Name	Special Species / Community Type	PNHP Ranks* Global	PNHP Ranks* State	State Status	Last Seen	Quality**
Susquehanna River (Middle Section)	Animal: Bald Eagle *(Haliaeetus leucocephalus)*	G4	S2B	PE	2004	E
	Animal species of concern:	G3G4	S3S4	N	2004	E
	Animal species of concern:	G4	S4	N	2004	E
	Animal species of concern:	G4	S3S4	N	2004	E
	Animal species of concern:	G3	S2	N	2004	E

* Please refer to Appendix IV for an explanation of PNHP Ranks and State Status.
**Please refer to Appendix V for an explanation of Quality Ranks.



Locally Significant: None

Managed Lands: None

Wysox Township is a mixture of agricultural fields and large unfragmented forests, and borders the Susquehanna River. Several of the forest blocks in the Township are over a square mile in area, many of which connect to form portions of natural wildlife corridors through the Township to the Susquehanna River. These large blocks of forest should be preserved intact by avoiding unnecessary fragmentation of the landscape with additional roads and building developments Where the Susquehanna River floodplain is wide and flat, the river typically has a narrow strip of trees between adjacent agricultural fields and the river edge. Conversely, they are deeply forested where extreme slopes have prevented agriculture. Maintaining an intact, forested floodplain along the river can preserve much of the Township's important biodiversity. Floodplains along the Susquehanna River should be excluded from future development. Forested buffers should be maintained, widened and created where absent along the length of the river with logging operations minimizing cutting within 100 meters of the river edge. Future biological surveys in the Township could focus on the Township's large forested blocks, especially in conjunction with streams and ravines. Oxbows, islands and steep slopes along the Susquehanna River and Wysox Creek floodplains are also high priorities for future biological surveys. Conservation efforts within the Township could focus on reforesting portions of the banks of Wysox Creek and the Susquehanna River that lack adequate forested buffers.

WYSOX TOWNSHIP MAP

SUSQUEHANNA RIVER (Middle Section) (Asylum, North Towanda, Standing Stone, Towanda, and Wysox Townships)

Nesting Bald Eagles and four aquatic animal species of concern have been documented along this section of the Susquehanna River. The Bald Eagles nest in large trees along the river and utilize the river as their main food foraging area, feeding on fish and waterfowl. Bald Eagles had been in steep decline throughout Pennsylvania due largely to the poisonous effects of organochlorine insecticides, but recently, habitat loss may have replaced pesticide poisoning as the major threat to eagles (Brauning 1992). Nesting occurrences of Bald Eagles in Pennsylvania have increased in the last two decades, particularly along the Susquehanna River and in northwestern PA. The four aquatic animal species of concern are under the jurisdiction of the PA Fish & Boat Commission, and their names cannot be released under a data sharing agreement. These animal species of concern are affected by non-point sources of pollution including sedimentation from cultivated and developed land along the river, runoff from roadways, pesticide runoff from agricultural fields, discharge of chemical pollutants and thermal pollution.

The Susquehanna River has cut deeply through Bradford County, creating soaring rock outcrops opposite low-lying floodplains. The river is subject to great fluctuations in its water level, from a near trickle during dry periods to severe flooding events. The action of the powerful ebb and flow of the river has created various microhabitats along its length. The steep cliff communities, scoured islands, oxbows and wide floodplains can all have unique assemblages of plants and animals.

Many of the ice and flood scoured islands have distinctive "Big bluestem (*Andropogon gerardii*)-Indian grass (*Sorghastrum nutans*) River Grasslands," which are natural tall grassland communities created as the result of these natural disturbances. The two plant species the community type is named for dominate these habitats and also include switch grass (*Panicum virgatum*) and Indian hemp (*Apocynum cannabinum*). The habitat tends to grade into a "water willow (*Justicia americana*) – smartweed riverbed community" on the lowest island elevations, and into a "Black willow Scrub/shrub Wetland", and "River birch – sycamore Floodplain Scrub" as the elevation increases and the habitat becomes drier. These natural communities are part of the "Riverbed – Bank – Floodplain Community Complex" (Fike 1999), a broadly defined mosaic of community types that typify the natural vegetation along the Susquehanna River in Bradford County.

Another important area for conservation in the Township are the forested slopes along the Susquehanna River. These steep ravines and slopes have likely remained forested because of their topography. The direction the slope is facing will have a significant impact on the species composition found there. Forestry practices on these steep slopes should be evaluated to minimize negative effects such as erosion. Additional surveys of forested slopes, ravines and streams in this township are encouraged.

<u>Threats and Disturbances:</u>

The main threat to these animal species of concern is the reduction of water quality. Activities of industries and landowners along the river can have significant impacts on water quality in the River down to the Chesapeake Bay. Erosion and chemical runoff into the water systems is a serious concern throughout the state. The banks, floodplains and islands of the river have large populations of several aggressive introduced plants including Japanese knotweed (*Polygonum cuspidatum*) and purple loosestrife (*Lythrum salicaria*). Control of established populations of these

species is very difficult. Eradication of pioneer populations is the best way to control the spread of these invasive species.

Conservation Recommendations:

Forested buffers should remain intact for the length of the river with logging operations minimizing cutting within 100 meters of the river bank. Floodplain forests help buffer the watershed from the effects of non-point sources of pollution including runoff from agricultural, residential and roadway settings. In addition, the river floodplain and corridor can be an area of significantly higher biodiversity than the adjoining uplands. Much of the area's important biodiversity can be preserved by maintaining an intact, forested floodplain along the river. The effectiveness of the river as a habitat corridor would be diminished by fragmentation of the forest continuity by the construction of buildings, houses and additional roadways along the river. Local planning should discourage new construction and roadways along the river, adjacent slopes and floodplain.

Glossary

Acid Mine Drainage (AMD) – drainage flowing from or caused by surface mining, deep mining, or coal refuse piles that are typically highly acidic with elevated levels of dissolved metals (DEP).

Acidophilic – a plant that requires or prefers acidic soil conditions.

Alluvium – material such as sand, silt, or clay that is deposited on land by streams.

Anthracite - dense, shiny coal that has a high carbon content and little volatile matter and burns with a clean flame. Also called *hard coal***.**

Anthropogenic – human caused.

ATV – all-terrain-vehicle.

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

Bt (*Bacillus thuringiensis*) – an insecticide, which is produced by the fermentation of a bacterium (Bt), used to control many caterpillar-type pests (e.g., gypsy moth).

Bog – a nutrient poor, acidic peatland that receives water primarily from direct rainfall with little or no input from groundwater or runoff; vegetation consists primarily of peat moss and ericaceous shrubs.

Calcareous - composed of, containing, or characteristic of calcium carbonate, calcium, or limestone; chalky.

Canopy – the layer formed by the tallest vegetation.

Circumneutral – pH between 5.5 and 7.

Co-dominant – where several species together comprise the dominant layer (see "dominant" below).

Community – an assemblage of plant or animal populations sharing a common environment and interacting with each other and the physical environment.

DBH – the diameter of a tree at breast height.

DCNR – Pennsylvania Department of Conservation and Natural Resources.

DEP – Pennsylvania Department of Environmental Protection.

Diabase – a dark gray igneous rock. The chemical composition of diabase may support unusual plant communities.

Dimilin – a commercially produced, restricted-use insecticide containing diflubenzuron as the active ingredient. Diflubenzuron, which has been used as a method to control gypsy moth, interferes with chitin production during the early stages of certain insects (DCNR, Division of Pest Management).

Dominant – the species (usually plant) exerting the greatest influence on a given community either by numerical dominance or influence on microclimate, soils and other species.

Ecosystem - an ecological community together with its environment, functioning as a unit.

Element – all-inclusive term for species of special concern and exemplary natural communities.

Ericaceous – members of the heath family including blueberries, huckleberries, rhododendrons, and azaleas; these plants are adapted to living in acidic soils.

Exceptional Value Waters (EV) – DEP designation for a stream or watershed which constitutes an outstanding national, state, regional or local resource, such as waters of national, state or county parks or forests; or waters which are used as a source of unfiltered potable water supply, or waters of wildlife refuges or State Game Lands, and other waters of substantial recreational or ecological significance. For more detailed information about EV stream designations, the reader is referred to the Special Protection Waters Implementation Handbook (Shertzer 1992).

Exotic – non-native; used to describe plant or animal species that were introduced by humans; examples include Japanese honeysuckle, purple loosestrife and grass carp; exotics present a problem because they may out-compete native species.

Extant – currently in existence.

Fen - open-canopy peatland that has developed under the influence of basic-rich waters

Floodplain – low-lying land generally along streams or rivers that receives periodic flooding.

Forb – non-grass herbaceous plant such as goldenrod.

Fragipan - a very dense soil layer that prevents water from draining quickly through the soil.

Graminoid – grass or grass-like plant such as a sedge or a rush.

Ground cover – low shrubs, herbs and mosses that are found at or close to the ground surface.

Hemic – an organic soil in which the plant remains show a good degree of decomposition (between 1/3 and 2/3 of the fibers are still visible after rubbing the material between the fingers).

Hibernacula – a location where animals hibernate.

Hibernation – the period of winter inactivity during which time normal physiological processes are reduced and a significant decrease in body temperature occurs. In Pennsylvania, true hibernation is shown by woodchucks, jumping mice, and bats.

High-Quality Coldwater Fisheries (HQ-CWF) – DEP designation (PA Code, Chapter 93) for a stream or watershed that has excellent quality waters and environmental or other features that require special water quality protection.

Hydrology – water system of an area including both surface water and ground water.

Igneous - formed by solidification from a molten state. Used of rocks.

Kame – a short ridge or mound of sand and gravel deposited during the melting of glacial ice.

Kettle – a depression left in a mass of glacial drift, apparently formed by the melting of an isolated block of glacial ice.

Lepidoptera – moths and butterflies.

Listed species – species that is monitored and considered to be of concern by PNHP.

Littoral – the area where water meets land, the shoreline.

Matrix – the form of land use or habitat that surrounds a focal patch of habitat.

Mesic – moist, not saturated.

Minerotrophic – groundwater fed; influenced by water that has been in contact with bedrock or soil, and is richer in mineral content than rainwater.

Native – describes species that occurred in Pennsylvania or in the area in which they are found prior to European settlement; not introduced by human activities.

Natural area – as used in this study, a site with either an exemplary natural community or species of special concern; not to be confused with the State Forest Natural Areas which are specific management units designated by DCNR Bureau of Forestry.

Neo-tropical - referring to the tropical locations in the new world; Mexico, Caribbean Islands, and Central and parts of Northern South America.

Non-point – refers to diffuse sources of pollution such as storm water runoff contaminated with oil or pesticides.

Obligate species - able to exist or survive only in a particular environment or by assuming a particular role

Oligotrophic – poor to extremely poor in nutrients; typically describes dilute waters with low base metal ion concentrations.

Palustrine - describes wetlands; areas intermediate between aquatic and terrestrial habitats, supporting predominately hydrophytic vegetation, where conditions are at least periodically wet enough during the growing season to produce anaerobic soil conditions and thereby influence plant growth.

Peat – partially decomposed remains of plant material in which at least some of the plant parts are still distinguishable.

POSCIP – Plant of Special Concern in Pennsylvania.

Potential Natural Area – used by The Nature Conservancy to denote an area that may have desirable environmental characteristics to support rare species or exemplary natural communities, but which needs a field survey to confirm; a preliminary category given to sites prior to field survey (see METHODS section).

Prescribed burning – burning under controlled conditions; needed to maintain communities such as limestone glades and pitch pine barrens.

Riparian – streamside.

Rookery - the breeding ground of certain birds or animals, such as herons, penguins and seals.

R-O-W – (Right-of-Way) strip of land occupied or intended to be occupied by a street, crosswalk, railroad, electric transmission line, oil or gas pipeline, water main, sanitary or storm sewer line, or other special use.

Sapric – organic soils (muck) in which most of the plant material is decomposed and the original constituents cannot be recognized.

Sedge - grasslike herbaceous plant of the family *Cyperaceae*, especially members of the genus *Carex*.

Seeps – where water flows from the ground in a diffuse pattern and saturates the soil; lush herbaceous vegetation often grows in these wet areas.

Shrub - a perennial, woody plant that differs from a tree in its short stature (less than five meters in height) and typically multi-growth form.

Soil association – a group of soils that are geographically associated in a characteristic repeating pattern and defined and delineated as a single unit.

Soil series – groups of soils that have vertical profiles that are almost the same, that is, with horizons (layers) that are similar in composition, thickness, and arrangement.

Subcanopy - in a forest community, the tops and branches of the small trees and tall shrubs that form a distinct layer beneath the high tree canopy and above the shrub layer (if present).

Swamp - a wooded wetland, intermittently or permanently flooded

Succession – natural process of vegetation change through time; over time, the plant species of a site will change in composition and structure as light and soil conditions change (e.g., a field that is left alone may, over time, be taken over by shrubs, then small trees and eventually a woodland).

Talus – slope formed of loose rock and gravel that accumulates at the base of mountains or cliffs.

TNC – The Nature Conservancy

Understory – layer of shrubs and small trees between the herbaceous layer and the canopy.

Upland - sites with well-drained dry to mesic soils.

Wetlands - areas intermediate between aquatic and terrestrial habitats; characterized by a predominance of hydrophytes, where conditions are at least periodically wet enough, during the growing season, to produce anaerobic soil conditions and thereby influence plant growth.

Vernal – occurring in the spring.

Xeric – extremely dry or droughty.

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APPENDIX I: NATURAL AREA SURVEY FORM

Surveyor: Address & Phone:

Date of Observation_____Site Name:

Quadrangle Name_____ Exact Location of
Site (please be specific & include a map or sketch)

Owner:
Owners Attitude Toward Conservation:

Site Elevation:_____ Size of Site (acres):

Source of Lead:

Current Land Use:

Type of Area: _Old Growth Forest; __Marsh; __Shrub Swamp;
_Forested Swamp; __Bog; __Natural Pond.

Written Description: Try to convey a mental image of the site features (including vegetation, significant animals & plants, aquatic features, land forms, geologic substrata, scenic qualities, etc.):

Evidence of Disturbance:

Site Condition Compared to Your Last Visit:

Please attach any additional information, species list, etc.
Please send completed report forms to Pennsylvania Science Office
of The Nature Conservancy, 208 Airport Drive, Middletown, PA 17057
(717) 948-3962. Additional forms may be obtained from this
office. Thank you for your contribution.

APPENDIX II: COMMUNITY CLASSIFICATION

CLASSIFICATION OF NATURAL COMMUNITIES IN PENNSYLVANIA (Fike 1999)

Community Name	State Rank
Terrestrial Forests	
CONIFEROUS TERRESTRIAL FORESTS:	
Hemlock (white pine) forest	S4
CONIFER – BROADLEAF TERRESTRIAL FORESTS	
Serpentine pitch pine - oak forest	S1
Serpentine Virginia pine - oak forest	S1
Pitch pine - mixed oak forest	S4
Virginia pine - mixed hardwood forest	S5
Dry white pine (hemlock) - oak forest	S4
Hemlock (white pine) - northern hardwood forest	S5
Hemlock (white pine) - red oak - mixed hardwood forest	S4
Hemlock - tuliptree - birch forest	S4
Rich hemlock - mesic hardwood forest	S2S3
BROADLEAF TERRESTRIAL FORESTS	
Dry oak - heath forest	S4S5
Dry oak - mixed hardwood forest	S3
Red oak - mixed hardwood forest	S5
Northern hardwood forest	S4
Black cherry - northern hardwood forest	S4
Tuliptree - beech -maple forest	S4
Sugar maple - basswood	S4
Mixed mesophytic forest	S1S2
Sweet gum - oak coastal plain forest	S1
Red maple (terrestrial) forest	S5
Black-gum Ridgetop forest	S3
Aspen/gray (paper) birch forest	S3 NOT TRACKED
Palustrine Forests	
CONIFEROUS PALUSTRINE FORESTS	
Black spruce - tamarack peatland forest	S3
Red spruce palustrine forest	S3
Hemlock palustrine forest	S3
CONIFER – BROADLEAF PALUSTRINE FORESTS	
Hemlock - mixed hardwood palustrine forest	S3S4
Red spruce - mixed hardwood palustrine forest	S3
BROADLEAF PALUSTRINE FORESTS	
Bottomland oak - hardwood palustrine forest	S2
Red maple - black-gum palustrine forest	S3S4
Red maple - black ash palustrine forest	S2S3
Red maple - magnolia Coastal Plain palustrine forest	S1
Great Lakes Region lakeplain palustrine forest	S1
Sycamore - (river birch) - box-elder floodplain forest	S3
Silver maple floodplain forest	S3
Red maple - elm - willow floodplain swamp	S2

Terrestrial Woodlands

CONIFEROUS WOODLANDS	
Pitch pine - heath woodland	S2
Pitch pine - scrub oak woodland	S2S3
Red spruce rocky summit	S1
Pitch pine - rhodora - scrub oak woodland	S1
CONIFER – BROADLEAF TERRESTRIAL WOODLANDS	
Pitch pine - mixed hardwood woodland	S2S3
Virginia pine - mixed hardwood shale woodland	S2
Red-cedar - mixed hardwood rich shale woodland	S1S2
BROADLEAF – TERRESTRIAL WOODLANDS	
Dry oak - heath woodland	S3
Birch (black-gum) rocky slope woodland	S2
Yellow oak - redbud woodland	S2
Great Lakes Region scarp woodland	S1S2
Great Lakes Region bayberry - cottonwood community	S1

Palustrine Woodlands

CONIFEROUS PALUSTRINE WOODLANDS	
Pitch pine - leatherleaf palustrine woodland	S1
Black spruce - tamarack palustrine woodland	S2
Red spruce palustrine woodland	S2S3
BROADLEAF PALUSTRINE WOODLANDS	
Red maple - highbush blueberry palustrine woodland	S4
Red maple - sedge palustrine woodland	S4
Red maple - mixed shrub palustrine woodland	S4

Terrestrial Shrublands

CONIFEROUS TERRESTRIAL SHRUBLANDS	
Red-cedar - prickly pear shale shrubland	S2
Red-cedar - pine serpentine shrubland	S1
CONIFER – BROADLEAF TERRESTRIAL SHRUBLANDS	
Red-cedar - redbud shrubland	S2
BROADLEAF TERRESTRIAL SHRUBLANDS	
Low heath shrubland	S1
Low heath - mountain ash shrubland	S2
Scrub oak shrubland	S3
Rhodora - mixed heath - scrub oak shrubland	S1

Palustrine Shrublands

BROADLEAF PALUSTRINE SHRUBLANDS	
Buttonbush wetland	S4
Alder - ninebark wetland	S3
Alder - sphagnum wetland	S4
Highbush blueberry - meadow-sweet wetland	S5
Highbush blueberry - sphagnum wetland	S5
Leatherleaf - sedge wetland	S3
Leatherleaf - bog rosemary peatland	S2
Leatherleaf - cranberry peatland	S2S3
Water-willow (Decodon verticillatus) shrub wetland	S3
River birch - sycamore floodplain scrub	S4
Black willow scrub/shrub wetland	S4
Poison sumac - red-cedar - bayberry fen	S1

Buckthorn - sedge (Carex interior) - golden ragwort fen	S1
Great Lakes Region scarp seep	S1
Great Lakes Region bayberry - mixed shrub palustrine shrubland	S1
Terrestrial Herbaceous Openings	
Little bluestem - Pennsylvania sedge opening	S2
Side-oats gramma calcareous grassland	S1
Calcareous opening/cliff	S2
Serpentine grassland	S1
Serpentine gravel forb community	S1
Great Lakes Region dry sandplain	S1
Great Lakes Region sparsely vegetated beach	S1
Herbaceous Wetlands	
PERSISTENT EMERGENT WETLANDS	
Bluejoint - reed canary grass marsh	S5
Cattail marsh	S5
Tussock sedge marsh	S3
Mixed forb marsh	S3
Herbaceous vernal pond	S3S4
Wet meadow	S5 NOT TRACKED
Bulrush marsh	S3
Great Lakes Region palustrine sandplain	S1
Prairie sedge - spotted joe-pye-weed marsh	S1S2
Open sedge (Carex stricta, C. prairea, C. lacustris) fen	S1
Golden saxifrage - sedge rich seep	S2
Skunk cabbage - golden saxifrage forest seep	S4S5
Serpentine seepage wetland	S1
Golden saxifrage - Pennsylvania bitter-cress spring run	S3S4
Sphagnum - beaked rush peatland	S3
Many fruited sedge - bladderwort peatland	S2
Water-willow (Justicia americana) - smartweed riverbed community	S4
Riverside ice scour community	S1S2
Big bluestem - Indian grass river grassland	S3
NON-PERSISTENT EMERGENT WETLANDS	
Pickerel-weed - arrow-arum - arrowhead wetland	S4
Spatterdock - water lily wetland	S4
Community Complexes	
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	

* Not all natural communities have been assigned a global or state rank; disturbed or artificial communities are not assigned ranks.

APPENDIX III: FIELD SURVEY FORM

PENNSYLVANIA NATURAL DIVERSITY INVENTORY EAST:
SPECIES OF SPECIAL CONCERN FIELD REPORT

SNAME: **EOCODE:**

SURVEYDATE:

SITENAME:

SOURCECODE

SURVEYSITE: **SURVEYOR:**

SPECIMEN REPOSITORY:

Locational Information QUADCODE DOTNUM
TEN,TEN COUNTYCODE TOWNSHIP

LAT:

LONG:

DIRECTIONS:

Global **PA EORANK:**
EORANK
COMMENTS:

DATA:

HABITAT
DESCRIPTION:

MISCELLANEOUS:

DATA SENSITIVITY: **OWNERCODE**

REASON FOR DATA **OWNER**
SENSITIVITY:

HABITAT SKETCH:

APPENDIX IV: PNHP Ranks, Federal and State Status

FEDERAL AND STATE STATUS AND THE PENNSYLVANIA NATURAL HERITAGE PROGRAM RANKS

FEDERAL STATUS

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

The following definitions are extracted from the September 27, 1985 U.S. Fish and Wildlife Service notice in the Federal Register:

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

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

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

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

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

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

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

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

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

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

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

STATE STATUS - NATIVE PLANT SPECIES

Legislative Authority: Title 25, Chapter 82, Conservation of Native Wild Plants, amended June 18, 1993, Pennsylvania Department of Environmental Resources.

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

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

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

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

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

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

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

STATE STATUS - ANIMALS

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

PE - Pennsylvania Endangered

Game Commission - Species in imminent danger of extinction or extirpation throughout their range in Pennsylvania if the deleterious factors affecting them continue to operate. These are:

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

Fish and Boat Commission - Endangered Species are all species and subspecies:

1) declared by the Secretary of the United States Department of the Interior to be threatened with extinction and appear on the Endangered Species List or the Native Endangered Species list published in the Federal Register; or,
2) declared by the Executive Director (PaFC) to be threatened with extinction and appear on the Pennsylvania Endangered Species List published in the Pennsylvania Bulletin.

PT - Pennsylvania Threatened

Game Commission - Species that may become endangered within the foreseeable future throughout their range in Pennsylvania unless the causal factors affecting the organism are abated. These are:

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

Fish and Boat Commission - Threatened Species are all species and subspecies:

1) declared by the Secretary of the United States Department of the Interior to be in such small numbers throughout their range that they may become endangered if their environment worsens and appear on a Threatened Species List published in the Federal Register; or,
2) have been declared by the Executive Director (PaFC) to be in such small numbers throughout their range that they may become endangered if their environment worsens and appear on the Pennsylvania Threatened Species List published in the Pennsylvania Bulletin.

APPENDIX IV (continued)

PNHP GLOBAL ELEMENT RANKS

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

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

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

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

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

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

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

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

PNHP STATE ELEMENT RANKS

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

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

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

S4 = Apparently secure in state, with many occurrences.

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

SA = Accidental in state, including species which only sporadically breed in the state.

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

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

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

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

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

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

SX = Apparently extirpated from the state.

Note: A "T" appearing in either the G Rank or S Rank indicates that the intraspecific taxa is being ranked differently than the species. A "Q" in the rank indicates that there is taxonomic uncertainty about a taxa being ranked (i.e., taxa is being accepted as a full species or natural community in this list but may be treated as a variety or form by others). A "?" after a "G" or "S" indicates that the rank is uncertain at this time.

APPENDIX V: PENNSYLVANIA ELEMENT OCCURRENCE QUALITY RANKS

Quality Rank*	Explanation
A	Excellent occurrence: all A-rank occurrences of an element merit quick, strong protection. An A-rank community is nearly undisturbed by humans or has nearly recovered from early human disturbance; further distinguished by being an extensive, well-buffered occurrence. An A-rank population of a sensitive species is large in area and number of individuals, stable, if not growing, shows good reproduction, and exists in natural habitat.
B	Good occurrence: protection of the occurrence is important to the survival of the element in Pennsylvania, especially if very few or no A-rank occurrences exist. A B-rank community is still recovering from early disturbance or recent light disturbance, or is nearly undisturbed but is less than A-rank because of significantly smaller size, poorer buffer, etc. A B-rank population of a sensitive species is at least stable, in a minimally disturbed habitat, and of moderate size and number.
C	Fair occurrence: protection of the occurrence helps conserve the diversity of a region's or county's biota and is important to statewide conservation if no higher-ranked occurrences exist. A C-rank community is in an early stage of recovery from disturbance, or its structure and composition have been altered such that the original vegetation of the site will never rejuvenate, yet with management and time partial restoration of the community is possible. A C-rank population of a sensitive species is in a clearly disturbed habitat, small in size and/or number, and possibly declining.
D	small occurrence: protection of the occurrence may be worthwhile for historical reasons or only if no higher ranked occurrences exist. A D-rank community is severely disturbed, its structure and composition been greatly altered, and recovery to original conditions, despite management and time, essentially will not take place. A D-rank population of a sensitive species is very small with a high likelihood of dying out or being destroyed, and exists in a highly disturbed and vulnerable habitat.
E	Verified as extant, but has not been given a rank; additional information needed to evaluate quality.

*Intermediate ranks may also be assigned.

APPENDIX VI: PLANTS AND ANIMALS OF SPECIAL CONCERN IN BRADFORD COUNTY

Bradford County Animals of Special Concern

Scientific Name	Common Name
Aeshna clepsydra	Mottled Darner (dragonfly)
Alasmidonta marginata	Elktoe (freshwater mussel)
Alasmidonta undulata	Triangle Floater (freshwater mussel)
Ardea herodias	Great Blue Heron Rookery (bird)
Arigomphus furcifer	Lilypad Clubtail (dragonfly)
Circus cyaneus	Northern Harrier (bird)
Crotalus horridus	Timber Rattlesnake (reptile)
Dorocordulia lepida	Petite Skimmer (dragonfly)
Enallagma aspersum	Azure Bluet (damselfly)
Euphyes dion	Sedge Skipper (butterfly)
Haliaeetus leucocephalus	Bald Eagle (bird)
Lampsilis cariosa	Yellow Lampmussel (freshwater mussel)
Lasmigona subviridis	Green Floater (freshwater mussel)
Leucorrhinia glacialis	Crimson-ringed Whiteface (dragonfly)
Leucorrhinia proxima	Red-waisted Whiteface (dragonfly)
Libellula incesta	Slaty Skimmer (dragonfly)
Lycaena epixanthe	Bog Copper (butterfly)
Porzana carolina	Sora (bird)
Rallus limicola	Virginia Rail (bird)
Somatochlora elongata	Ski-tailed Emerald (dragonfly)
Somatochlora forcipata	Forcipate Emerald (dragonfly)
Somatochlora incurvata	Incurvate emerald (dragonfly)
Sorex palustris albibarbis	Northern water shrew (mammal)

Bradford County Plants of Special Concern

Scientific Name	State Common Name
Andromeda polifolia	bog rosemary
Carex diandra	lesser panicled sedge
Carex disperma	soft-leaved sedge
Carex eburnea	ebony sedge
Carex lasiocarpa	slender sedge
Carex retrorsa	backward sedge
Erythronium albidum	white trout-lily
Gaultheria hispidula	creeping snowberry
Lathyrus ochroleucus	wild pea
Lupinus perennis	wild blue lupine
Poa languida	drooping bluegrass
Potamogeton illinoensis	Illinois pondweed
Prunus pumila var. susquehanae	Appalachian sand cherry
Viola selkirkii	great-spurred violet

Bradford County Natural Communities of Special Concern

Natural Community Name
Hemlock Palustrine Forest
Leatherleaf-bog rosemary Peatland
Leatherleaf-sedge Wetland
Water-willow (*Decodon veticillatus*) Shrubland

Fact Sheets
on selected species
of Bradford County

Bald Eagle
(Haliaeetus leucocephalus)

Pennsylvania Endangered Animal species of concern

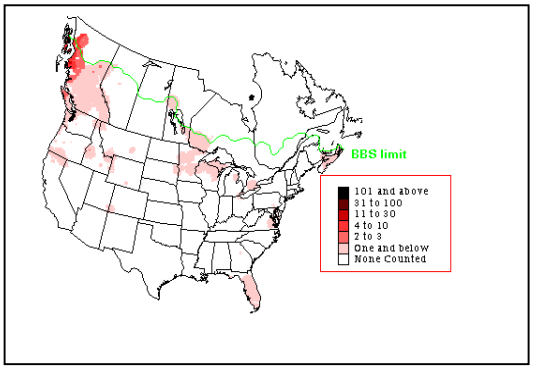
State Rank: S2B Global Rank: G4

Identification

Bald Eagles are large raptors with a 32-inch body length and 80-inch wingspan. The male and the female are similar in plumage, but the juvenile is dark overall. The adult is identified as having a white head and upper neck, white tail, dark brown body, and a heavy yellow bill. The juvenile is identified as having a dark bill and dark cere, dark brown body plumage, including head and tail, variable amounts of white on the undertail coverts, and belly, and back. The white head and tail, and dark underwings, are generally acquired in four years.

Range

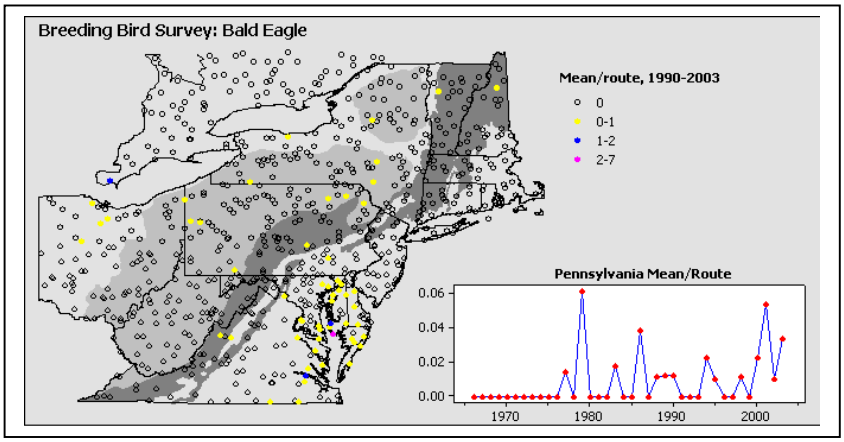
Bald Eagles have extensive breeding populations in Alaska, with major populations in the coastal regions. This species breeds throughout most of Canada, especially along coastal areas. In the continental United States, Bald Eagles breed extensively along the Atlantic Coast from Florida to the Maritime Provinces of Canada. Also, this species breeds extensively in the Great Lake States in Minnesota, Michigan and Wisconsin, and in the Pacific Northwest (California, Oregon, and Washington). Breeding populations also occur along Gulf Coast in Louisiana and Texas. In addition, this species is increasing in the Rocky Mountains, especially the greater Yellowstone region. Every state except Vermont and Rhode Island have reported Bald Eagle nesting areas, and also a limited number of pairs occur along the Baja Coast in Mexico.



Habitat

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

Conservation/Status



This species is currently listed as an endangered species in Pennsylvania. However, it has been proposed to drop the status of Bald Eagles from Endangered status to Threatened status. The main reason for the potential downgrade in status is the remarkable recovery that has taken place in breeding Bald Eagle areas across the state of Pennsylvania. In the 1970's, Bald Eagle nesting pairs were at a all-time low of two due to the effect of the insecticide DDT, and pollution of major waterways. Since the 1970's, this species has made a comeback, and recently, over 100 nests have been recorded across the state. In addition, neighboring states have also reported increases in the population of Bald Eagles. Continued success of the breeding areas will depend on protection from human persecution and environmental contaminants. Also, other threats include water quality degradation, human disturbances of nesting areas, and disease. If ecological conditions for Pennsylvania continue to improve, there is no reason why this species will not increase nesting populations to add assurance that Bald Eagles will be around for generations to come.

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PNHP
Pennsylvania Natural Heritage Program
The Nature Conservancy
SAVING THE LAST GREAT PLACES ON EARTH

Bog Copper
(Lycaena epixanthe)

Pennsylvania Species of Concern
State Rank: S2 Global Rank: G4G5

Identification:
The Bog Copper has a wingspan of 7/8 to 1 inch. On males, the upper surface of the wing is brownish with a purple iridescence, a white margin, black dots and a reddish zig-zag line on the lower portion of the hind wing. The upper surface of wings of females are a dull gray-brown with black spots and a white margin. The wing underside of both sexes is white or pale tan with dark spots and a reddish zig-zag line on the lower portion of the hind wing.

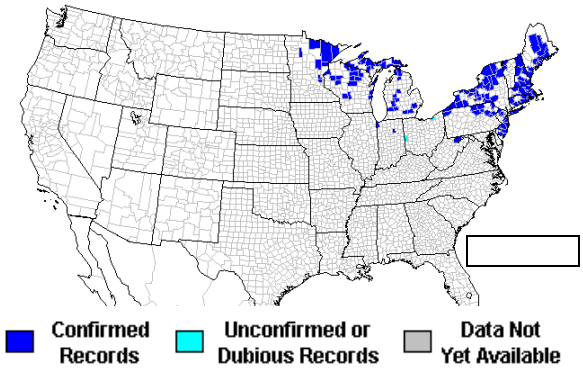

David M. Wright

Habitat:
This species is restricted to acid bogs or other wetland habitats containing cranberries. Habitats are mainly open, but may have some trees. Some habitats at least from southern Maine to New Jersey are very wet acid sedge meadows with cranberry between the sedges rather than true bogs. Soils or Sphagnum must be saturated or nearly so most or all of the year. Bog Coppers are usually excluded from commercial cranberry bogs by insecticides.


Erik Nielsen

Life History:
Caterpillars feed on shoots and leaves of cranberry plants. Adults feed on nectar from cranberry flowers and water from raindrops. Males perch on low plants to watch for females. Eggs are laid singly at the base of host plant. First-stage caterpillars overwinter in their eggs, often underwater.

Status:
Bog Coppers are habitat dependent and can be locally abundant when suitable habitat is present. Habitat is sensitive and subject to draining, flooding, or conversion to commercial use. The wetland habitat of this species should be protected from conversion, pollution and insecticides.



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http://www.npwrc.usgs.gov/resource/distr/lepid/bflyusa/usa/269.htm (Accessed: March 1, 2005)

Dion Skipper
(Euphyes dion)

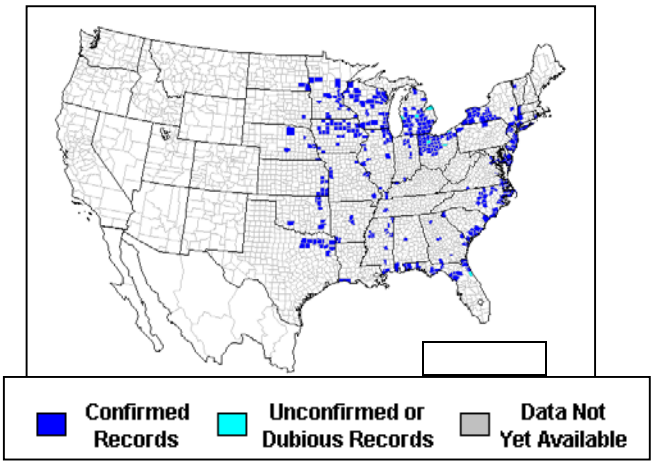
State Rank: S1 Global Rank: G4

Identification: Upperside of male forewing is dark brown with a central orange area with a black stigma: female forewing is dark brown with light orange spots. Hindwing is dark brown with a wide orange streak. Underside of hindwing is red-brown or orange brown with 2 yellow-orange streaks running from the base to the margins (Struttman 2005).

Habitat/Behavior: Generally open to shrubby sedge wetlands and occasionally in openings in red maple swamps. Subspecies *dion* northward generally on calcareous soils associated with large sedges like *Carex lacustris*. Coastal plain and southeastern populations (mostly subspecies *alabamae*) in a great variety of sedge situations from swales in wet pine barrens (especially in southern New Jersey), to bogs, roadside ditches and a very good colonizer (NatureServe 2005).

Life history: Caterpillar hosts include various sedges including woolgrass (*Scirpus cyperinus*), hairy sedge (*Carex lacustris*), and shoreline sedge (*Carex hyalinolepis*). Third stage caterpillars hibernate, emerge in the spring to complete feeding and pupate in nests made of leaves and silk. Males have a quick flight, are territorial, and perch in marshes in the afternoons to await females. Adults feed on nectar from flowers of pickerelweed, sneezeweed, buttonbush, Alsike clover and others (Struttmann 2005).

Status: Scattered populations occur along the Atlantic coast from western Massachusetts and southeastern New York south to northeastern Florida, west to northeast Texas, and north to southeastern North Dakota, northern Wisconsin, southern Ontario, and southern Quebec (Struttmann 2005). Recent records of documented occurrences of this species in Pennsylvania include only Tioga and Bradford county locations. Additional surveys for this species are recommended.



Conservation Recommendations: Preserve the wetland habitat and avoid pesticide applications in or near wetlands containing this species.

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Green Floater
(Lasmigona subviridis)

Freshwater Mussel Species of Concern
State Rank: S2 Global Rank: G3

Identification

The green floater (*Lasmigona subviridis*) is a small mussel, usually less that 55 mm in length. The shell is thin and the mussel has a subovate or trapezoidal shape. The color varies from a dull yellow to green with many dark green rays visible, especially in young individuals. This species may be confused with the creek heelsplitter (*Lasmigona compressa*). The creek heelsplitter is larger, thicker shelled and less ovate. Also, the creek heelsplitter has only been found in the Ohio River Drainage while the green floater is also present in the Susquehanna and Delaware River Drainages.


Photo: PA Science Office

Habitat

The green floater is often found in small creeks and large rivers and sometimes canals. This species is intolerant of strong currents and is often found in pools and other calm water areas. Preferred substrate is gravel and sand in water depths of one to four feet. This species is more likely to be found in hydrologically stable streams, not those prone to flooding and drying. Good water quality is also important to this mussel species of concern.

Status

Lasmigona subviridis ranges from New York to Georgia and West to Tennessee. This species is not very common in Pennsylvania, but has been found in the Susquehanna, Delaware and Ohio River Drainages. Little is known about the status of freshwater mussels in Pennsylvania and North America. The state status of the green floater is condition undetermined (CU) due to a lack of information for this species. The small size of this species may also make it more difficult to locate during surveys. More extensive surveys are necessary to determine the current status of this species in Pennsylvania and the United States.

Freshwater mussels have the highest current and future rate of extinction of any animal group in North America. In Pennsylvania, 75% of the mussel fauna is of conservation concern. One of the biggest threats to freshwater mussel populations throughout North America is a reduction in water quality. The protection Pennsylvania's aquatic habitat is critical to the survival of this species and the many other aquatic and terrestrial species that depend on these systems.

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Dragonflies
Emeralds: Family Corduliidae

Ski-tailed Emerald (*Somatochlora elongata*) G5 S2
Forcipate Emerald (*Somatochlora forcipata*) G5 S2
Incurvate Emerald (*Somatochlora incurvata*) G4 S1
Petite Emerald (*Dorocordulia lepida*) G5 S2

Invertebrate Species' of Concern

Identification

Dragonflies in the family Corduliidae, the Emeralds, are so-called because many of them have emerald green jewel-like eyes as adults and some have a metallic iridescence on the body. Many of these species look similar and identification can be difficult. The Ski-tailed Emerald is a relatively large Emerald, with bright yellow lateral thoracic markings. The Forcipate Emerald is a medium-sized Emerald with a slender abdomen and two pale yellow, oval-shaped lateral spots on the thorax. The Incurvate Emerald is almost identical to the Forcipate Emerald but this species is larger and longer. The Petite Emerald is one of the smallest Emeralds. It is slender, with a metallic green and brown thorax lacking significant markings.

Habitat/Behavior

The Emeralds are active/persistant flyers and even eat their prey while in flight. When they do rest, they tend to perch either vertically or obliquely from vegetation. The Ski-tailed Emerald can be found in slow, shaded small streams and outlets of beaver ponds. The Forcipate Emerald inhabits small, forest streams, seeps, bogs and swamps. The Incurvate Emerald is limited to sphagnum bog habitats. The Petite Emerald occupies mostly acidic wetlands including marshes, bogs, swamps, bog lakes and ponds.

Status

Emeralds are often difficult to find and generally aren't a very common family of dragonflies. Many of the species inhabit somewhat uncommon wetland habitats. The adults are fairly short-lived and fly for a short period of time, making them difficult to observe. Dragonflies are not considered for conservation status in PA, such as endangered, threatened or rare. These four species of concern are listed as globally secure (G5) or apparently secure (G4) and statewide imperiled (S2) or critically imperiled (S1). The most critical factors to protect these dragonfly species of concern are habitat preservation and water quality protection. Further studies of the dragonflies of Pennsylvania will help biologists to better understand the current status of these species of concern and the most important habitats for protection in the state.

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SAVING THE LAST GREAT PLACES ON EARTH

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Grassland-Dependent Bird Species

*Upland Sandpiper (Bartramia longicauda)
*Dickcissel (Spiza americana)
Henslow's Sparrow (Ammodramus henslowii)
Grasshopper Sparrow (*Ammodramus savannarum)*
Savannah Sparrow (Passerculus sandwichensis)
Vesper Sparrow (Pooecetes gramineus)
Eastern Meadowlark (*Sturnella magna)*
Bobolink (Dolichonyx oryzivorus)
**Short-eared Owl (Asio flammeus)*

Pennsylvania Animal fact sheets
***Denotes species of concern in Pennsylvania**

Introduction

Many bird species depend on early-successional habitats such as hayfields, open grasslands and prairies, abandoned strip-mines, and air fields. These species are habitat specialists, and the specificity of their habitat choices has deemed them a species group of management concern. Many of these species cannot tolerate land use changes from open grassland/pasture to row crop agriculture such as cornfields and soybean fields. In Pennsylvania, many of these species are quite unpredictable in their range and site fidelity. Species, such as Dickcissel, for example, occur unpredictably on the fringe of their range. Other species, such as Henslow's Sparrow, may have increased in Pennsylvania due to the reclaiming of abandoned strip mines into grassland habitats. The historic extent of the distribution of grassland-bird dependent species in Pennsylvania is relatively unknown, but indications are that prior to European settlement, grassland bird species were fairly rare in Pennsylvania. However, as forests were cleared in the 1800's, and by 1840, almost half of Pennsylvania was farmland. This cleared the way for grassland bird species to increase in numbers, and become somewhat common up until the mid 1900's. However, by 1980, only 26 percent of the land remained in agricultural production. Many grassland bird species are now decreasing in Pennsylvania and throughout their range. There is hope in programs such as CREP (Conservation Reserve Enhancement Programs), and reclaiming of strip mines into grassland, which have assisted in restoring habitat for these grassland-dependent species.

Henslow's Sparrow (*Ammodramus henslowii*)

Grasshopper Sparrow
(*Ammodramus savannarum*)

Species specific habitat requirements

**Upland Sandpiper*-areas with low to moderate forb cover, low woody cover, moderate grass cover, moderate to high litter cover, and little bare ground (fence posts and display perches may be important components of suitable habitat)- they use native and tame grasslands, wet meadows, hayland, pastures, planted cover, highway and railroad rights-of-way, and grassy areas of airports. The Upland Sandpiper is a Partners in Flight (PIF) priority species in the regional conservation plans for physiographic region Allegheny Plateau.

Henslow's Sparrow- fallow weedy fields, often with broomsedge (*Andropogan spp.*) grasses, reclaimed strip mines, use grasslands that have well-developed litter, relatively high


Bobolink
(Dolichonyx oryzivorus)

cover of standing dead residual vegetation, tall dense vegetation, and generally low woody stem densities. They may use idle hayfields, CREP lands, or wet meadows. The Henslow's Sparrow is listed on the Partners in Flight (PIF) watch list as a highest concern species and is a priority target species in the regional conservation plans for physiographic region Allegheny Plateau.

**Dickcissel*- prefers habitat with dense, moderate to tall vegetation and moderately deep litter. Suitable habitats are found in oldfields, hayfields (especially alfalfa), fencerows, hedgerows, road rights-of-way, planted cover, CREP fields and dense nesting cover, and moderately grazed and idle prairie. The Dickcissel is listed on the Partners in Flight (PIF) watch list as threatened and declining. This species occurrence is unpredictable, and could occur here due to deteriorating habitat conditions in the Midwest.

Grasshopper Sparrow- generally prefers moderately open grasslands and prairies with patchy bare ground, selects different components of vegetation, depending on grassland ecosystem. This species generally avoids grasslands with extensive shrub cover but regularly occurs in hayfields, dry pastures, and reclaimed strip mines.

photo by Ron Austing

Savannah Sparrow- occupies similar habitats to Grasshopper Sparrow such as hayfields and pastur[illegible] meadows. In Pennsylvania, the species occurs in meadows, cultivated fields, grasslands, hayfields, and reclaimed strip mines.

Vesper Sparrow- prefer extensive meadowlands or even croplands, cornfields, alfalfa fields, hayfields, reclaimed strip mines. They require elevated perches from which to sing from such as isolated trees, power lines, or tall grass.

Eastern Meadowlark- grazed and ungrazed pastures, hayfields, winter wheatfields, idle or fallow areas, reclaimed strip mines. Males prefer areas with an elevated perch, such as a tree or utility perch.

Bobolink- prefers open fields, moist meadows with heavy stands of hay, clover, alfalfa, or weeds, and reclaimed strip mines. The Bobolink is a Partners in Flight (PIF) priority species in the regional conservation plans for physiographic region. The grassy agricultural areas of northcentral and northeastern part of Pennsylvania remains an important area for Bobolinks, due to later hay-cutting dates due to high elevation and less frost-free days.

**Short-eared Owl*- reclaimed strip mines, field stubble and grasslands, and originally, and possibly still, open marshlands. Within such areas, these owls require cover, dense thickets, grassy tussocks, clumps of rushes or reeds, and even dense evergreen, and an abundance of mammalian prey. The Short-eared Owl is listed on the Partners in Flight (PIF) watch list as threatened and declining.

Conservation/Management Recommendations


photo by Ron Austing
Upland Sandpiper (*Bartramia longicauda*)

Many of the above species depend heavily on some type of agricultural practice for maintenance of their preferred breeding habitats. The loss of pasture and hayfields to suburban development and succession of abandoned pasture and hayfields to old-field and woodland habitat are two of the biggest threats to these species in Pennsylvania. Many of the above species nest in active hayfields and pasture, and early mowing and harvesting of these fields in the summer will destroy many nests. It is recommended, if possible and feasible, that farmers delay mowing and harvesting hayfields until late July to give these species juveniles time to fledge. Selling of farms to developers is a process that is occurring most frequently in southern Pennsylvania, where development pressure is high. Reclaimed strip mines may be a harbor for some of these grassland species, especially ones that have been applied proper management. However, there are far too few of these reclaimed strip mines to support healthy populations of these species. Conservation Reserve Enhancement Programs (CREP) have also been proving beneficial to restoring some breeding areas for many of these species, and one of the goals of this program is to provide financial and technical assistance for Pennsylvania farmers to voluntarily restore wetlands, riparian areas and grasslands by enrolling up to 200,000 acres of farmland in CREP. For more information on how to enroll in CREP, visit http://www.fsa.usda.gov/pas/publications/facts/html/creppa03.htm. This program will hopefully give farmers incentives to plant native grasses and help the populations of grassland birds reach a healthy level.

Partners in Flight Goals

Partners in Flight identified the Allegheny Plateau physiographic province as high priorities for conserving grassland bird species. In the High Allegheny Plateau, Bobolinks, Henslow's Sparrow, and Upland Sandpipers are high priority species for conservation in this region. Objectives for this region include the identification of 30,000 hectares of grassland habitat that would be required by all species habitat requirements. Of the 30,000 hectares of grassland habitat, 1,200 hectares could be suitable for 2,500 pairs of Henslow's Sparrow, and 3,300 hectares for Upland Sandpiper habitat.

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Marsh Bird Species

* Sora (Porzana carolina)
* Virginia Rail (Rallus limicola)
* King Rail (Rallus elegans)
* Common Moorhen (Gallinula choronata)
* American Coot (*Fulica americana)*
* American Bittern *(Botaurus lentiginosus)*
* Least Bittern *(Ixobrychus exilis)*
* Marsh Wren *(Cistothorus palustris)*
* Sedge Wren *(Cistothorus platensis)*

Pennsylvania Animal Fact Sheets

***Denotes species of concern in Pennsylvania**

Introduction

Many bird species depend on herbaceous-dominated marsh wetlands such as cattail-dominated wetlands, sedge-dominated wetlands, and open herbaceous marshes and ponds. These species are habitat specialists, and the specificity of their habitat choices has deemed them a species group of management concern. Marshes are a type of wetland, generally being less acidic than sphagnum moss dominated swamps, and support a variety of plant life, most notably Cat-tail (Typha spp.) and Sedges (Carex spp.).

Marsh-dependent birds are uncommon to very rare in Pennsylvania. In general, they are also very secretive birds that require abundant time and effort in surveying for them. Many rail species do not fly when flushed from their habitat, as their narrow bodies are supremely adapted to stalking through vegetation when disturbed. Many of these species are area sensitive as well, and will not breed in very small marshes/wetlands. In Pennsylvania, all marsh-related birds are birds of special concern and are either candidates for state listing or are already state-listed.

Sora (*Porzana carolina*)-photo by Ron Austing

Marshes provide critical habitat for all species named above and for a variety of other wildlife and plant life. Many marshes/emergent wetlands have been lost to development. From 1956 to 1979, Pennsylvania lost six percent of its vegetated wetlands, a loss of 1,200 acres a year (Goodrich et al., 2003). Wetland loss continues throughout the state, and despite regulations, some estimates have suggested that about half of Pennsylvania's wetlands are now gone. The conversion of marshes/wetlands to lakes ponds and reservoirs, conversion to farmland, urban development, and channelization drainage projects are the largest threats to all wetland habitat.

Species specific habitat requirements:

Sora (*Porzana carolina*)- This species nests in a variety of freshwater marshes, bogs, and wet meadows, but prefer cattails and sedges with mud and standing water. It eats primarily seeds, but also some insects as well. According to the first breeding bird atlas, Sora numbers have decreased sharply in PA in the last 25 years, but Sora remains the most common breeding rail in Pennsylvania.

Virginia Rail (*Rallus limicola*)- This species inhabits Freshwater and occasionally brackish marshes, mostly in cattails, reeds, and deep grasses (AOU 1983), also in or close to other emergent vegetation. It prefers to inhabit shallow freshwater emergent wetlands of every size and type, from roadside ditches and borders of lakes and streams to large cattail marshes. This species can occur even in small marshes.

Least Bittern (*Ixobrychus exilis*)- photo by Ron Austing

King Rail *(Rallus elegans)*- King Rails prefer to nest in large brackish or freshwater marshes, although a diversity of habitats have been used across its entire range. The King Rail is one of the rarest breeding birds in Pennsylvania, and it has been designated as an endangered species. Much of the habits of the King Rail are still unknown, due to its secretive nature.

Common Moorhen *(Gallinula chloropus)*- This species inhabits lakes, ponds, and river edges if sufficient vegetation exists. However, for nesting, this species prefers to nest in cat-tail marshes, which could be large or small in extent. This species tends to inhabit the open areas of the marsh, as opposed to rails, that prefer to be hidden in the thick herbaceous vegetation. It has been noted that this species prefers thick vegetation, preferably cat-tails, and deep water with scattered open places were important to the nesting success of this species. They may nest in patches of sweetflag, arrow-arum, and in tussocks of sedges and rushes.

Virginia Rail (*Rallus limicola*)- photo by Mark Chappell

American Coot (*Fulica americana*)- A rare breeder in Pennsylvania, this species prefers to nest nearer to open water than other marsh species, setting up breeding territories along the edge of an open pool in a cattail marsh, or less commonly, in a large bed of spatterdock. Coots occur most frequently in the northwest part of Pennsylvania, where optimum habitat conditions exist. Scattered other areas occur throughout the state, and anywhere where there is enough open water with herbaceous vegetation, this species could be present.

American Bittern *(Botaurus lentiginosus)*- This species prefers to breed in extensive freshwater marshes, especially those characterized by dense stands of cat-tails, and thick growths of spatterdock, bulrushes, grasses, and sedges, interspersed with areas

of open water. Rarely does this species nest in smaller marshy areas along rivers or sluggish streams and in bogs, ponds, wet meadows, and possibly dry grassy areas. The American Bittern is a rare and declining species in Pennsylvania, and occurs more commonly in the northwest part of the state.

Least Bittern (*Ixobrychus exilis*)- Least Bitterns prefer to nest in freshwater or brackish marshes, swamps, and bogs. In Pennsylvania, this species prefers large, deep-water cat-tail marshes that have scattered shrubs and small trees growing in and around them. This species is very rare in Pennsylvania, and has been designated as a threatened species.

Marsh Wren (*Cistothorus palustris*)- This species almost exclusively nests in large cat-tail marshes, both brackish and freshwater marshes, in marshy lake or pond edges, and along the banks of tidal rivers and sluggish streams. The first Breeding Bird Atlas determined that Marsh Wrens may be in trouble in Pennsylvania. Precipitous declines have occurred, and former strongholds for this species are no longer. This species is a species of concern in Pennsylvania, and is a candidate for listing in the state.

Marsh Wren (*Cistothorus palustris*)- photo by Mark Chappell

Sedge Wren (*Cistothorus platensis*)- This species prefers moist upland sedge meadows with little or no standing water, and usually does not occupy deep cat-tail marshes like its close relative the Marsh Wren frequents. Less commonly, Sedge Wrens may nest in a low pasture among clumps of sweetflag and grasses, or may even nest in orchard grass in an upland hayfield along with the Savannah Sparrow and Bobolink (Brauning, 1992). This species is very rare in Pennsylvania, and has been listed as threatened in the state.

American Coot (*Fulica americana*)-photo by Mark Chappell

Conservation/Management Recommendations

Throughout the range of marsh-dependent bird species, breeding habitat continues to be destroyed, with some marsh habitat restored and created, and populations of these species have responded accordingly. Marsh birds have declined in many locations where large extensive marshes have been drained or filled or developed. For example, King Rails have declined precipitously in the last fifty years and has undergone extreme range contraction, and has virtually disappeared from the northeast, upper Midwest, and southeast Canada. This species continues to decrease even in strongholds in the southeast, where large populations occur.

Other possible reasons for decline of marsh birds include pesticides and other contaminants/toxics, ingestion of lead and plastic, collisions with stationary/moving structures or objects, degradation of wintering habitat, disturbance at nest, roost, or feeding habitat, and human/research impacts. It is not known to what effect these factors have on marsh bird populations, but research should be conducted to determine reasons for decline. One large discrepancy is the lack of information on the populations of all marsh birds, due to the very secretive nature of these species. The most important conservation need is the immediate preservation of emergent wetlands that provide breeding, migration, and wintering habitats. Many wintering habitats, including coastal marshes in California, Florida, Louisiana, New Jersey, and Texas provide critical habitat for Soras and other marsh bird species, yet these areas are extremely vulnerable to habitat degradation. Marsh birds will benefit from policies and management that eliminate or minimize effects of wetland draining and filling, siltation, competition from resident Canada Geese and exotic Mute Swans, toxic bioaccumulation, eutrophication, and other forms of pollution, and invasion of exotic plant species.

North American Waterbird Conservation Plan

The North American Waterbird Conservation Plan is a management plan that deals with conservation of all waterbirds, including wetland dependent birds in North America. This plan provides a continental scale framework for the conservation and management of over 210 species of waterbirds. Each species is evaluated and the species with the most conservation concerns are highlighted. In the Southeast regional plan, three rail species are identified for immediate conservation management (Yellow Rail, Black Rail and King Rail). In addition, according to the plan, management action is needed for Least Bitterns, American Bitterns, and American Coots. Long-term management and planning was identified as a priority for Virginia Rails, Soras and Common Moorhens. In the Middle-Atlantic and New England region, A marshbird monitoring program is being implemented due to the conservation concerns for these species. The goal is to develop a targeted monitoring program following standardized regional (or national) approach, and using remote acoustical techniques to monitor marshbirds. Another possible program will attempt to evaluate and monitor the impact of hunting on rail populations, research rail populations and harvest, and manage/restore wild rice habitat for rails.

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Mottled Darner
Aeshna clepsydra

Invertebrate Species of Concern
State Rank: S2S3 Global Rank: G4

Identification

The Mottled Darner (*Aeshna clepsydra*) is part of a group of Darners in the family Aeshnidae that are named for their long, slender abdomens that resemble darning needles. The Darners are flyers that often perch by hanging vertically and include our largest dragonfly species. The Mottled Darner is a relatively large Darner species that is somewhat easily recognizable in its group. It has pastel mottling on the thorax that varies from blue, to yellow and green. Both male and female are similar in appearance, but the female often has more greenish, pale markings.

Habitat/Behavior

This species can be found in marshes and bogs with open water, ponds, lakes and bays. They are often found in wetlands with water lilies and clear water. The adults of this species can be found hunting in open woods and clearings. They fly fast and high and are usually found perching on tree trunks. Males are often seen patroling shorelines.

Status

There are only 7 current locations where this species has been documented in Pennsylvania. Dragonflies are not considered for conservation status in PA, such as endangered, threatened or rare. The Mottled Darner is considered globally apparently secure (G4) and statewide imperiled to vulnerable (S2S3). The most critical factors to protect these dragonfly species of concern are habitat preservation and water quality protection. This species is dependant on wetland habitats as well as upland habitats. Documenting the mottled Darners habitat requirements will help land managers to determine the most critical areas for protection of this species. Further studies of the Mottled Darner will help biologists to better understand its needs and conservation status.

Pennsylvania Natural Heritage Program

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Northern Harrier
Circus cyaneus

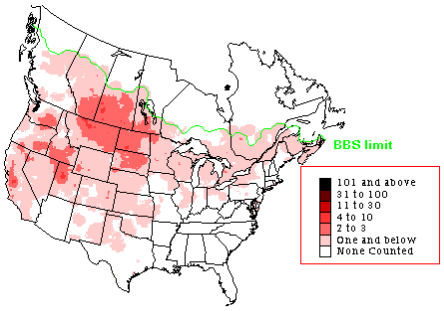
Pennsylvania Animal species of concern
State Rank: S3B, S4N Global Rank: G5

Identification

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

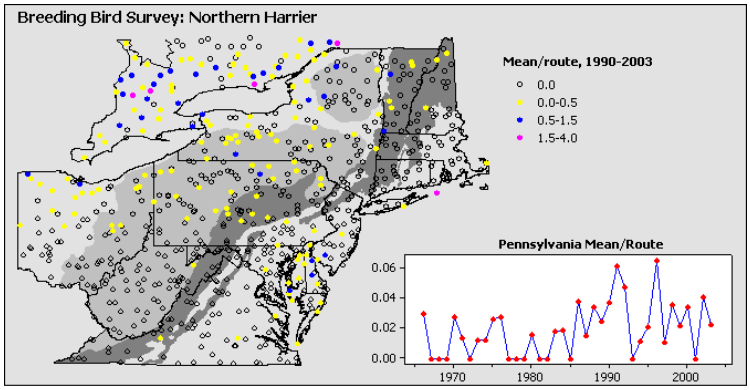
Range

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



Habitat

Northern Harriers use open wetlands, including marshy meadows, wet lightly grazed pastures, old fields, freshwater and brackish marshes, also dry uplands, including upland prairies, mesic grasslands, drained marshlands, croplands, cold desert shrub-steppe, and riparian woodlands. In Pennsylvania, this species also use reclaimed strip mines for nesting in some areas.



Conservation/Status

Breeding Northern Harriers declined slowly from 1966 to 1987 throughout North America, including Pennsylvania, where there is few data to report. Loss of wetlands and suitable field habitat are the primary causes of the widespread decline. Other reasons for decline may include suburban development, reforestation, conversion of hay crops to row crops, and intensive farming. This species is listed as an endangered species in Illinois, Iowa, Indiana, Missouri, New Jersey, Connecticut and Rhode Island and it is listed as threatened in several other states. The protection of large, open wetlands and open fields in Pennsylvania will secure the future for the Northern Harrier in Pennsylvania.

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Pennsylvania Natural Heritage Program

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SAVING THE LAST GREAT PLACES ON EARTH

Dragonflies
Skimmers: Family Libellulidae

Slaty Skimmer (*Libellula incesta*) G5 S3?
Crimson-ringed Whiteface (*Leucorrhinia glacialis*) G5 S3S4
Red-waisted Whiteface (*Leucorrhinia proxima*) G5 S2

Identification

Skimmers, dragonflies in the family Libellulidae, are the largest family of Odonates in the world. They vary widely in color and pattern. One of the characteristic features of this family is the foot-shaped anal loop. This loop is formed by a vein located at the base of the wing and provides structural support to the wings, which helps to support the base of the hind wings. Male Slaty Skimmers are dark blue while females are brown with a light, mid-dorsal stripe. Neither has a distinctive wing pattern. In the Crimson-ringed Whiteface the males' thorax is red dorsally and black on the sides. The abdomen is bright red at the base. Females have a black thorax with yellow shoulder stripes and lateral marks, which may turn reddish with age. The Red-waisted Whiteface tends to have a yellow thorax, mottled with red at maturity. Males have both a red and white form.

Habitat/Behavior

Skimmers are found in a variety of wetland types but tend to be absent from riverine systems. They can be found wandering far from water as adults and fly for long periods of time. Most species are perchers and cling horizontally or obliquely to stems and other vegetation. Some in this family are considered gliders and spends hours at a time in the air. The Slaty Skimmer is found in slow water with muck, often ponds lakes and slow streams. The Crimson-ringed Whiteface can be found near boggy marshes, lakes and ponds. The Red-waisted Whiteface inhabits boggy marshes, lakes and ponds as well as fens.

Status

This group is the most common family found in wetlands and still water. Though 105 species of this group are found in North America, some species are quite uncommon. Dragonflies are not considered for conservation status in PA, such as endangered, threatened or rare. These three species of concern are listed as globally secure (G5) and statewide vulnerable/apparently secure (S3S4) to statewide imperiled (S2). The most critical factors to protect these dragonfly species of concern are habitat preservation and water quality protection. Further studies of the dragonflies of Pennsylvania will help biologists to better understand the current status of these species of concern and the most important habitats for protection in the state.

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Dunkle, S.W. 2000. Dragonflies through Binoculars: A Field Guide to Dragonflies of North America. Oxford University Press, New York, NY.

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Timber Rattlesnake
Crotalus horridus

Pennsylvania Reptile Species of Concern
State Rank: S3S4 Global Rank: G4

Identification

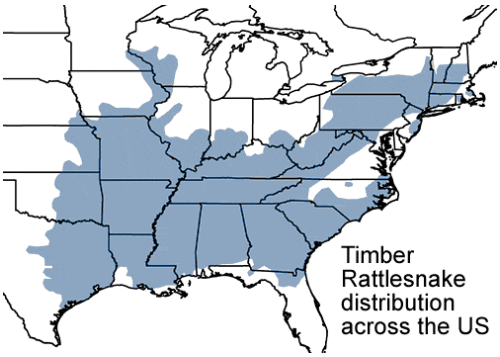
Timber rattlesnakes (*Crotalus horridus*) are easily distinguished from other snakes in Pennsylvania. Timber rattlesnakes are stout-bodied, large snakes reaching lengths of up to 5 feet. Color is extremely variable but usually consists of brown or black bands on bright yellow to black coloration. The head is triangular in shape and a black rattle is present at the end of the tail. This species may be confused with the less common eastern massasauga (*Sistrurus catenatus catenatus*) only present in the western portion of the state. The timber rattlesnake can be distinguished from the massasauga by the lack of white facial lines, completely black tail and scale-covered head.

Habitat/Behavior

Crotalus horridus is associated with deciduous forests and rocky outcrops. Hibernacula are usually found on south-facing rocky slopes with adequate crevices to provide shelter during the winter months. Males may travel far from the den site in the summer, moving into valleys and low-lying areas. Gravid females are far less mobile and tend to stay within a short distance of the den. Timber rattlesnakes are venomous, however are generally mild-mannered and not likely to strike.

Status

Timber rattlesnake numbers have decreased significantly from historic records. This species was once widespread across the state. The remaining populations are usually found in remote, isolated areas. Collection and destruction of habitat are likely the main reasons for reductions in population size. Den sites have been targets for collection and should be the focus of conservation efforts for this species. The state status of the timber rattlesnake is candidate at risk (CA). Though this species is still relatively abundant across the state, it remains vulnerable to exploitation.



Permits are now required to collect rattlesnakes and only one snake can be taken each year. Snake hunts still occur in the state but after capture, snakes must be marked and release and the site of capture. Biologists are gathering information from collectors and individual studies to determine the current status of this species in the state.

Pennsylvania Natural Heritage Program

The Nature Conservancy
SAVING THE LAST GREAT PLACES ON EARTH

References

Genoway, H.H. and F.J. Brenner. 1985. Species of Special Concern in Pennsylvania. Carnegie Museum of Natural History. Pittsburgh, PA. 430pp.

Hulse, A.C., C.J. McCoy and E.J. Censky. 2001. Amphibians and Reptiles of Pennsylvania and the Northeast. Cornell University Press, New York. 419pp.

The Center for Reptile and Amphibian Conservation and Management. Species Accounts: Timber Rattlesnake. Website: http://herpcenter.ipfw.edu/outreach/accounts/reptiles/snakes/Timber_Rattlesnake/

Northern Water Shrew
Sorex palustris albibarbis

Pennsylvania Candidate Rare Species
State Rank: S3 Global Rank: G4T5

Identification

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


Photo: B. Moose Peterson

Habitat/Behavior

Water shrews are solitary, short-lived species with an average life span of 18 months. They breed from December to September and have 2-3 litters per year. They are active both day and night and spend their lives in and around water. Water shrews can be found along streams and lake edges, in boulders and sphagnum moss. They dive and swim into water when foraging for food and to avoid predators. Air trapped in the fur allows them to immediately come to the surface when they stop swimming. The fringe of hairs on the hind foot trap air and actually allow the shrews to walk on water. Easy access to food is essential to the survival of this species. Water shrews can only survive without food for up to three hours. In captivity, they have been found to feed almost every 10 minutes.

Status

Sorex palustris is found throughout most of Canada, the western U.S., the upper northeastern U.S. and the Appalachian mountains. The *albibarbis* subspecies is found in southeastern Canada and the upper northwestern U.S. including north central and northeastern Pennsylvania. In Globally, this species is considered secure. However, in Pennsylvania, the northern water shrew is vulnerable and a candidate for listing as rare. It is only found in a few sites around the state and is affected by many factors, which could lead to declines in their populations. Decreased water quality may have a significant effect on this species. A decrease in numbers of aquatic insects may be very detrimental to this species since food is such a limiting factor. Timber harvesting along streams and lake edges may also be detrimental to this species. Many times, they will live in vegetation or crevices along the waters edge. The loss of the overstory could dramatically change the microhabitat conditions on the forest floor. Maintaining natural stream corridors and lake buffers is essential to the protection of this species.

Pennsylvania Natural Heritage Program

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SAVING THE LAST GREAT PLACES ON EARTH

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-The University of Michigan Museum of Zoology Animal Diversity Web. Species Account: Sorex palustris (water shrew). http://animaldiversity.ummz.umich.edu/site/accounts/information/Sorex_palustris.html.

Yellow Lampmussel
Lampsilis cariosa

Freshwater Mussel Species of Concern
State Rank: S3S4 Global Rank: G3G4

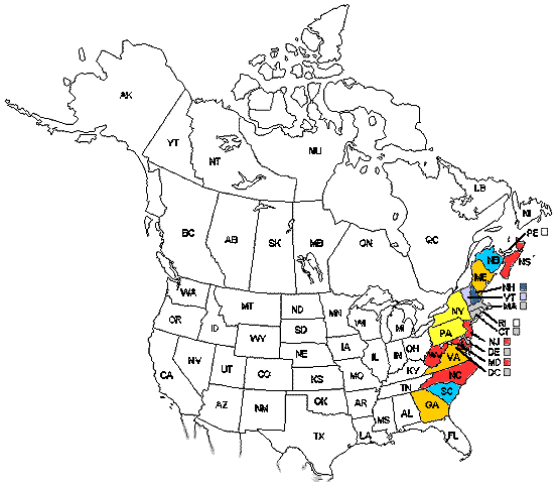
Identification

The yellow lampmussel (*Lampsilis cariosa*) is a bright yellow, medium-sized freshwater mussel that can reach lengths of up to five inches. The mussel has an ovate to elliptical shell and the valves appear inflated in cross section. The shell is thick and strong. The bright yellow coloration makes it fairly easy to distinguish from other freshwater mussels in Pennsylvania but it may be confused with the eastern lampmussel (*Lampsilis radiata*). The presence of abundant rays on the outer shell of the eastern lampmussel is usually a key to distinguishing these two species. The yellow lampmussel is also more ovate and is more inflated in cross section.


Photo: PA Science Office

Habitat

The yellow lampmussel inhabits medium to large rivers throughout most of its range, but is known from lakes and ponds in the north. In Pennsylvania, the yellow lampmussel is found within the Susquehanna and Delaware River drainages. This species occurs in a variety of substrate types including sand, silt, cobble and gravel.



Status

Lampsilis cariosa ranges from Nova Scotia to Georgia and west to West Virginia. Little is known about the status of freshwater mussels in Pennsylvania and the United States. The state status of the yellow lampmussel is condition undetermined (CU) due to lack of information for this species. Though it appears to be relatively abundant in the Susquehanna River, thus far it is not present or less common in other river systems in the state. More surveys are required to determine the status of this species and other freshwater mussels in Pennsylvania.

Freshwater mussels have the highest current and future rate of extinction of any animal group in North America. In Pennsylvania, 75% of the mussel fauna is of conservation concern. One of the biggest threats to freshwater mussel populations throughout North America is a reduction in water quality. The protection Pennsylvania's aquatic habitat is critical to the survival of this species and the many other aquatic and terrestrial species that depend on these systems.

PNHP
Pennsylvania Natural Heritage Program

The Nature Conservancy
SAVING THE LAST GREAT PLACES ON EARTH

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Nedeau, E.J, M.A. McCollough, and B.I. Swartz. 2000. The Freshwater Mussels of Maine. Maine Dept. of Inland Fisheries and Wildlife, Augusta, Maine.

Stein, B.A. and S.R. Flack. 1997. 1997 Species Report Card: The State of U.S. Plants and Animals. The Nature Conservancy, Arlington, Virginia.

CREEPING SNOWBERRY
Gaultheria hispidula *(L.) Bigel.*
Heath Family (Ericaceae)

SIGNIFICANCE
The creeping snowberry has been given a status of Rare on the Plants of Special Concern in Pennsylvania list by the Pennsylvania Biological Survey and the Department of Conservation and Natural Resources, based on the relatively few historical and recent records that have been documented in the state.

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

HABITAT
The species grows in cool, damp or wet woods and boggy places, often being found on rotting logs, sphagnum hummocks, and other moss-covered substrates.

RANGE
The creeping snowberry is widely distributed in the more northern and cooler portions of North America. It appears to be restricted to the northern counties in Pennsylvania.

REFERENCES
NatureServe web site (www.natureserve.org)

Pennsylvania Department of Conservation and Natural Resources web site (www.dcnr.state.pa.us)

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

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

EBONY SEDGE
Carex eburnea Boott
Sedge Family (Cyperaceae)

SIGNIFICANCE
The ebony sedge has been given a status of Endangered on the Plants of Special Concern in Pennsylvania list by the Pennsylvania Biological Survey and the Department of Conservation and Natural Resources, based on the relatively few historical and recent records that have been documented in the state. More field work is needed in order to justify this status, since the plant may have been overlooked due to its inconspicuous appearance and because its habitat is not always easily accessible.

DESCRIPTION
The ebony sedge is a low, grass-like plant with extremely slender, elongate leaves and very small, three-sided, black, nutlet-like fruits in terminal clusters that appear in late spring. The fruits may persist for months after maturing. The plant has creeping, underground stems. It is one of the more easily distinguished species of the large and complex genus *Carex*.

HABITAT
The species grows in a variety of habitats in its range, but in Pennsylvania it is typically found on cliffs, outcrops, steep slopes and banks, often on northerly exposures, that are composed of limestone or calcareous rock.

RANGE
The ebony sedge is widely distributed in the more northern and cooler portions of North America. It is known from several scattered locations in the northern or mountain counties in Pennsylvania.

REFERENCES
NatureServe web site (www.natureserve.org)

Pennsylvania Department of Conservation and Natural Resources web site (www.dcnr.state.pa.us)

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

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

GREAT-SPURRED VIOLET / SELKIRK'S VIOLET
Viola selkirkii Goldie
Violet Family (Violaceae)

SIGNIFICANCE
The great-spurred violet has been given a status of Undetermined on the Plants of Special Concern in Pennsylvania list by the Pennsylvania Biological Survey and the Department of Conservation and Natural Resources, based on the relatively few historical and recent records that have been documented in the state. More field work is needed in order to determine if the species should be of conservation concern. The plant is very easily overlooked due to its small size and similarity to more common species of violets.

DESCRIPTION
The great-spurred violet is a perennial herb that may grow to a few inches in height. The general appearance is similar to other species of violets, but the great-spurred violet can be distinguished by its smaller size, the heart shaped leaves (with a tendency for the basal lobes of some leaves to overlap) with minute hairs on the upper surface and few to no hairs on the lower surface, and the small violet-colored flowers with hairless lateral petals (contrasting with other species of violets that have a tuft of hairs, or "beard", on the lateral petals), and rather prominent spur of the middle petal.

HABITAT
The species inhabits moist woods throughout its range, particularly on calcareous or limestone substrates. In Pennsylvania, it grows in cool, moist woods, often on humusy or mossy rock outcrops and boulders.

RANGE
The great-spurred violet occurs in the more northern and cooler parts of North America. The historical range in Pennsylvania is concentrated in the northeastern counties and the species apparently reaches a southern border of its range in the state.

REFERENCES

NatureServe web site (www.natureserve.org)

Pennsylvania Department of Conservation and Natural Resources web site (www.dcnr.state.pa.us)

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

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

Wild Pea
Lathyrus ochroleucus Hook Pea Family (Fabaceae)

Pennsylvania Threatened Species
State Rank: S2 Global Rank: G4G5

SIGNIFICANCE
The wild pea has been given a status of Threatened on the Plants of Special Concern in Pennsylvania list by the Pennsylvania Biological Survey and the Department of Conservation and Natural Resources, based on the relatively few recent records that have been documented in the state. More field work is needed for this species in order to determine if this status is justified.

DESCRIPTION
The wild-pea is a perennial herb with sprawling stems. The leaves are alternately arranged, divided into four to eight, hairless, entire leaflets with a branching and twining tendril at the tip. The flowers are whitish or yellowish-white and appear in May or June. The fruit is a pea-like pod.

HABITAT
The species grows in woods, thickets, and openings in well-drained, usually calcareous, substrate.

RANGE
The wild pea is widely distributed in the more northern and cooler portions of North America. It occurs in the northern or mountain counties in Pennsylvania.

REFERENCES

NatureServe web site (www.natureserve.org)

Pennsylvania Department of Conservation and Natural Resources web site (www.dcnr.state.pa.us)

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

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Photo: David Werier