
The Pennsylvania Rivers Conservation Program

Shenango River Watershed Conservation Plan

July 2005

Prepared for:

Shenango River Watershed Community

Prepared by:



Western Pennsylvania Conservancy
Watershed Assistance Center
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July 31, 2005

Dear Friend:

Since 1932, Western Pennsylvania Conservancy has been working with partners in conservation to save the places we care about by connecting people to the natural world. We protect natural lands, heal degraded landscapes, keep clean waters flowing clean, promote healthy and attractive communities and preserve Fallingwater. WPC has protected more than 216,000 acres of natural lands and wildlife habitat in Pennsylvania.

Our scientists have been documenting ecologically significant places, such as those found in the Shenango River watershed, since the 1970s. WPC has ongoing projects in the region. In 2002, along with our partners, we initiated the Riparian Restoration and Protection Initiative providing streambank fencing to agricultural landowners in the watershed. In 2002 and 2003, we also completed natural heritage inventories for Lawrence and Mercer counties.

Western Pennsylvania Conservancy understands the need for a community-supported vision for watershed conservation. This vision must include recreational and aesthetic values, as well as protection for many rare and important species and habitats. We further understand the economic importance of the Shenango River and its tributaries to northwestern Pennsylvania.

We particularly would like to thank the Shenango River watershed community members who served on the steering and technical committees. We feel very strongly that a project of this nature must involve the cooperation of many organizations, municipalities, agencies, and individuals who will ultimately see the recommendations in the plan to fruition.

We trust that you will find the information contained within this publication to be accurate, timely, and an effective tool to aid in the overall management of the watershed and those communities that lie within it. We value the relationships we've formed with our partners in conservation and look forward to future involvement in the conservation of the Shenango River watershed.

We hope you enjoy this report and, as always, please feel free to contact us with your comments.

Sincerely,

A handwritten signature in black ink, appearing to read "Nick Pinizzotto".

Nick Pinizzotto
*Senior Director,
Watershed Programs*

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- Pennsylvania Department of Environmental Protection
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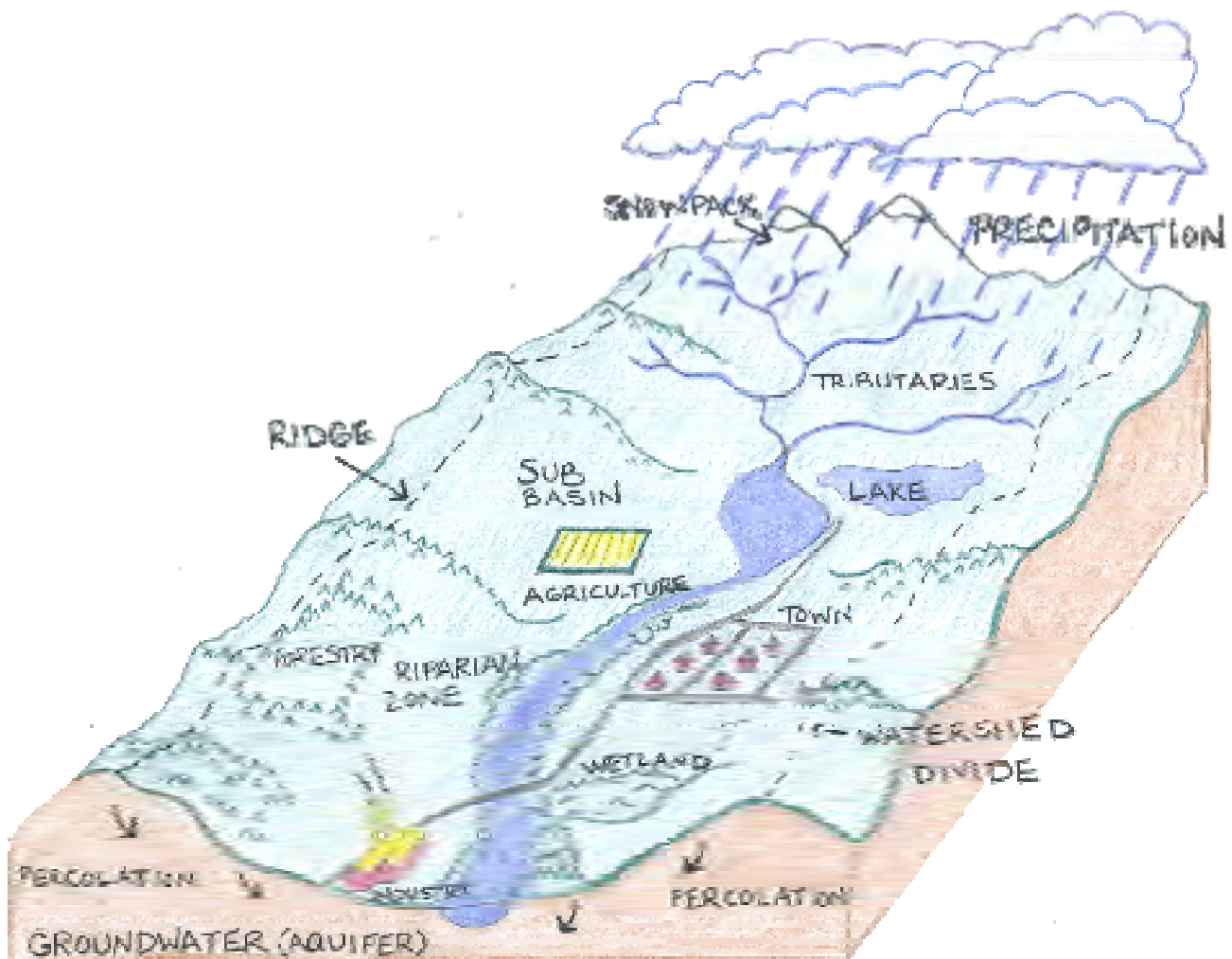
ACROYMNS

ADA	American Disability Act
AMD	Abandoned Mine Drainage
ASA	Agricultural Security Area
BDA	Biological Diversity Area
BMP	Best Management Practices
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CNHI	County Natural Heritage Inventory
CREP	Conservation Reserve Enhancement Program
CSO	Combined Sewer Overflow
CWF	Cold Water Fishery
CWH	Cold Water Habitat
DA	Dedicated Area
DO	Dissolved Oxygen
E&S	Erosion and Sedimentation
EAC	Environmental Advisory Committee
EWH	Exceptional Warm Water Habitat
EQB	Environmental Quality Board
IBA	Important Bird Area
IMA	Important Mammal Area
KARE	Keystone Aquatic Resource Education
LCA	Landscape Conservation Areas
LRW	Limited Resource Water
LWV	League of Women Voters
MIB	Methylisoborneol
MPO	Metropolitan Planning Organization
MWH	Modified Warm Water Habitat
NEEAC	National Environmental Education Advisory Council
NFIP	National Floodplain Insurance Program
NLCD	National Land Cover Data
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NPS	Non-Point Source
NRCS	Natural Resource Conservation Service
ODNR	Ohio Department of Natural Resources
OhioEPA	Ohio Environmental Protection Agency
ORV	Off-Road Vehicles
OSM	United States Department of Interior Office of Surface Mining
PA DCNR	Pennsylvania Department of Conservation and Natural Resources

PA DEP	Pennsylvania Department of Environmental Protection
PA HSCA	Pennsylvania Hazardous Sites Cleanup Act
PABS	Pennsylvania Biological Survey
PCB	Polychlorinated biphenyl
PDE	Pennsylvania Department of Education
PENNVEST	Pennsylvania Infrastructure Investment Authority
PFBC	Pennsylvania Fish and Boat Commission
PGC	Pennsylvania Game Commission
PHMC	Pennsylvania Historic Museum Commission
PNHP	Pennsylvania Natural Heritage Program
RCRA	Resource Conservation and Recovery Act
RRPI	Riparian Restoration and Protection Initiative
RUS	United States Department of Agriculture Rural Utility Service
SAC	Sewage Advisory Committee
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SEO	Sewage Enforcement Officer
SSO	Sanitary Sewer Overflow
SSWAP	Statewide Surface Water Assessment Program
SWAP	Source Water Assessment and Protection Program
SWAT	Strength, Weakness, Opportunities, Threats/Barriers
TDS	Total Dissolved Solids
TMDL	Total Maximum Daily Load
US EPA	United States Environmental Protection Agency
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Service
WHPP	Wellhead Protection Program
WPC	Western Pennsylvania Conservancy
WWF	Warm Water Fishery
WWH	Warm Water Habitat

WATERSHED DEFINITION

A watershed can be defined as the area of land that drains to a particular point along a stream. Each stream has its own watershed. Land use is the key element affecting this area of land. The boundary of a watershed is defined by the highest elevation surrounding the stream. A drop of water falling outside of the boundary will drain to another watershed.



EXECUTIVE SUMMARY

Project Background

Located in northwestern Pennsylvania and northeastern Ohio, the Shenango River joins the Mahoning River in Lawrence County, Pennsylvania to form the Beaver River (Figure ES-1). It is rich in natural and recreational resources. The Shenango River watershed, known for its high biodiversity, is home to several rare, threatened, and endangered species. The watershed suffers from erosion and sedimentation, and nutrient loading, mainly from agricultural areas and inadequate septic and sewage systems.



Springfield Falls

In 2001, Western Pennsylvania Conservancy (WPC) approached the Shenango Conservancy about completing a River Conservation Plan for the Shenango River watershed. The two organizations were already spearheading a streambank fencing program for the watershed and Penn Ohio Watershed Association was conducting the Interstate Pymatuning Shenango Watershed Plan. Although a plan for the watershed was already underway, Pennsylvania data was not available at the time. Funding for that project came from Ohio and crucial parts of it were missing to qualify it for the Pennsylvania Rivers Registry.

In 2002, WPC received a grant from the Pennsylvania Department of Conservation and Natural Resources (DCNR) to complete a River Conservation Plan (herein referred to as watershed conservation plan) for the Shenango River watershed. Due to its size, and in order to better study the resources available, WPC proposed completing a plan with a subwatershed focus.

The Pennsylvania River Conservation Program operates through DCNR's Community Conservation Partnership Program. The program aids groups in accomplishing their local initiatives through planning, implementation, acquisition, and development activities. As a part of the program, DCNR has established the Pennsylvania Rivers Registry to validate the local initiative to complete approved River Conservation Plans. The registry serves to promote public awareness of completed plans while fostering support for future projects that will enhance the overall quality of the watershed. With the completion of this plan, the Shenango River watershed will be placed on the Pennsylvania River Registry at <http://www.dcnr.state.pa.us/brc/rivers/riversconservation/registry/>. A complete copy of the Shenango River Watershed Conservation Plan can be accessed at <http://www.paconserve.org/rc/rap-shen.html>.

Purpose

The purpose of this study is to document current conditions and identify additional initiatives aimed at improving the livability and attractiveness of the region. The watershed community was involved in developing a vision for the watershed through public meetings, interviews, and surveys. Stakeholders identified important issues and resources needing restoration, protection, conservation, and/or preservation. The goal of this plan was to develop a strategy to make the vision for the watershed a reality. Practical solutions and action steps were suggested, and resources were identified to support implementation. This plan can be used to assist groups and citizens working and/or living within the watershed with obtaining resources to fulfill the vision set forth for the area. This watershed conservation plan should be used in planning for long-term growth.

One objective of the plan is to restore and enhance the watershed's natural resources and regional assets. This can be achieved by implementing solutions and action plans identified and by working with a variety of organizations. Another objective is to increase environmental education within the watershed. Many residents and stakeholders are still unaware of basic watershed functions and the interaction between human activities and natural processes. Educational programs are needed to inform youth, residents, and stakeholders about environmental issues within the watershed. Actively involving stakeholders increases the pride they have for their community and their willingness to become further involved with conservation efforts.

Planning Process

In July 2003, the Watershed Conservation Plan process was initiated at a set of five public meetings held over two weeks at various locations within the watershed. Local citizens were invited to come together to voice their opinions about local conservation and the need to improve the watershed.



Members of the advisory committee for the Shenango River Conservation Plan

Municipal officials were encouraged to participate in the planning process. Invitations for each of the public meetings were sent, along with a survey for each municipality to complete.

Members of the steering committee and WPC attended community events to reach out to local residents and visitors to the region. At these events, community members were informed about the planning process via displays and personal communication, and given an opportunity to express their opinions by completing a survey.

With the completion of the draft plan, a series of public meetings were held in March 2005. Stakeholders were given the opportunity to review the plan and provide comments. Public comments were collected for 30 days and incorporated into the final plan.

Implementation

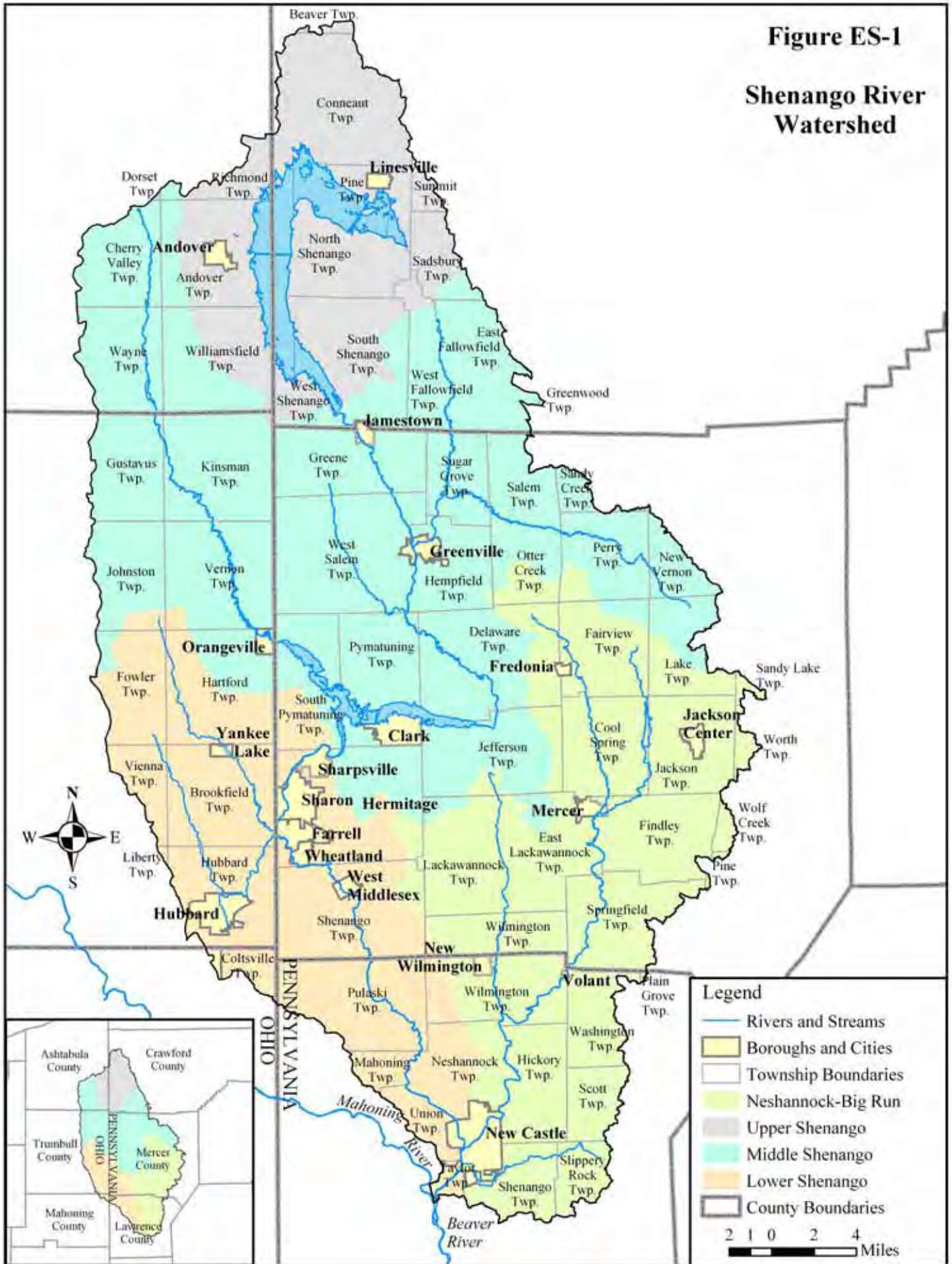
Any citizen, group, or agency interested in improving the quality of life within the Shenango River watershed should use the Shenango River Watershed Conservation Plan. This document should serve as a reference and educational tool to promote the conservation of natural resources, monitor and improve water quality, and advocate sound community-planning practices.

Implementation of this plan is the responsibility of the entire watershed community and depends upon cooperation and collaboration among many different organizations. Although the Shenango Conservancy, Shenango River Watchers, Penn-Ohio Watershed Association, and Western Pennsylvania Conservancy will likely spearhead many of the projects throughout the watershed, numerous partnerships are needed for success. Partnering among organizations is invaluable in implementing and completing projects.

Involvement of local municipal officials in watershed efforts is a critical program component. Decisions that affect the overall quality of the watershed, such as establishing zoning ordinances, development, stormwater management, and sewage treatment begin at the local level. Municipal cooperation and collaboration on any community project provides the essential local connectivity for success. Many of the management recommendations involve changes in regulations and ordinances, which require the cooperation of local government officials.

Figure ES-1

Shenango River Watershed



Chapter Summaries

Project Area Characteristics

The Shenango River watershed drains 1,066 square miles in northwestern Pennsylvania and northeastern Ohio. Ninety-two municipalities are located within the boundaries of the watershed. The Shenango River is approximately 92 miles long. It begins in Crawford County, Pennsylvania and ends at its confluence with the Mahoning River to form the Beaver River. Due to its size, and in order to better study the resources available, the watershed has been divided into four subwatersheds: Upper Shenango River, Middle Shenango River, Lower Shenango River, and Neshannock Creek/Big Run.



A downtown street in New Castle utilizing smart growth principals

Glaciers had a profound effect on the topography of the watershed. The entire Shenango River watershed is located in the Appalachian Plateau Province. In Pennsylvania, the watershed is part of the Northwestern Glaciated Plateau section. In Ohio, parts of the Killbuck-Glaciated Pittsburgh Plateau and Grand River Low Plateau sections make up the watershed.

Over 70 percent of the municipalities within the watershed are utilizing comprehensive plans or zoning to control land uses. In 2000, the calculated population of the watershed was 218,322. This is a positive growth of four percent since 1990.

Sanitary sewer systems, public water supplies, and transportation infrastructure usually determine how much development a given area can support. Urbanized areas of the watershed have more sanitary sewer services than do rural areas. In many areas of the watershed, the installation of proper sewer disposal systems is limited due to soil permeability and the level of the water table. As with sanitary sewer systems, urbanized areas within the watershed are more likely to rely on public water suppliers for their water and rural areas rely on wells and springs for their drinking water. The Shenango River watershed is well connected with its network of highways, railroads, and airports.

Manufacturing, education, health, and social services are the major employment industries within the watershed. The top three major employers, all of which are part of the healthcare industry, are Sharon Regional Health System (1,700 employees), Horizon Hospital System (1,300 employees), and Jameson Health System (1,100 employees).

There are portions of 20 school districts and three technical schools to educate students from grades K-12 in the watershed. Three colleges and three adult technical and vocational institutions are available for further education within the watershed.

Land Resources

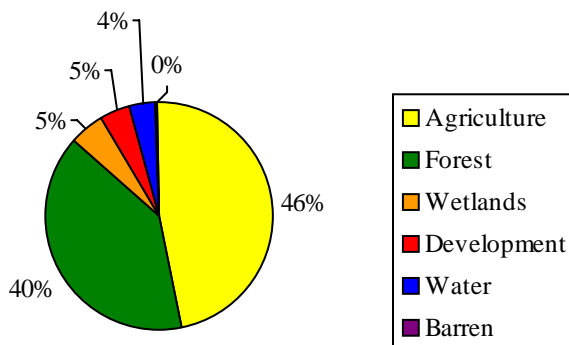
Two glaciers, the Illinoian and Wisconsinan, changed the surface of the region. Northwestern Pennsylvania is underlined with bedrock from the Late Devonian, Early Mississippian, and Early Pennsylvanian ages.

Within the watershed, soils are derived from glacial till and many soils in the region have dense subsoil that roots cannot penetrate. The dense subsoil allows very slow water and air movement through it causing the drainage of soil in the area to be poor. Soils that meet certain physical, chemical, and slope characteristics, in addition to being extremely well suited for agricultural uses, are identified as prime agricultural soils. There are 86 prime agricultural soils within the watershed. Soils of two or three major

soil types and some minor soil types, located together, are grouped into soil associations. There are 24 soil associations within the Shenango River watershed.

Agricultural security areas are lands enrolled in statewide programs to promote and conserve agricultural lands and the agricultural community. Within the municipalities making up the Shenango River watershed, there are 111,433 acres of agricultural security areas.

Figure ES-2. Land Use



Land use is a major determinant of environmental quality, and an issue of much debate at local, regional, state, and national levels. Forestry and agriculture dominate the land use within the Shenango River watershed. Figure ES-2 identifies the land uses within the watershed.

The majority of the watershed is privately owned. Public properties within the watershed include Pymatuning State Park, Shenango River Lake, State Game Lands, schools, community parks, and municipal properties.

Areas containing rare, threatened, or endangered species, natural communities of special concern, or significant ecological and geological landscapes worthy of protection are critical areas. Floodplains, streambanks, and wetlands are examples of critical areas within the Shenango River watershed. Other areas of concern within the watershed are hazardous areas, such as illegal dumpsites, waste sites, and brownfields.

Water Resources

The Shenango River watershed forms a dendritic drainage pattern on the landscape. Within the 1,066 square mile watershed, 30 named tributaries contribute to the Shenango River, all of which are considered warm-water streams (supporting warm-water aquatic species).

The Shenango River watershed has historically experienced a high level of wetland loss, with Pennsylvania losing over 56 percent, and Ohio losing nearly 90 percent, of original wetlands. The major causes of wetland loss can be attributed to development, agriculture, and forestry. The consequences of wetland loss range from more severe impacts from flooding and drought to loss of critical habitats and species.

Riparian buffers are extremely important for stream and water quality protection. A riparian buffer is the transition zone between water and human land uses. This area provides streambank stabilization, wildlife habitat, an aquatic food source, and a filter for sediment and pollution. One effort currently underway within the watershed is the Riparian Restoration and Protection Initiative. This project has included the installation of 71,348 feet of streambank fencing in agricultural areas to enhance riparian buffers and their benefits to streams, wildlife habitat, and water quality.

The watershed contains two major impoundments: Pymatuning Reservoir and Shenango River Lake. The primary purpose of each reservoir is flood control and water supply, with a secondary purpose of recreation. Both impoundments are popular places for a variety of activities, including fishing, swimming, camping, and hiking. Water quality within the reservoirs is compromised by an overabundance of nutrients. During certain times of the year, this situation worsens and a noticeable taste and odor issue arises. It is recommended that action be taken soon to study the exact causes and sources

of the excess nutrients and bacteria, and to develop a remediation plan to minimize the pollution and impacts. A close partnership with the public water supply companies will be essential.

Water quality within the watershed is typically impaired from sedimentation and nutrient overload. Much of this can be attributed to agricultural practices; however, inadequate sewage and on-lot septic systems, construction practices, natural resource extraction, and timber harvesting also contribute to non-point source pollution. For those stream segments identified by the Pennsylvania Department of Environmental Protection (PA DEP) as impaired, total maximum daily loads (TMDLs) have been or will be developed in order to address the water quality issues.



Neshannock Creek in New Castle: stormwater discharge, channelized stream, high percentage of impervious cover

Stormwater runoff is a major concern within the Shenango River watershed. Typically, the impacts of stormwater are more severe in urbanized or populated areas due to the high percent of impervious cover (i.e. paved driveways, parking lots, rooftops, sidewalks, etc.). Several options exist to alleviate the impacts of stormwater runoff, including stormwater catch basins, and alternative community development designs that minimize the amount of impervious cover. The Center for Watershed Protection has developed the Eight Tools for Watershed Protection, which is a document that can help a community determine the best methods of dealing with stormwater.

Sewage issues are also prevalent throughout the watershed. Combined sanitary sewers, which are common in urbanized areas, become overloaded during precipitation events and raw sewage is often discharged to the streams due to inadequate capacity at treatment plants. In rural areas, malfunctioning or non-existent on-lot septic systems are thought to contribute significantly to nutrient overload in streams and eutrophication of lakes and ponds. One potential solution in developing areas is to install community sewage systems. Another solution, although costly, is to replace combined sanitary sewers with separated systems that can adequately treat both stormwater and sewage.

Biological Resources

The Shenango River watershed is one of the most diverse watersheds in Pennsylvania. This high biodiversity is largely attributable to the numerous bogs, marshes, swamps, and other wetland environments created during the Wisconsin glacialiation over 20,000 years ago. Despite this high biodiversity, the watershed contains very few conservation lands, or lands set aside to protect natural resources. Existing conservation lands include State Game Lands, and small properties owned by WPC, Cleveland Museum of Natural History, and private landowners.

Forested areas within the watershed are dominated by mixed oaks. Other common forest types include sugar maple mixed hardwoods, hemlock-northern hardwoods, and sycamore box elder (river birch) floodplain forest. Common understory and herbaceous species include mountain laurel, mayapple, intermediate log fern, and jewelweed. Wetland species often include pin oak, red maple, winterberry, highbush blueberry, and buttonbush. Wetland types include broadleaf-conifer swamps, hemlock hardwood swamps, narrow-leaved cattail colonies, glacial bogs, mixed emergent marshes, hillside-graminoid forb fens, and others. Serious invasive species threats include Japanese knotweed, multiflora rose, autumn olive, and non-native honeysuckles.

At least 95 plant and animal species are listed as threatened, endangered, or otherwise of special concern within the Shenango River watershed. The watershed contains five Important Bird Areas (Shenango, Pymatuning, Barrows and Brucker Heronry, and portions of Pennsy Swamp in Pennsylvania;

and Pymatuning IBA in Ohio). One Important Mammal Area (Pymatuning IMA) and 24 Biological Diversity Areas are also identified in the Pennsylvania portion that contain species of special concern and/or exemplary natural communities. Additional areas of biodiversity, similar to BDAs, have been identified in the Ohio portion. Both Shenango and Pymatuning Reservoirs serve as important stop-over points and breeding grounds for numerous wading birds and are popular birding areas. In addition, the forested areas provide breeding grounds for declining migratory species, such as the cerulean warbler and willow flycatcher.

The watershed has some of the highest levels of aquatic diversity in the world, though diversity has declined greatly in the last century. It harbors 11 fish species of special concern in Pennsylvania, including possibly the last location for the southern redbelly dace in the state. At least 24 mussel species have been documented, 14 of which are considered of special concern in Pennsylvania and two (clubshell and northern riffleshell) are federally endangered. Species such as Blanding's turtle and the federally endangered bog turtle are believed to have disappeared from the watershed due to development pressures. The state endangered eastern massasauga rattlesnake, which relies on wetlands next to old fields for habitat, may also be an extirpated species, as no individuals have been found in the last 10 years.

The biggest threats to biodiversity include artificially induced changes in hydrology, nutrients and sedimentation, industrial pollution and stormwater runoff, invasive species, and filling in, or otherwise altering, wetlands and sensitive habitats. Fluctuations in flow of the Shenango River, designed to accommodate recreation and drinking water needs downstream of the Pymatuning Reservoir and Shenango River Lake, are often too drastic to support the fish and mussel species of special concern. Low flows do not provide enough oxygen and habitat, while high flows scour mussel beds. Nutrients and sedimentation enter the Shenango River and its tributaries through agricultural activities, faulty on-lot septic systems, and inadequate municipal sewage treatment systems. Industrial pollution from the many factories and other businesses surrounding Youngstown and Sharon may further overload municipal treatment facilities, causing additional pollution to aquatic systems.

Efforts are ongoing to improve the water quality and natural resources of the watershed. The county conservation districts and local conservation groups are increasing streambank fencing and other best management practices in agricultural areas. Groups such as the Shenango River Watchers and Shenango Conservancy are working to monitor stream health and enhance recreation areas along the Shenango River. Also, some municipalities within the watershed are increasing efforts to upgrade faulty sewage systems. However, there are few instances of organizations and municipalities working together on these issues and little indication of community support for protecting biodiversity. The large size of the watershed makes it difficult to build support and capacity for such activities. However, any large-scale improvements will likely require these types of partnerships and outreach efforts to be successful.

Cultural Resources

The Shenango River watershed is privileged to have numerous recreational opportunities, including hiking, biking, boating, fishing, camping, golfing, birding, hunting, and off-road vehicle riding. There are two major recreational centers within the watershed: Pymatuning State Park and Shenango River Lake Recreation Area. In addition, there are several trails, State Game Lands, golf courses, a fish hatchery, and a wildlife learning center.



Bird boxes provide habitat for local wildlife

The region is also fortunate to have a variety of organizations and agencies to provide environmental education services to youth and adult members of the community. Organizations such as Pymatuning State Park, Shenango River Watchers, Pennsylvania Fish and Boat Commission, Pennsylvania Game Commission, Shenango Conservancy, county conservation districts, cooperative extension office provide resources and programs to educate and help landowners within the Shenango River watershed.

The well-documented history of the region is remarkable and details early settlers, agricultural and industrial movements, transportation innovations (including railroads and canals), postal delivery, and flood control. In addition, there are 60 historical sites within the watershed that are listed on the National Register of Historic Places.

Issues and Concerns

Several methods were used to identify the issues and concerns of watershed stakeholders. Public meeting workshops, public and municipal surveys, and stakeholder interviews were used to gather information from watershed residents. A variety of issues were brought up, including the following:

- Water quality and quantity
- Erosion and sedimentation
- Waste cleanup
- Public awareness and education
- Recreation
- Historic preservation
- Smart growth and planning
- Protecting biodiversity
- Horsepower limitations

One method for compiling issues and concerns was the use of public and municipal surveys. These surveys were used to determine how watershed stakeholders and municipal officials perceive the watershed. In one category, watershed attributes, stakeholders and municipal officials disagreed on residential development being a priority. While municipal officials ranked residential development as their second highest priority, watershed residents ranked it eighth out of a possible eight. Complete results can be found in the Issues and Concerns chapter of the full report.

Another method of obtaining issues and concerns was interviewing local watershed residents identified by the steering committee. Complete results can be found in the Issues and Concerns chapter of the full report.

Management Recommendations

This section of the plan provides a matrix of the various issues identified in each of the subject areas. The recommendations were compiled from the municipal and public meetings, and individual comments. The matrix of recommendations includes the following: issues, recommended approaches, potential partners, potential funding sources, and priority ratings. Issues refer to a concern, situation, project, or idea deemed important by watershed stakeholders. The recommended approach is the action step, or objective necessary to address the issue. Potential partners are groups with the resources best suited to assist in meeting the objectives. Potential funding sources identify avenues to finance identified projects. The priority ranking was determined by public comment and response, and input from the steering and advisory committees, and was based on need, feasibility, and probability of funding.

Management recommendations are suggestions to improve the quality of life within the watershed. It is important to note that these suggestions are non-regulatory in nature and are to be used only as a guide. No limitation to the number or types of issues, actions, approaches, partners, or funding opportunities should be assumed due to ever-changing circumstances. Creativity is encouraged.

CHAPTER 1. PROJECT AREA CHARACTERISTICS

Project Area

Location

The Shenango River watershed drains 1,066 square miles in northwestern Pennsylvania and northeastern Ohio (Figure 1-1). Originating from a large wetland area in the southwestern corner of Crawford County, Pennsylvania, it flows south joining the Mahoning River to form the Beaver River. The Beaver River is a tributary of the Ohio River. The watershed covers portions of Crawford, Lawrence, and Mercer counties in Pennsylvania and Ashtabula, Mahoning, and Trumbull counties in Ohio. The Shenango River is part of sub-basin 20 A in the Pennsylvania State Water Plan.



The Shenango River

In Pennsylvania, the Shenango River watershed encompasses 51 townships, 15 boroughs, and four cities covering approximately 788 square miles. These municipalities are listed in Table 1-1 and Figure 1-2. In Ohio, the Shenango River watershed covers 278 square miles of tributary watersheds encompassing 17 townships, four villages, and one city.

Size

The mainstem of the Shenango River is approximately 92 miles long. Originating as a wetland area in Crawford County where West Fallowfield, East Fallowfield, and Sadsbury townships meet, the Shenango River flows northward into Pymatuning Reservoir. The river channel continues through the reservoir, exits through Pymatuning Dam, and flows south through Jamestown and Greenville where it is impounded to form the Shenango River Lake. Continuing in a southerly direction, it flows through the cities of Sharon, Farrell, and New Castle. Neshannock Creek joins the Shenango River in New Castle before its union with the Mahoning River to form the Beaver River.

Due to its size, and in order to better study the resources available, the watershed has been divided into the four subwatersheds described below. The subwatersheds are also illustrated in Figures 1-3, 1-4, 1-5, and 1-6.

The **Upper Shenango River subwatershed** is located in the northernmost part of the watershed and includes 155 square miles. It includes headwater streams and the Pymatuning Reservoir to its outlet along the Shenango River. Made up from 16 municipalities, the Upper Shenango River subwatershed is located in Crawford County, Pennsylvania and Ashtabula County, Ohio.

The **Middle Shenango River subwatershed** is the largest subwatershed with a total area of 434 square miles. Subwatershed boundaries consist of the Pymatuning Reservoir outlet to the Shenango River Lake outlet. It includes Crooked Creek, Little Shenango River, Pymatuning Creek, and the Shenango River Lake. This subwatershed is made up from 37 municipalities in Crawford and Mercer counties in Pennsylvania, and Ashtabula and Trumbull counties in Ohio.

The **Lower Shenango River subwatershed** begins at the outflow of the Shenango River Lake. It ends where the Shenango River joins the Mahoning River to form the Beaver River. Including 208 square miles, the subwatershed is made up from 17 municipalities in Lawrence and Mercer counties in Pennsylvania, and Trumbull and Mahoning counties in Ohio.

Figure 1-1

Shenango River Watershed

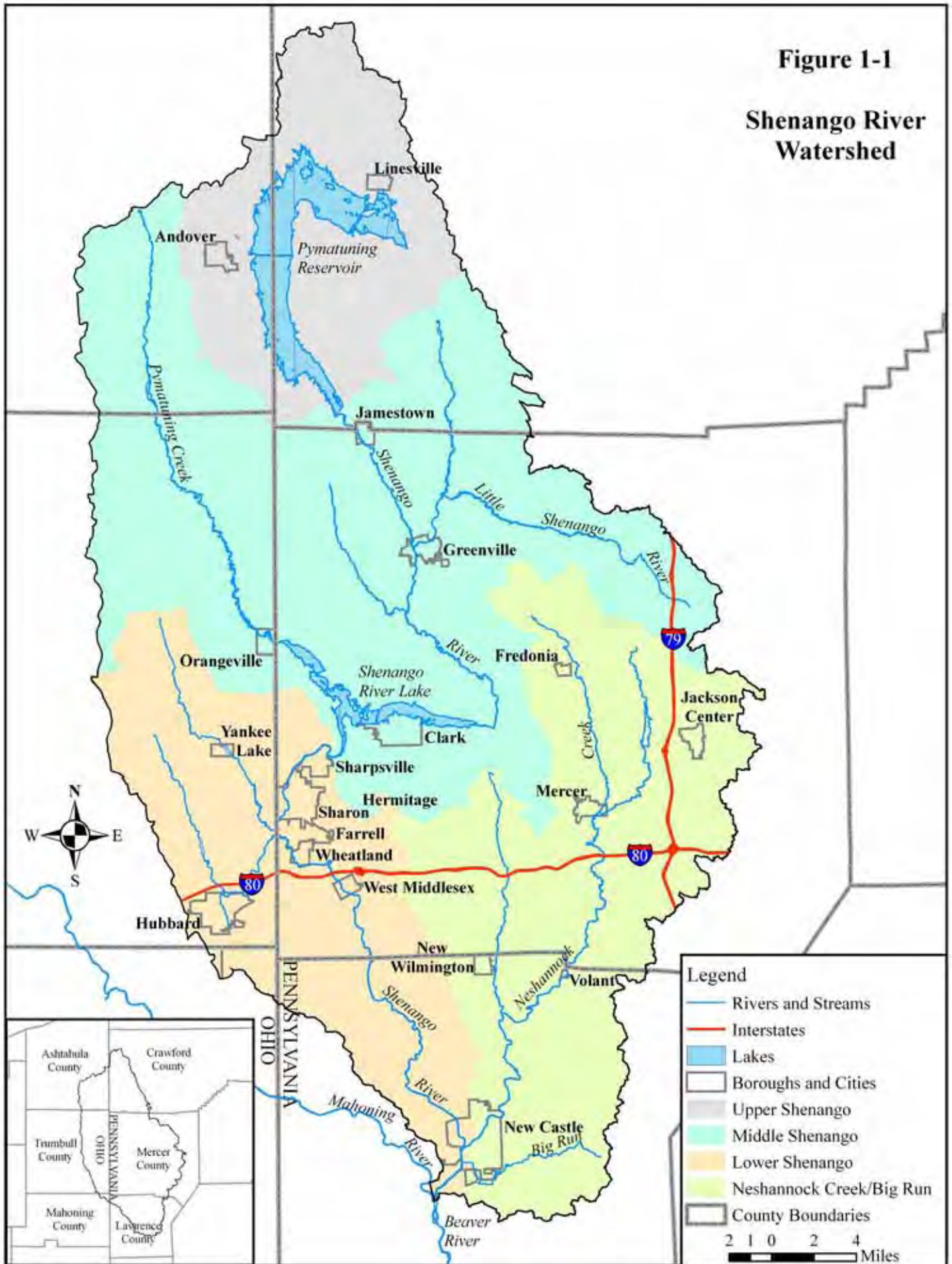
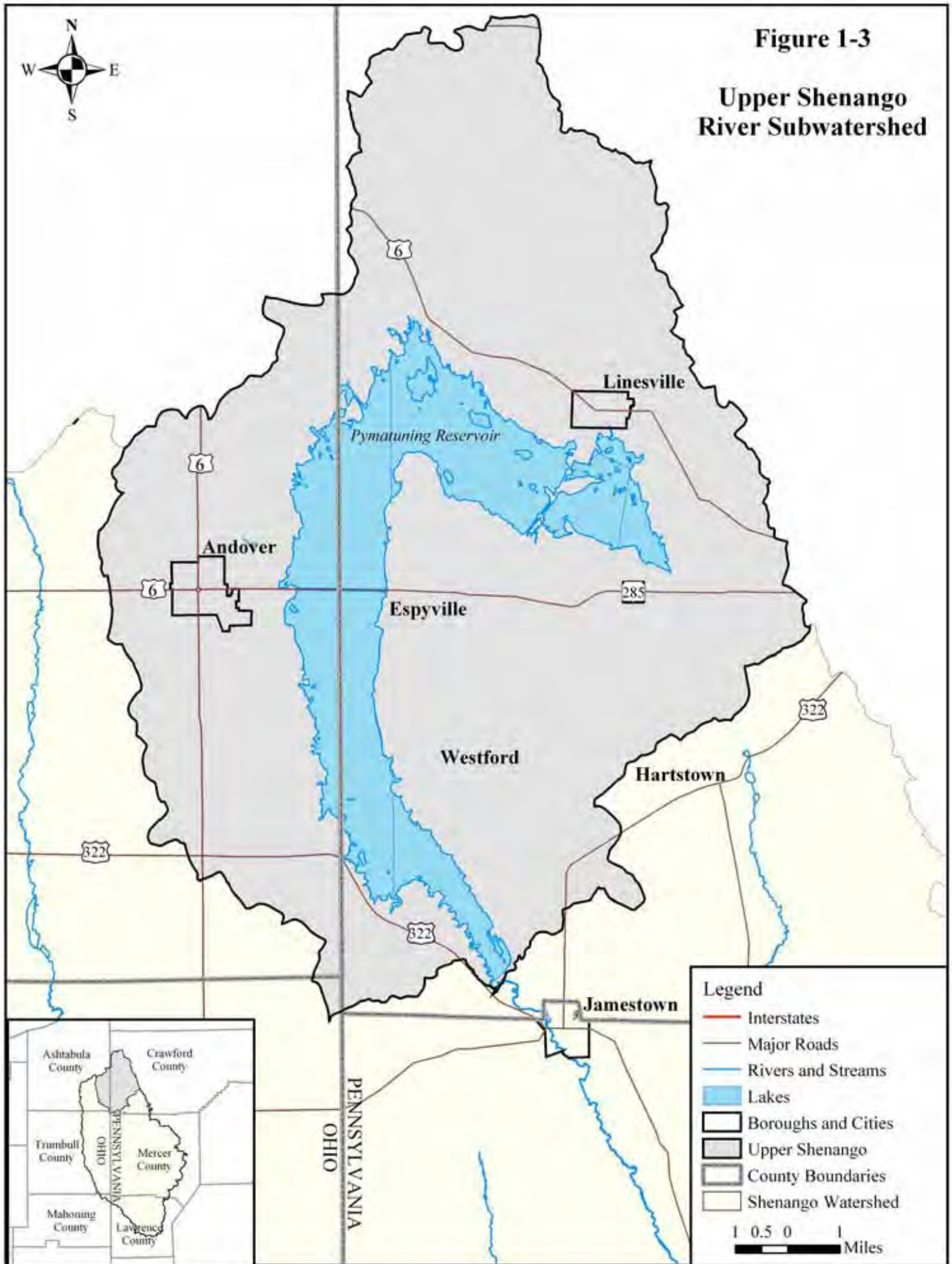


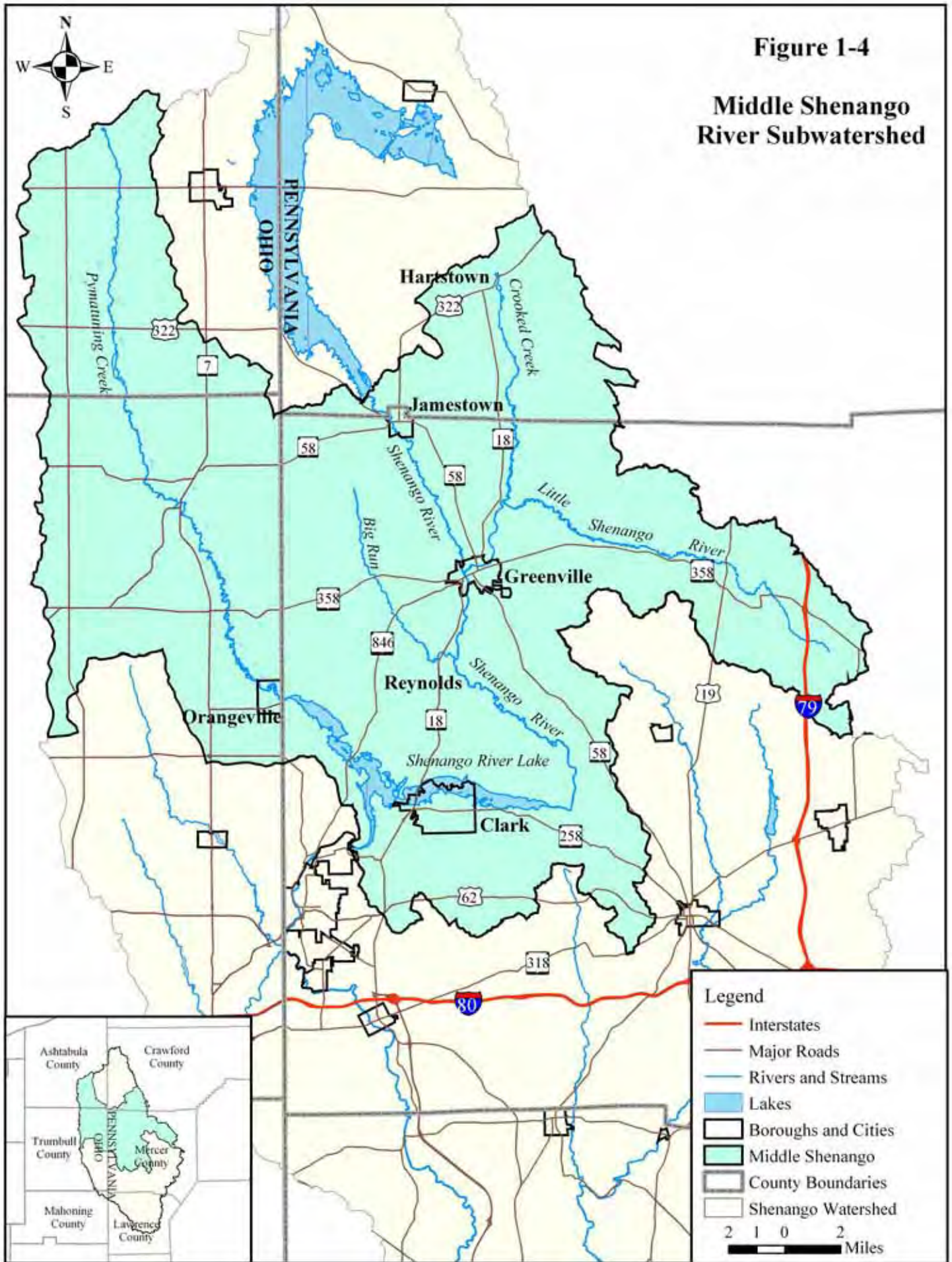
Figure 1-2
Municipalities

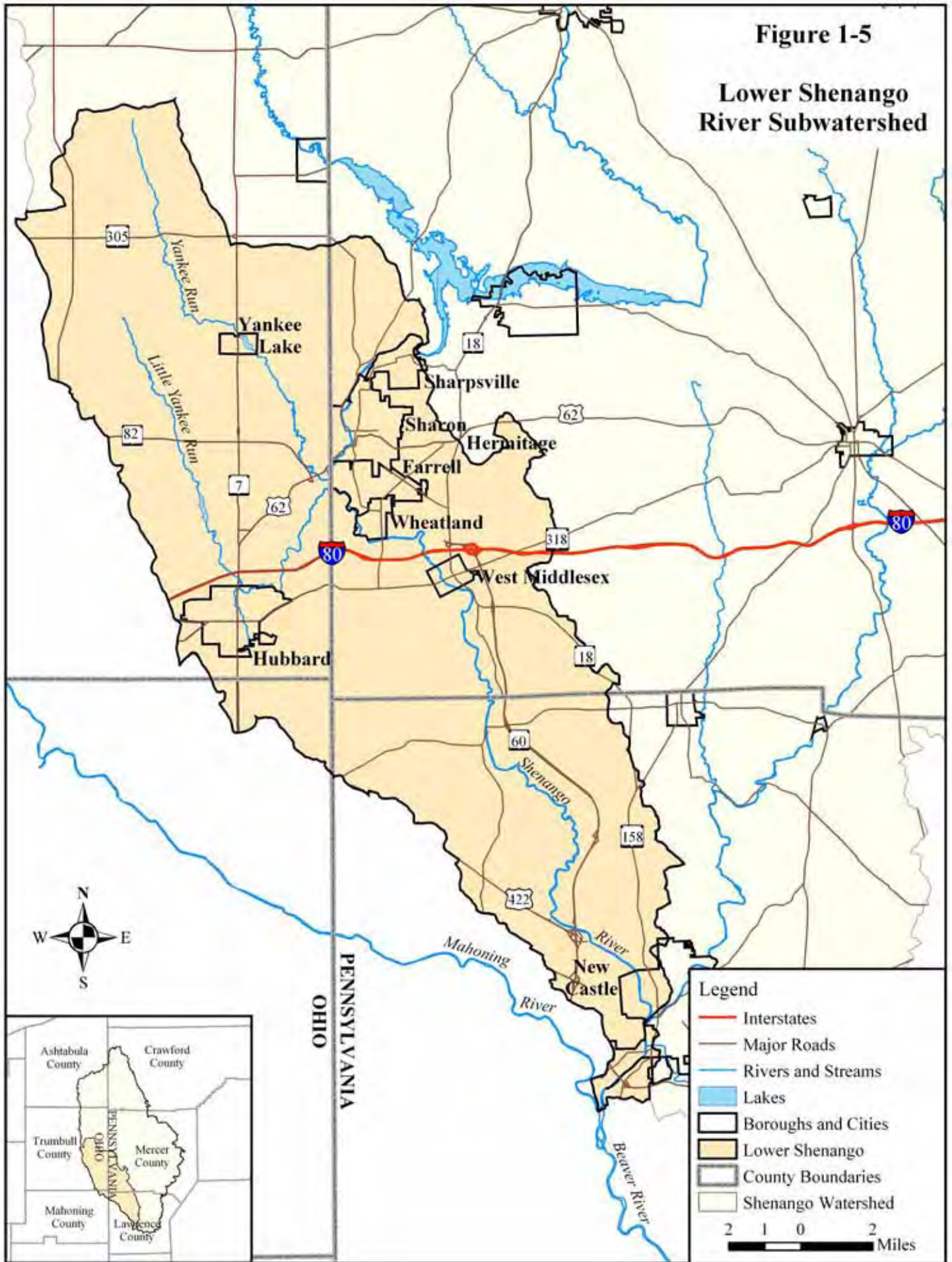


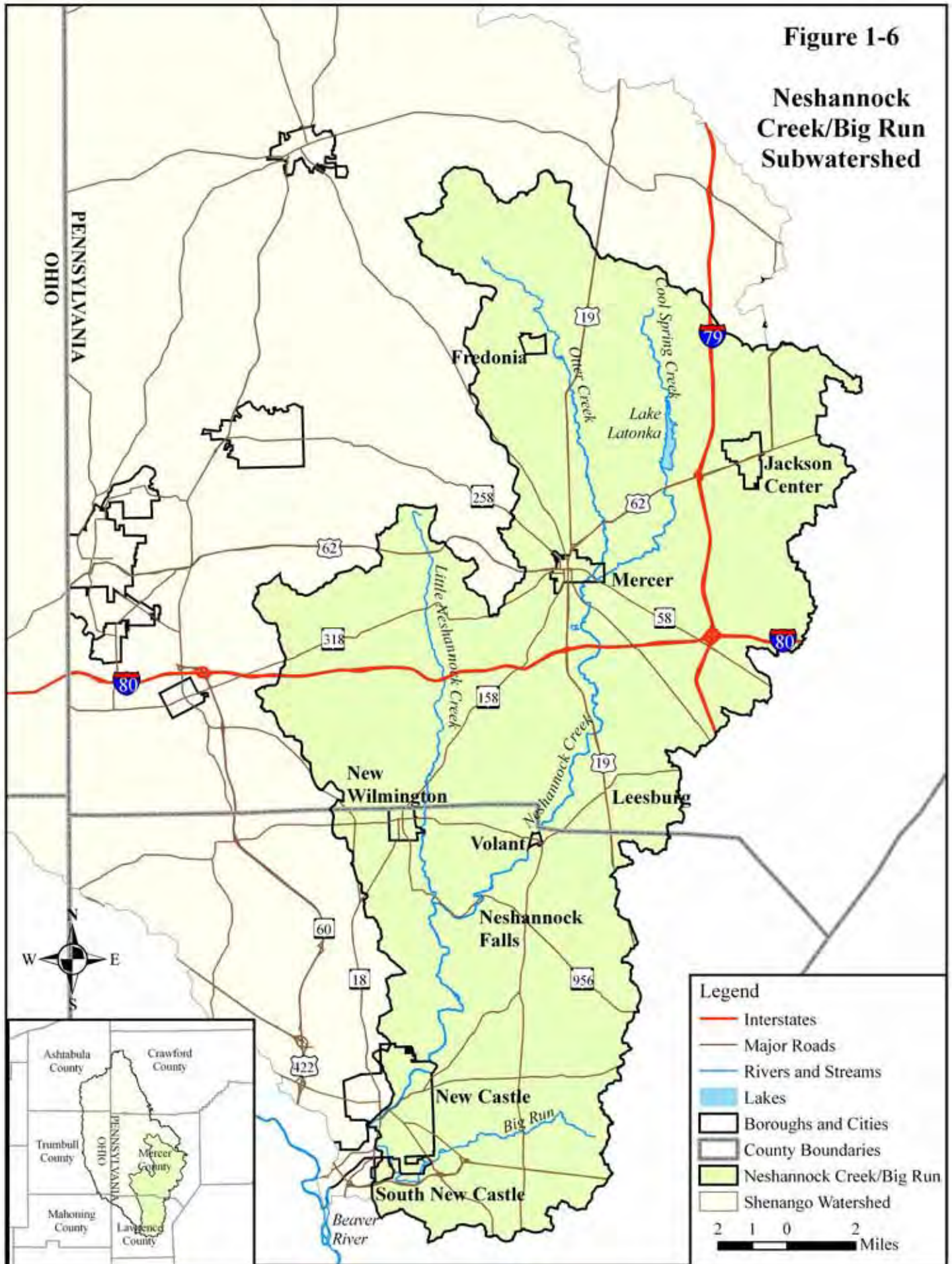
Table 1-1. Pennsylvania Municipalities

Municipalities	Square Miles	% of Watershed	Municipalities	Square Miles	% of Watershed
<i>Mercer County</i>	<i>484.98</i>	<i>45.49</i>	West Salem Township	36.874	3.46
Clark Borough	3.801	.36	Wheatland Borough	0.844	.08
Coolspring Township	19.027	1.78	Wilmington Township	12.988	1.22
Deer Creek Township	0.021	.002	Wolf Creek Township	1.862	.17
Delaware Township	32.959	3.09	Worth Township	2.022	.19
East Lackawannock Township	21.562	2.02	<i>Lawrence County</i>	<i>145.58</i>	<i>13.65</i>
Fairview Township	18.569	1.74	Hickory Township	16.123	1.51
Farrell City	2.317	.22	Mahoning Township	4.458	.42
Findley Township	20.868	1.96	Neshannock Township	17.285	1.62
Fredonia Borough	0.360	.03	New Castle City	7.677	.72
Greene Township	21.840	2.05	New Wilmington Borough	0.762	.07
Greenville Borough	1.797	.17	North Beaver Township	0.000	.00
Hempfield Township	14.286	1.34	Plain Grove Township	0.137	.01
Hermitage City	29.389	2.76	Pulaski Township	26.115	2.45
Jackson Center Borough	1.141	.11	Scott Township	8.508	.80
Jackson Township	17.485	1.64	Shenango Township	17.037	1.60
Jamestown Borough	0.836	.08	Slippery Rock Township	7.278	.68
Jefferson Township	25.472	2.39	South New Castle Borough	0.321	.03
Lackawannock Township	20.774	1.95	Taylor Township	1.714	.16
Lake Township	14.339	1.35	Union Township	5.647	.53
Mercer Borough	1.111	.10	Volant Borough	0.106	.01
New Vernon Township	7.263	.68	Washington Township	11.786	1.11
Otter Creek Township	12.266	1.15	Wilmington Township	20.596	1.93
Perry Township	17.354	1.63	<i>Crawford County</i>	<i>157.09</i>	<i>14.73</i>
Pine Township	0.397	.04	Beaver Township	0.915	.09
Pymatuning Township	17.641	1.65	Conneaut Township	33.707	3.16
Salem Township	11.672	1.09	East Fallowfield Township	20.849	1.96
Sandy Creek Township	3.329	.31	Greenwood Borough	0.061	.01
Sandy Lake Township	1.004	.09	Linesville Borough	0.768	.07
Sharon City	3.776	.35	North Shenango Township	26.052	2.44
Sharpsville Borough	1.401	.13	Pine Township	12.711	1.19
Shenango Township	30.471	2.86	Sadsbury Township	9.097	.85
South Pymatuning Township	21.538	2.02	South Shenango Township	29.996	2.81
Springfield Township	21.034	1.97	Summit Township	2.334	.22
Stoneboro Borough	0.029	.003	West Fallowfield Township	11.720	1.10
Sugar Grove Township	12.410	1.16	West Shenango Township	8.880	.83
West Middlesex Borough	0.845	.08			









The **Neshannock Creek/Big Run subwatershed** includes the Neshannock Creek watershed and the Big Run watershed. They are made up of 35 municipalities in Mercer and Lawrence counties in Pennsylvania, and cover 270 square miles.

Climate

The temperate climate in the Shenango River watershed is typical of western Pennsylvania and eastern Ohio. A temperate climate is a climate without extremes of temperature or precipitation. There are two types of temperate climates: maritime and continental. With its cold winters and warm summers, the Shenango River watershed is a continental climate. A maritime climate maintains fairly steady temperatures across the seasons. During the winter months in the Shenango River watershed, the average low and high temperatures range from 23 to 32 degrees Fahrenheit. The summer average low and high temperatures range from 66 to 72 degrees Fahrenheit.

Topography

Ancient glaciers, which carve out lakes and valleys, have had a profound effect on the topography of some areas, including the Shenango River watershed. Being complex systems, glaciers are dependent upon the climate to dictate whether they grow or shrink. A glacier forms when the temperature is low enough to allow falling snow to accumulate and slowly transform into ice. It then begins to flow outwards and downwards under the pressure of its own weight.

As they move, glaciers erode part of their structure. The eroded materials, known as glacial deposits, are deposited along the path and form features characteristic of glaciated areas. There are a variety of glacial deposits within the watershed. Glacial deposits are described in further detail in Table 1-2.

Table 1-2. Types of Glacial Deposits

Deposit Type	Description
Drumlins	Clusters of elongated hills of un-stratified mixtures of clay, silt, sand, gravel, and boulders.
Eskers	A sinuous ridge of sediment, typically gravel or sand, deposited by streams that cut channels under or through the glacier's ice.
Kames	Deposits that are formed when running water and stagnant ice come into contact.
Kettles	Blocks of ice left behind on outwash plains by retreating glaciers, or outburst floods from ice-dammed glacial lakes caused by collapse of the ice dam.
Moraines	Sediment consisting of mud, sand, gravel, and boulders deposited in long mounds.
Lateral	Form on each side of a valley that a glacier has reached in its advance.
Medial	Separate tributary glaciers that flow into a compound valley glacier.
Terminal	Marks the farthest distance down a valley that a glacier has reached in its advance.
Recessional	Where glaciers advanced and remained stationary for some time in the past.
Outwash Plains	Gentle slopes in front of a glacier where eroded materials, transported by water, were deposited.

The entire Shenango River watershed is located in the Appalachian Plateaus Province. In Pennsylvania, the watershed is part of the Northwestern Glaciated Plateau Section. In Ohio, parts of the Killbuck-Glaciated Pittsburgh Plateau and Grand River Low Plateau sections make up the watershed. Figure 1-7 illustrates the topography and elevation in the watershed.

Figure 1-7
Topography



The **Northwestern Glaciated Plateau Section** is characterized by broad, rounded upland and deep, steep-sided linear valleys partly filled with glacial deposits. The underlying rock is made up of shale, siltstone, and sandstone. It has a dendritic drainage pattern originating from fluvial and glacial erosion and glacial deposition. Elevations range between 900 and 2,200 feet.

Ridges and flat uplands generally above 1,200 feet characterize the **Killbuck-Glaciated Pittsburgh Plateau**. It is covered with thin drift and dissected by steep valleys. Valley segments alternate between broad drift-filled and narrow rock-walled reaches. Elevations range between 600 and 1,505 feet.

The **Grand River Low Plateau** is characterized by gently rolling ground and terminal moraine glacial deposits with thin to thick drift. Poorly drained areas and wetlands are relatively common. Elevations range between 760 and 1,200 feet.

Major Tributaries

The Shenango River has been designated a warm-water fishery in Pennsylvania, except for the mainstem from the Shenango River Dam to river mile one downstream, which is designated a trout-stocked fishery. There are 28 named tributaries entering the Shenango River. The majority of the tributaries to the Shenango River have been designated as warm-water fisheries with a few exceptions. Of the named tributaries, nine are considered to be major tributaries of the Shenango River; they include Neshannock Creek, Little Neshannock Creek, Crooked Creek, Otter Creek, Cool Spring Creek, Paden Creek, Linesville Creek, Pymatuning Creek, and the Little Shenango River. Tributaries will be discussed further in the Water Resources chapter.



Headwaters of Linesville Creek, a tributary to Pymatuning Reservoir

Air Quality

Each year nearly 200 million tons of toxic emissions pollute the air in the United States, making air pollution the nation's largest environmental risk (PA DEP 2003). Any substance in the air that causes damage to life, ecosystems, or property is an air pollutant. Natural and man-made processes can lead to air pollution. Over 90 percent of the pollutants originate from industry, power plants, vehicles, and other human influences. In 1970, the Clean Air Act was passed, setting a national goal to have clean and healthy air for everyone. The act was amended in 1977, and again in 1990.

Airborne pollutants can travel very long distances. They can fall to the ground in raindrops, fog, and dew, in dust, or simply due to gravity. Identifying sources of airborne pollutants to a body of water can be complicated. Pollutants can enter waterways through direct deposition, falling directly into waterways, or through indirect deposition, falling onto land being washed into waterbodies as runoff. Researchers developed the concept of airsheds to assist in the study of atmospheric deposition (the process of airborne pollutants falling to the ground).

Airsheds are geographic areas responsible for emitting 75 percent of the air pollution reaching a body of water. Different pollutants have different airsheds because of their varying behaviors in the atmosphere. Airsheds are determined using mathematical models of atmospheric deposition, as opposed to watersheds, which utilize physical features of the landscape.

Atmospheric Deposition

Atmospheric deposition is the process of airborne pollutants falling to the ground. There are two types of atmospheric deposition, dry and wet. Dry deposition refers to gases and particles that fall to the earth. They deposit on buildings, cars, homes, and trees where these particles can be washed away as runoff during storm events.

Rain, fog, and snow are examples of wet deposition. One type of wet deposition is acid rain, which typically occurs when nitrous oxides and sulfur dioxide react in the atmosphere with water, oxygen, and other chemicals to form various acidic compounds.

Atmospheric deposition can affect the water quality in lakes and streams; terrestrial and aquatic wildlife; forests; human health; visibility; and materials such as, automobiles, statues, and buildings. More information about the effects of acid rain is located in the Water Resources chapter.

Critical Pollutants

Six critical pollutants affect air quality. They include carbon monoxide, lead, nitrogen oxides, ozone, particular matter, and sulfur dioxide.

Carbon monoxide

Carbon monoxide is a poisonous compound that results as a byproduct from the incomplete burning of fuels, such as exhaust of motor vehicles, industrial processes, and wood stoves. It can impair vision, alertness, and other mental and physical functions when inhaled. Individuals suffering from cardiovascular disease are at the highest risk, but healthy individuals can also be affected. Carbon monoxide poisoning can be fatal when high enough levels are present, because it replaces the oxygen in blood and inhibits the delivery of oxygen to body tissues.

Lead

Lead is emitted into the atmosphere through the burning of leaded fuel and industrial processes, such as battery manufacturers and lead smelters. Metal processing is the major source of lead emissions. Lead poisoning reduces mental abilities; damages blood, nerves, and organs; and raises blood pressure when ingested or inhaled. Lead is highly toxic and accumulates in the body, so even small doses are harmful.

Nitrogen Oxides

Nitrogen oxides () are produced when fossil fuels are burned at temperatures greater than 1,200°F . Automobiles, trucks, buses, airplanes, industries, and power plants emit NO_x into the atmosphere. They contribute to the deposition of nitrogen in soil and water through acid rain and play a major role in the formation of ground-level ozone. Human health is impacted when NO_x enter the lungs and make breathing more difficult.

Ozone

Ozone is a colorless, odorless gas that forms in the atmosphere. Depending on where it is located in the atmosphere it can be good or bad. When located in the upper atmospheric layer, it is called the ozone layer and it filters the sun's harmful ultraviolet rays. When it is located in the lowest atmosphere it is called ground-level ozone. Ground-level ozone is a secondary pollutant, a pollutant that is formed in the atmosphere instead of being directly emitted from a specific source. It forms when NO_x combine and react with volatile organic compounds in the presences of sunlight and warm temperatures. Ozone, and the pollutants that cause it, can be transported from hundreds of miles away.

When inhaled, ozone reacts with tissues in our lungs making breathing difficult. People with asthma and lung disease are most seriously impacted, but even healthy individuals are at risk with prolonged exposure.

Particular Matter

Particulates are tiny drops of liquid or small particles of dust, metal, or other materials that float in the air. A mixture of these particles is called particular matter. Four different types and sizes of particular matter exist. These particles travel into the lungs and become trapped. They can cause respiratory ailments and can carry cancer-causing chemicals, producing greater health problems.

Total suspended particulates vary in size up to 45 micrometers in diameter. They can remain suspended in the air for a few seconds to several months. There are no federal or state air quality standards for total suspended particulates.

Particular matter 10 (PM₁₀) is solid matter or liquid droplets from smoke, dust, fly ash, or condensing vapors that can be suspended in air for long periods of time. They are less than 10 micrometers in diameter.

Particular matter 2.5 (PM_{2.5}) is fine particles with diameters less than 2.5 micrometers. They can accumulate in the respiratory system and are associated with numerous adverse health effects, especially among children, the elderly, and individuals with asthma or cardiopulmonary disease.

Sulfates and nitrates are classified together as a critical pollutant. Both have a role in reducing visibility. Sulfates are one of the key components in the formation of acid rain. Nitrates are currently being studied to determine if they have an impact on the formation of acid rain.

Sulfur Dioxide

Sulfur dioxide is emitted into the atmosphere by industrial processes burning coal or oil containing sulfur. Trees, plants, and agricultural crops are damaged by sulfur dioxide and it can accelerate the corrosion of materials, such as monuments, buildings, and iron-containing metals. Sulfur dioxide is the main component of acid rain, joining with water vapor in the atmosphere to form sulfuric acid. Children, the elderly, and individuals with asthma, chronic lung disease, and cardiovascular disease, are more susceptible to negative health effects from this pollutant.

Mercury

Although mercury is not identified as a national critical pollutant, it is an important one. Mercury occurs naturally in air, water, and soil. Many rocks, including coal, release mercury into the atmosphere when burned. It is estimated that half of all mercury deposition within the United States comes from sources within the United States. Approximately 40 percent of the domestic mercury released is from coal-burning power plants. Of the mercury emissions from coal-burning power plants, only one-third is deposited in the United States. Current technology can reduce mercury emissions from coal-burning power plants by 60 to 90 percent.

Mercury emitted into the atmosphere eventually settles into water or onto land, where it can be carried to water by runoff. Once deposited, certain microorganisms can change it into methylmercury, a highly toxic form that builds up in fish, shellfish, and animals that eat fish. Some species of fish and shellfish build up more methylmercury than others and, depending on what they eat, how long they live, and where they are located in the food chain, the level of methylmercury varies.

Humans are exposed to methylmercury primarily through the consumption of fish and shellfish. At high levels, mercury exposure can harm the brain, heart, kidneys, lungs, and immune system. In unborn

babies, newborns, and young children, high levels of methylmercury can impact the development of the nervous system and impair learning.

The United States Environmental Protection Agency (US EPA), United States Food and Drug Administration, and individual states work together to establish local fish advisories for certain types of commercially harvested fish and shellfish. These advisories suggest how often women who may become

**Table 1-3. Fish Consumption Advisories
(Shenango River Lake to Mouth of Shenango River)**

Fish Species	Restriction	Contaminant
Muskellunge	Do not eat	PCB
Carp	Do not eat	PCB
Largemouth bass	One meal per month	Mercury
Smallmouth bass	One meal per month	Mercury
Walleye	One meal per month	Mercury
Bluegill	One meal per month	Mercury
Crappie	One meal per month	Mercury
Sunfish	One meal per month	Mercury
Channel catfish	One meal per month	Mercury
White sucker	One meal per month	Mercury

pregnant, pregnant women, nursing mothers, and young children should eat certain types of fish. Advisories for men, women, and children of all ages are also issued when appropriate.

Within the Shenango River watershed recreationally caught sports fish have a restriction of one meal of eight ounces per week when caught in the waters within Pennsylvania or Ohio. An exception to this restriction would include the following fish caught between the Shenango River Lake to the mouth.

Impacts of Air Pollution

Air pollution not only impacts the quality of the air, but the economy, health, and environment. It contributes to land and water pollution by destroying habitats (through the loss of trees and plants), decreasing property values and incomes, and increasing medical expenses and employee absenteeism. Approximately 25 percent of nitrogen compounds entering the Chesapeake Bay are deposited from the air (Mosier 2002).

Socio-Economic Profile

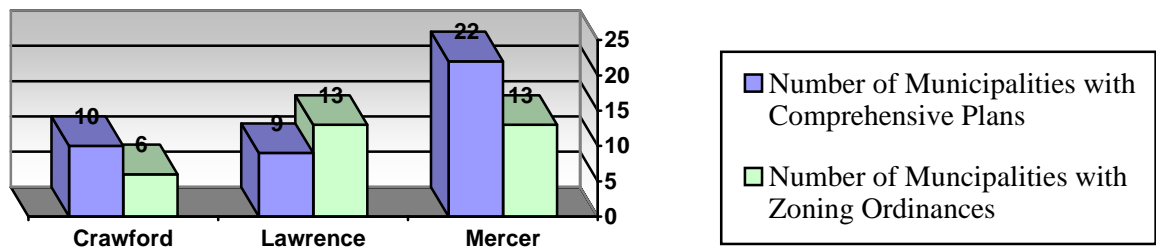
Land-Use Planning and Regulation

The majority of the Pennsylvania municipalities within the watershed are utilizing land-use regulation control powers granted them by the state legislature in the Pennsylvania Municipalities Planning Code. Land-use regulation control powers granted include comprehensive planning, subdivision regulation, and zoning. Unwanted land uses may result from uncontrolled industrial, commercial, or residential development.

Municipalities have the option to establish environmental advisory committees (EACs). EACs are created to advise municipal officials about issues of environmental importance to the community, and recommend ways to protect, preserve, and enhance the natural environment. Committees could be formed for an individual municipality or could encompass several municipalities. Municipalities in the watershed should consider establishing EACs.

Within Pennsylvania, the Shenango River watershed is made up of 70 individual municipalities from Crawford, Lawrence, and Mercer counties. Only 46 percent of the municipalities in the watershed currently have comprehensive plans for their municipality (Figure 1-8 and Figure 1-9). All three counties have recent county comprehensive plans.

Figure 1-8. Municipalities Utilizing Land-Use Regulation Controls



Fifty-nine percent of the Pennsylvania municipalities utilize zoning regulations to control unwanted land uses (Figure 1-8 and Figure 1-9). In Lawrence County, 76 percent of the municipalities have zoning ordinances, while 54 percent of Mercer County and 50 percent of Crawford County municipalities have incorporated zoning ordinances. Table 1-4 lists regulation control powers used by each municipality in the watershed.

In Ohio, there are 22 municipalities within the watershed in the counties of Ashtabula, Mahoning, and Trumbull. The majority of the municipalities in the Ohio portion of the watershed utilize zoning ordinances to control unwanted land uses, but only six municipalities have comprehensive plans. Ashtabula County does not have a county comprehensive plan, while Trumbull and Mahoning counties do. County comprehensive plans may not be binding on communities in Ohio.

Table 1-4. Land-Use Controls

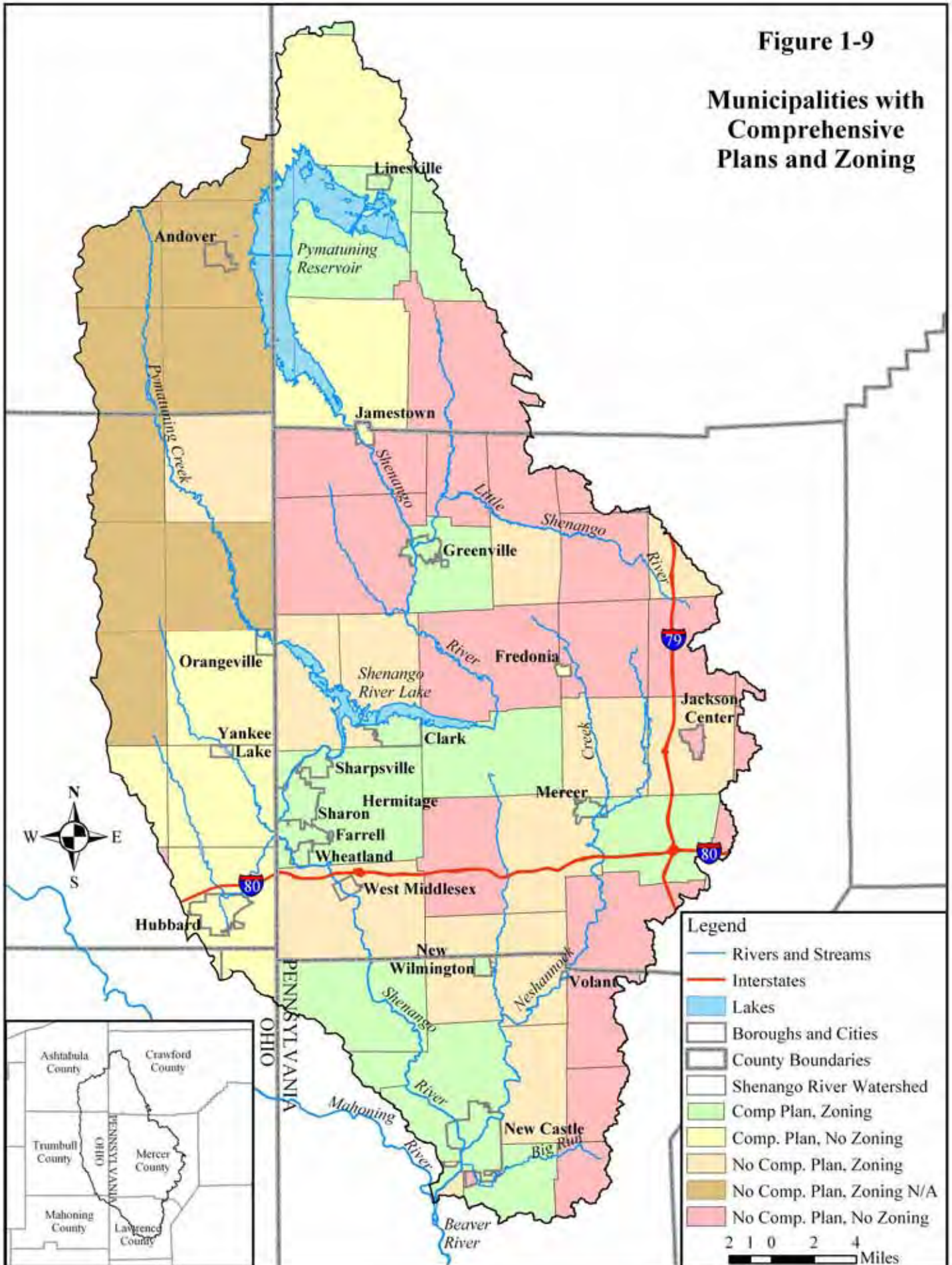
Municipalities	Comp Plan Zoning Joint Comp Plan			Municipalities	Comp Plan Zoning Joint Comp Plan		
	Y	N			Y	Y	N
Crawford County, PA				Lawrence County, PA (continued)			
Beaver Township	Y	Y	N	Neshannock Township	Y	Y	N
Conneaut Township	Y	N	N	New Castle City	Y	Y	N
East Fallowfield Township	N	N	N	New Wilmington Borough	Y	Y	N
Greenwood Township	Y	N	N	North Beaver Township	Y	Y	N
Linesville Borough	Y	Y	N	Plain Grove Township	Y	Y	N
North Shenango Township	Y	Y	N	Pulaski Township	Y	Y	N
Pine Township	Y	Y	N	Scott Township	N	N	N
Sadsbury Township	Y	Y	N	Shenango Township	Y	Y	N
South Shenango Township	Y	N	N	Slippery Rock Township	N	N	N
Summit Township	Y	Y	N	South New Castle Borough	N	N	N
West Fallowfield Township	N	N	N	Taylor Township	N	Y	N
West Shenango Township	Y	N	N	Union Township	Y	Y	N
Lawrence County, PA				Volant Borough	N	Y	N
Hickory Township	N	Y	N	Washington Township	N	N	N
Mahoning Township	Y	Y	N	Wilmington Township	N	Y	N

Table 1-4. Land-Use Controls (continued)

Municipalities	Comp Plan	Zoning	Joint Comp Plan	Municipalities	Comp Plan	Zoning	Joint Comp Plan
Mercer County, PA				Mercer County, PA (continued)			
Clark Borough	Y	Y	N	Stoneboro Borough	N	Y	N
Coolspring Township	N	Y	N	Sugar Grove Township	N	N	N
Deer Creek Township	N	N	N	West Middlesex Borough	N	Y	N
Delaware Township	N	N	N	West Salem Township	N	N	N
East Lackawannock Township	N	Y	N	Wheatland Borough	Y	Y	Y
Fairview Township	N	N	N	Wilmington Township	N	Y	N
Farrell City	Y	Y	Y	Wolf Creek Township	N	N	N
Findley Township	Y	Y	Y	Worth Township	N	N	N
Fredonia Borough	Y	N	N	Ashtabula County, OH			
Greene Township	N	N	N	Andover Township	N	Y	n/a
Greenville Borough	Y	Y	Y	Andover Village	N	Y	n/a
Hempfield Township	Y	Y	Y	Cherry Valley Township	N	Y	n/a
Hermitage City	Y	Y	N	Dorset Township	n/a	n/a	n/a
Jackson Center Borough	N	N	N	Richmond Township	N	N	n/a
Jackson Township	N	Y	N	Wayne Township	N	Y	n/a
Jamestown Borough	Y	N	N	Williamsfield Township	N	Y	n/a
Jefferson Township	Y	Y	N	Mahoning County, OH			
Lackawannock Township	N	N	N	Coitsville Township	Y	Y	n/a
Lake Township	N	N	N	Coitsville	n/a	n/a	n/a
Mercer Borough	Y	Y	Y	Trumbull County, OH			
New Vernon Township	N	Y	N	Brookfield Township	Y	N	n/a
Otter Creek Township	N	Y	N	Fowler Township	N	Y	n/a
Perry Township	N	N	N	Gustavus Township	N	Y	n/a
Pine Township	N	Y	N	Hartford Township	Y	Y	n/a
Pymatuning Township	N	Y	N	Hubbard City	Y	Y	n/a
Salem Township	N	N	N	Hubbard Township	Y	Y	n/a
Sandy Creek Township	N	N	N	Johnston Township	N	Y	n/a
Sandy Lake Township	N	N	N	Kinsman Township	N	Y	n/a
Sharon City	Y	Y	Y	Liberty Township	n/a	n/a	n/a
Sharpsville Borough	Y	Y	Y	Orangeville Village	n/a	n/a	n/a
Shenango Township	N	Y	N	Vernon Township	N	N	n/a
South Pymatuning Township	N	Y	N	Vienna Township	Y	Y	
Springfield Township	N	N	N	Yankee Lake Village	N	N	n/a
<i>n/a - information not available</i>							

Figure 1-9

Municipalities with Comprehensive Plans and Zoning



Demographics and Population Patterns

The Shenango River watershed population was calculated using data from the United States Census Bureau. Census block group information was used in calculating the population (Table 1-5). Figures 1-10 and 1-11 illustrate population and the population changes in the watershed.

Between 1990 and 2000, the population of the Pennsylvania portion of the watershed increased by 8,680 people. Both Mercer and Lawrence counties displayed slight population growth while Crawford County demonstrated a major population increase of 5,017 people. It is believed that the growing number of people who retired and re-established their summer homes as their permanent residences caused the large population change in Crawford County.

In Ohio, the population decreased by 368 people. Ashtabula and Mahoning counties showed moderate population changes within the watershed. Trumbull County showed the only population decline within the watershed.

Infrastructure

Sanitary sewer systems, public water supplies, and transportation usually determine how much development a given area can support. The existence of infrastructure is important in the development and redevelopment of communities. The lack of clean water and sewage disposal can hinder the development process, and therefore send potential jobs to other locations. Planning for development and redevelopment is key to the future of the area.

Sanitary Sewer Systems

Every municipality in the Pennsylvania portion of the watershed has an Act 537 Plan identifying how it will manage sewage in the municipality. Of those plans, 59 percent are 20 years or older, 25 percent are between five and 19 years old, and only 16 percent are less than five years old. Updating older plans is essential, especially in areas where development may occur in the future.

Urbanized areas of the watershed have more sanitary sewer services than do rural areas. There are three types of sewer systems: storm, sanitary, and combined. Stormwater systems carry stormwater runoff through pipes and ditches where they eventually enter into streams. Sanitary systems carry raw sewage from homes and businesses to wastewater-treatment facilities. Combined systems carry a combination of raw sewage and stormwater runoff.

Sewage overflows are a common problem in urbanized areas of the watershed. When sanitary systems malfunction and cause raw sewage to enter nearby streams, it is known as a sanitary sewage overflow (SSO). When the flow exceeds the capacity of the sanitary system and allows untreated wastewater to be discharged to the stream, it is referred to as a combined sewer overflow (CSO). CSOs typically occur during large storm events. The overflows from SSOs and CSOs flush human and industrial waste, oil, toxic metals, pesticides, and litter into streams.

**Table 1-5. Watershed Population by County
(U.S. Census Bureau 1990 and 2000)**

County	1990 Population	2000 Population	% Change in Population
Mercer, PA	95,840	98,237	+2
Lawrence, PA	63,038	64,304	+2
Crawford, PA	4,287	9,304	+54
Ashtabula, OH	4,544	5,269	+14
Mahoning, OH	1,871	2,195	+15
Trumbull, OH	40,430	39,013	-4
Total	210,010	218,322	+4

Figure 1-10

2000 Population by Census Block Group

Note: White spaces within the watershed indicate that the majority of the census block group laid outside the watershed, and therefore was not used in calculations.

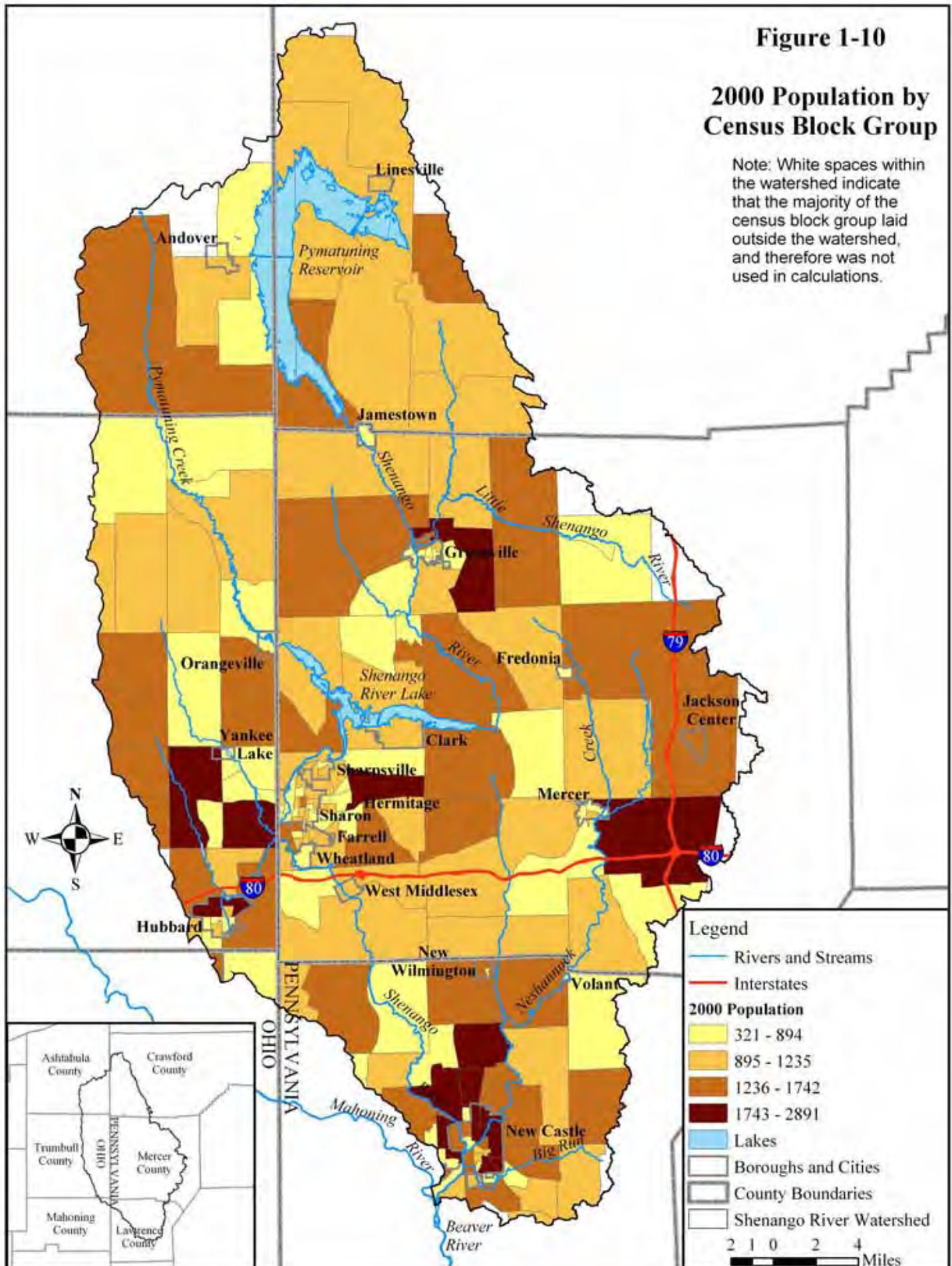
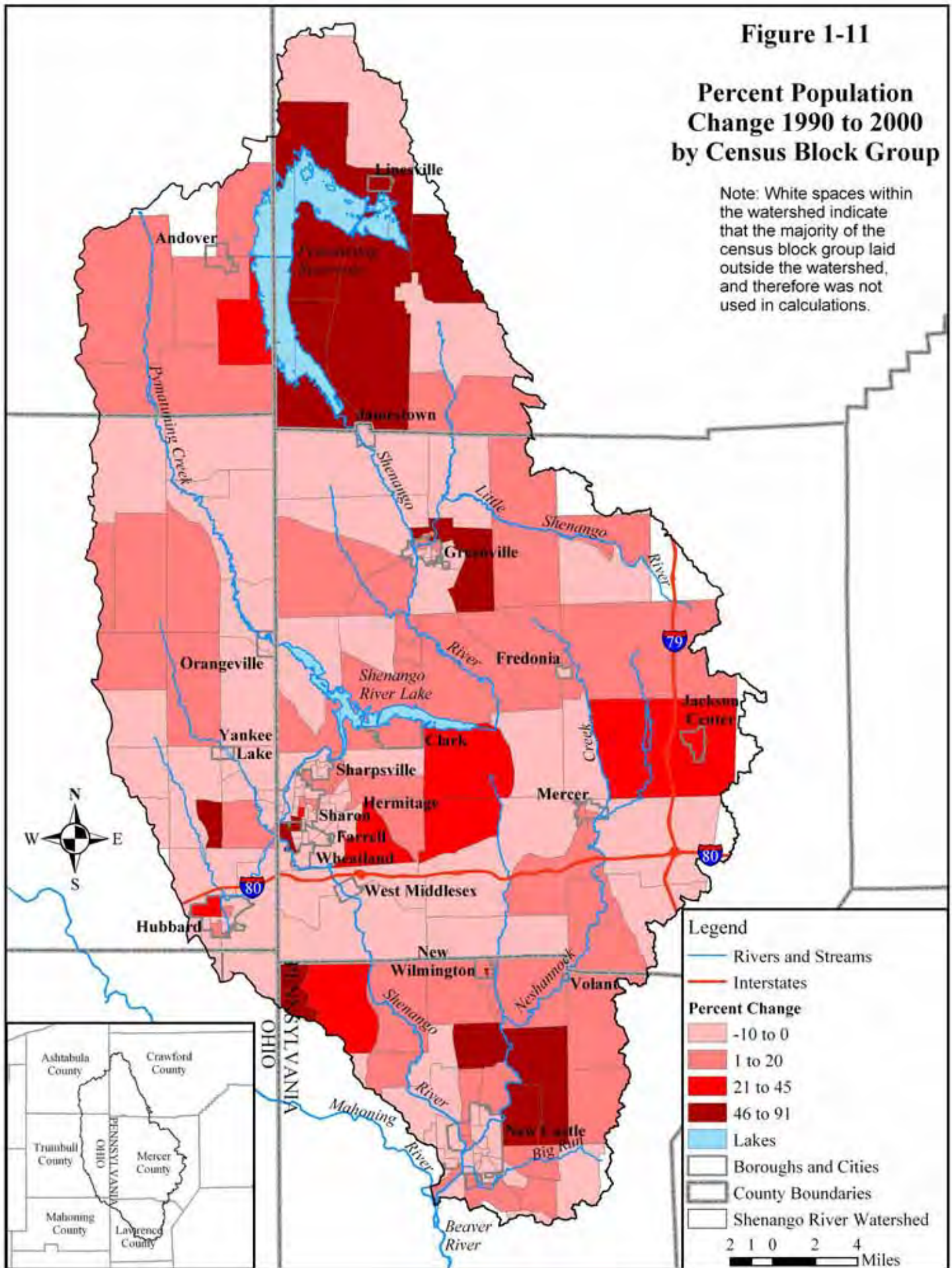


Figure 1-11

Percent Population Change 1990 to 2000 by Census Block Group

Note: White spaces within the watershed indicate that the majority of the census block group laid outside the watershed, and therefore was not used in calculations.



In many areas of the watershed, the installation of proper sewage disposal systems is limited due to soil permeability and the level of the water table. More information about sewage disposal is identified in the Water Resources chapter.

Stormwater Management

Stormwater is water that runs off the land into surface waters during and immediately following periods of precipitation. A stormwater management plan is a comprehensive and practical implementation plan that provides uniform technical standards and criteria throughout the watershed for managing stormwater runoff.

In Pennsylvania, Act 167 requires counties to prepare and adopt stormwater management plans for each watershed in the county, as designated by the Pennsylvania Department of Environmental Protection. In Ohio, the stormwater management program, operated by the Ohio Environmental Protection Agency, mimics the National Pollution Discharge Elimination System requiring that stormwater be treated to the maximum extent practicable. More information about stormwater management is identified in the Water Resources chapter.



*Stormwater pipe entering
Neshannock Creek in New Castle*

Public Water Supply

Having clean water is very important. Within the watershed, there are eight major public water suppliers providing public drinking water to residents. Watershed residents living in rural areas are less likely to have public water and rely on springs or well water for their daily needs. More information about drinking water is presented in the Water Resources chapter.

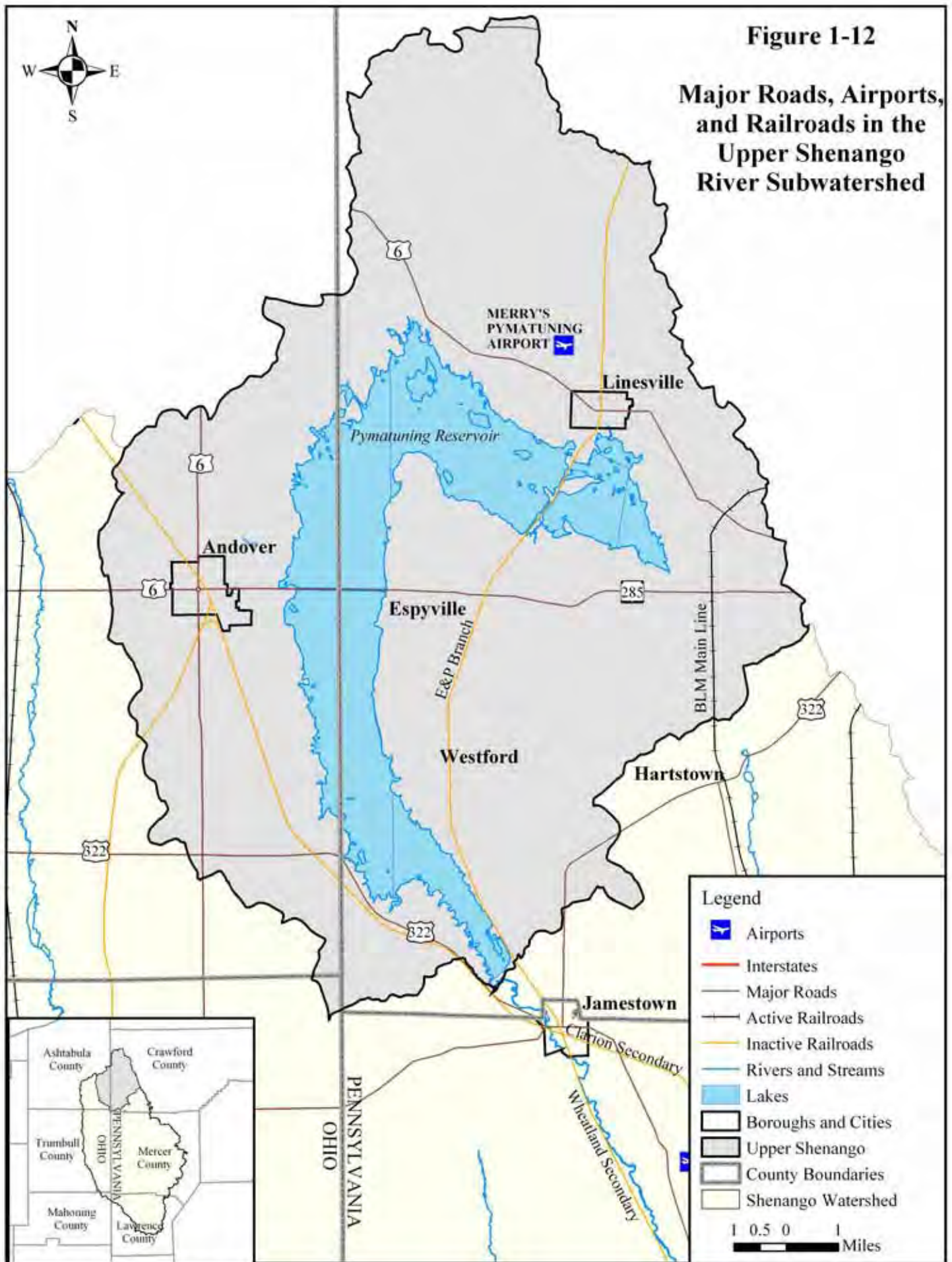
Transportation

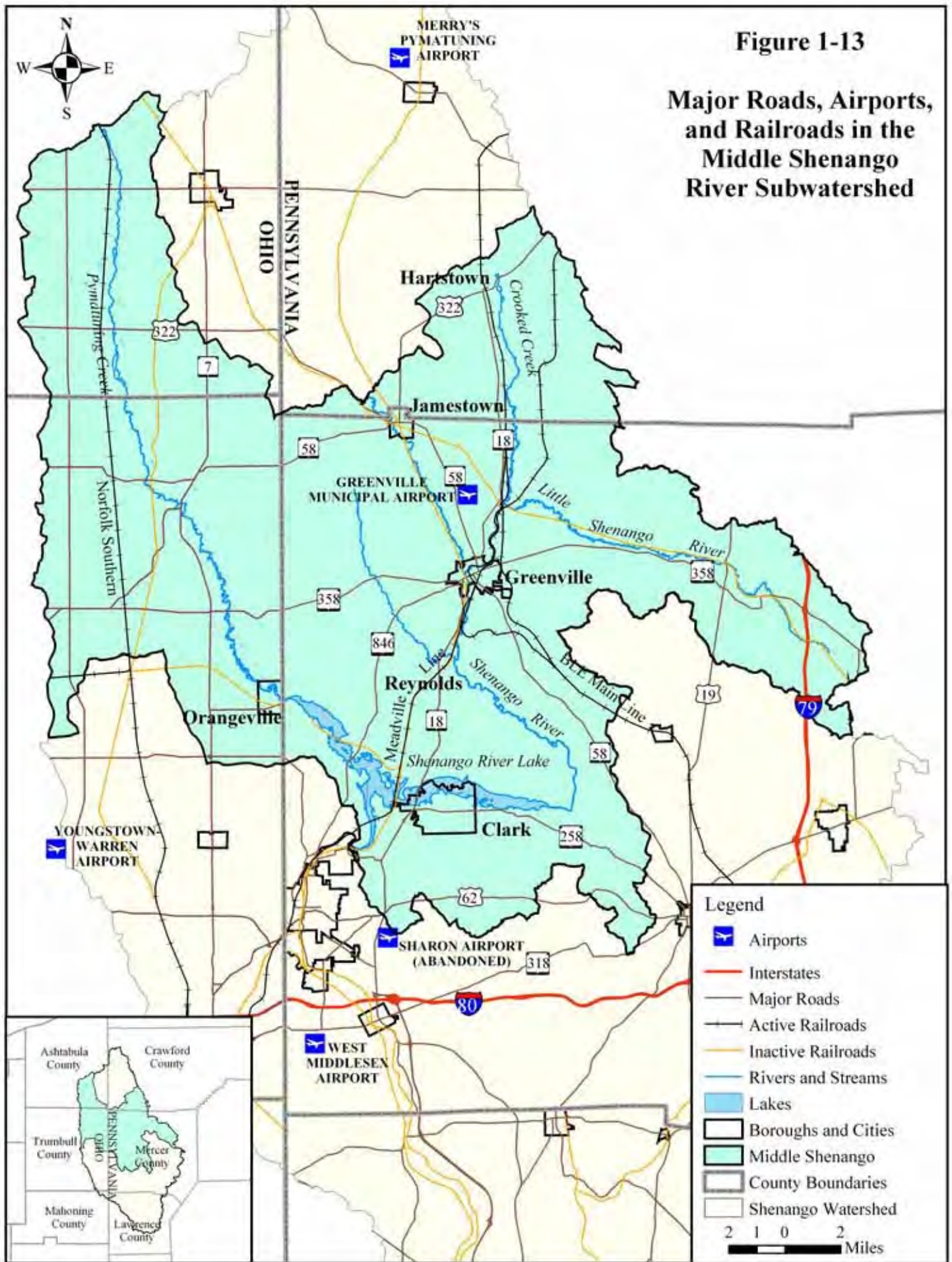
The Shenango River watershed is well connected with its network of highways, railroads, and airports. Transportation issues vary among the different counties. Major roads, railroads, and airports are identified in Figures 1-12, 1-13, 1-14, and 1-15. Two organizations in the watershed are responsible for transportation planning: the Northwest Regional Planning Commission and the Shenango Valley Metropolitan Planning Organization.

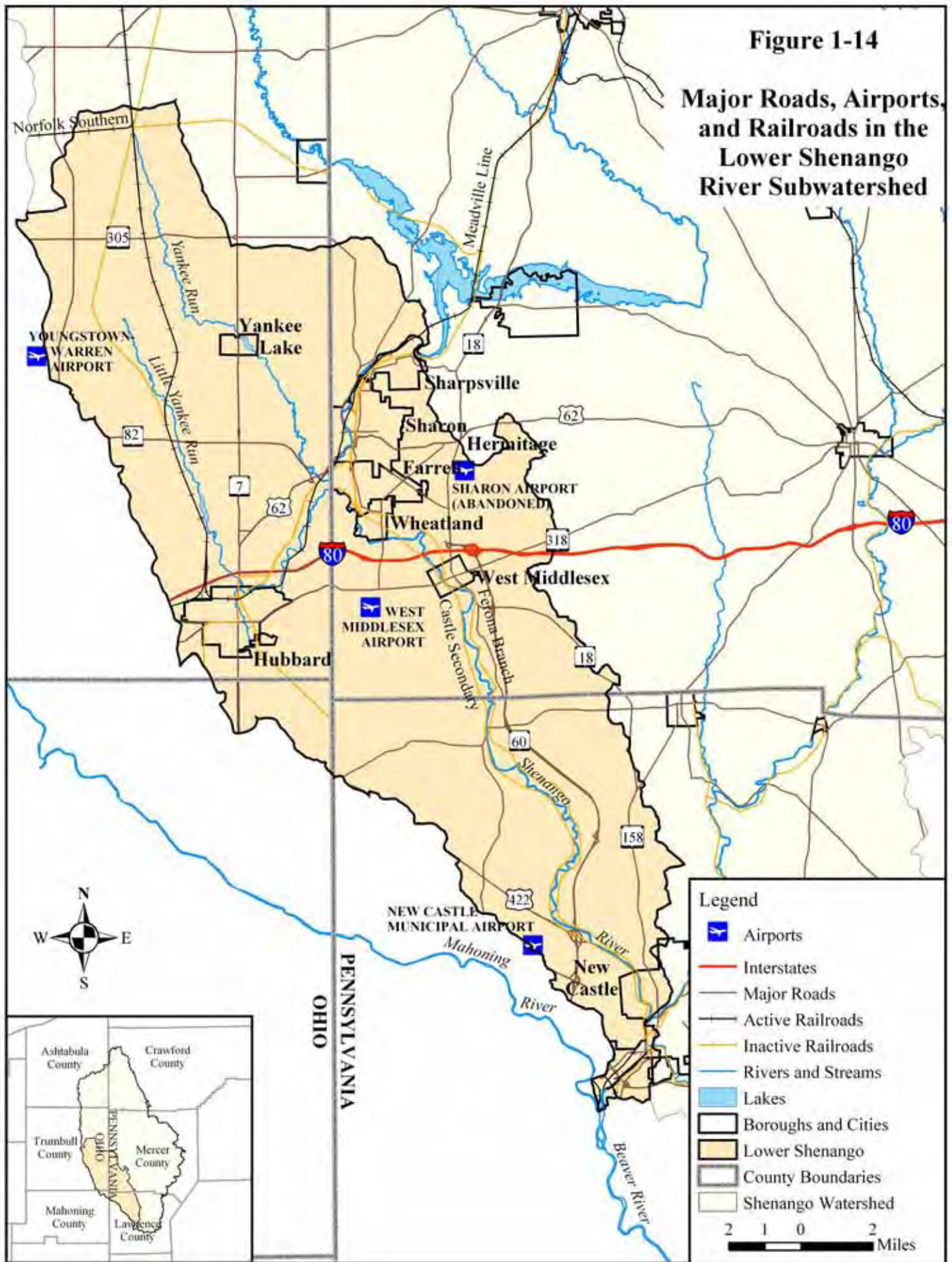
Urbanized areas with populations greater than 50,000 people are required by the federal government to form a metropolitan planning organization (MPO). MPOs are organizations primarily comprised of local officials who provide a forum for local decision-making about regional transportation issues. The only MPO in the watershed is in the Shenango Valley area. They are responsible for various transportation issues in Mercer County.

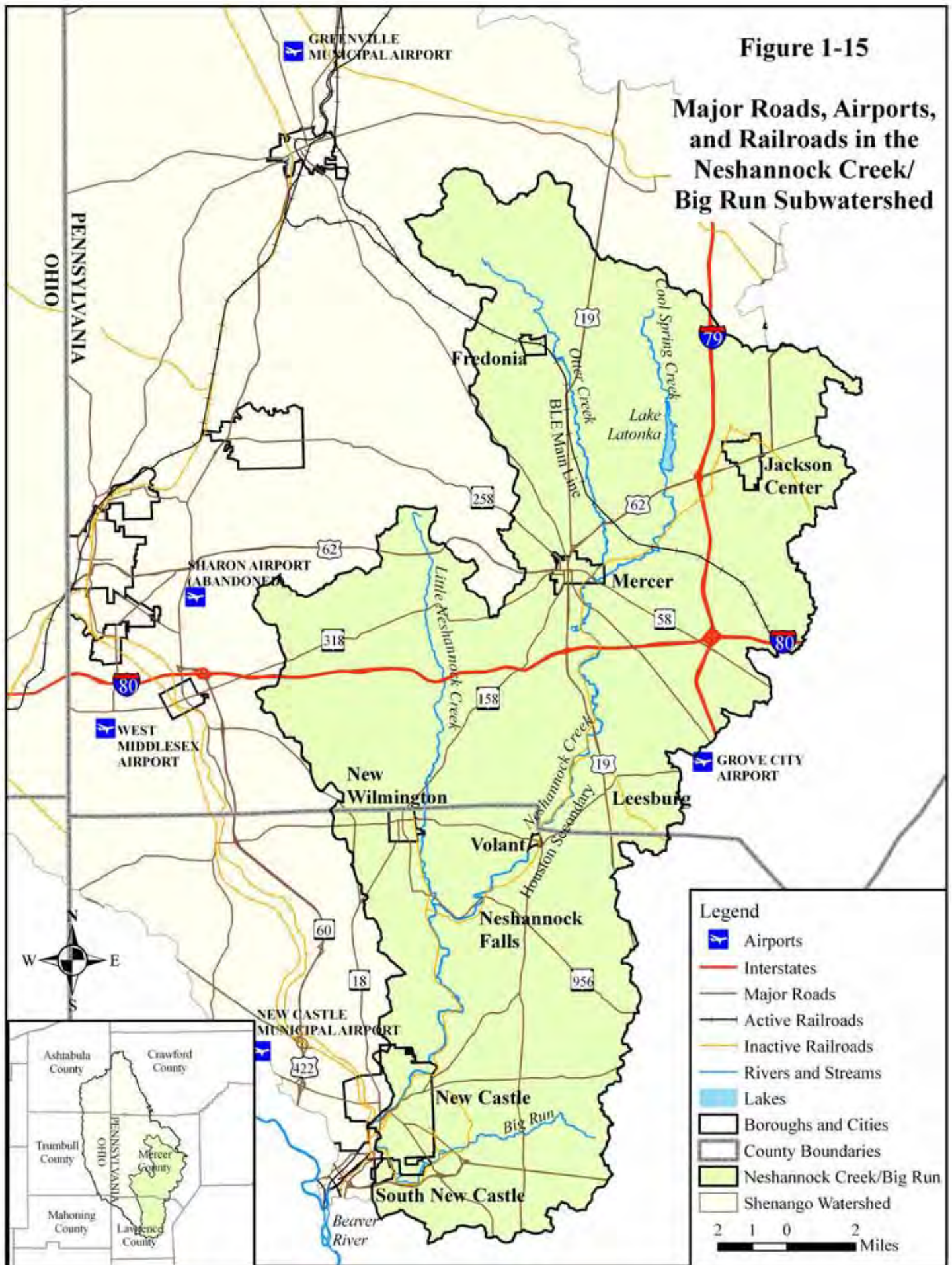
Roads

Interstate highways, state highways, and secondary roads provide automobile access to the Shenango River watershed. Within the watershed there are two interstates. Interstate 79 travels north - south in Pennsylvania, crossing over the eastern portion of the watershed in Mercer County. Interstate 80 travels east - west, crossing the watershed in southern Mercer County in Pennsylvania and southern Trumbull County in Ohio. Other major roads within the watershed include United States Highway Routes 6, 19, 62, 322, and 422; Pennsylvania State Routes 18, 58, 60, 108, 158, 168, 208, 258, 285, 318, 358, 388, 418, 518, 551, 718, 846, and 956; and Ohio State Routes 5, 7, 82, 85, 87, 88, 304, 305, and 609.









Railroads

There are nine active and 13 inactive railroad lines in the Shenango River watershed. The Bessemer Lake Erie Railroad has three active lines. The main line travels from Erie County to Butler County. In Osgood, there are two spurs from the main line traveling to KO Junction: the KO Cutoff and the Greenville Main.

CSX Corporation is another railroad company with three active lines within the watershed. The Main Line of the CSX railroad travels from Beaver County via New Castle Junction to the Ohio border. In New Castle, CSX also operates the New Castle Bridge Line.

Consolidated Rail Corporation is the third company with active lines in the watershed. Traveling from Meadville in Crawford County, through Mercer, to the Ohio border is the Meadville Line. The Youngstown Line travels from Beaver County to the Ohio border. Consolidated Rail Corporation also operates the New Castle Industrial Track.

Airports

There are seven local airports located within the Shenango River watershed: Merry’s Pymatuning Airport in Crawford County; New Castle Municipal Airport in Lawrence County; Greenville, Grove City, Sharon, and West Middlesex airports in Mercer County; and Youngstown-Warren Airport in Trumbull County. Major international airports within close proximity are Pittsburgh International, Erie International, and Cleveland Hopkins International airports.

Economy and Major Sources of Employment

Table 1-6 and Figure 1-16 show the breakdown of employment within Crawford, Lawrence, and Mercer counties. The largest employment sectors for the three counties are the educational, health, and social services industries accounting for 22 percent, and the manufacturing industry accounting for 21 percent. Agriculture, forestry, fishing and hunting, and mining industries account for only two percent of the employment in the three counties. The employment percentages by industry are similar in all three counties.

Figure 1-16. Percent of Employment by Industry in Crawford, Lawrence, and Mercer Counties in Pennsylvania



Table 1-6. Breakdown of Employment in Crawford, Lawrence, and Mercer Counties by Industry (Source: US Census Bureau, 2000)

Industry	Crawford		Lawrence		Mercer	
	Absolute Employment	%	Absolute Employment	%	Absolute Employment	%
Manufacturing	10,384	26.3	6,943	16.9	10,501	20.1
Educational, health, and social services	8,351	21.1	8,779	21.4	12,362	23.7
Retail trade	4,373	11.1	5,463	13.3	6,970	13.4
Arts, entertainment, recreation, accommodation, and food services	2,832	7.2	2,980	7.3	4,036	7.7
Construction	2,352	6	3,037	7.4	2,642	5.1
Other services	2,124	5.4	1,982	4.8	2,588	5
Professional, scientific, management, administrative, and waste management services	1,793	4.5	2,243	5.5	2,425	4.7
Transportation and warehousing, and utilities	1,705	4.3	2,943	7.2	2,594	5
Public administration	1,576	4	1,671	4.1	2,176	4.2
Agriculture, forestry, fishing and hunting, and mining	1,386	3.5	540	1.3	850	1.6
Finance, insurance, real estate, and rental and leasing	1,162	2.9	2080	5.1	2,179	4.2
Wholesale trade	864	2.2	1,626	4	1,984	3.8
Information	612	1.5	748	1.8	835	1.6

Major employers within the watershed are identified in Table 1-7. A major employer is designated as a company having a minimum of 200 employees. In the Shenango River watershed, 12 employers have been designated as major employers.

Table 1-7. Major Employers

Facility	Number of Employees	Location
Sharon Regional Health System	1,700	Sharon, PA
Horizon Hospital System	1,300	Farrell & Greenville, PA
Jameson Health System	1,100	New Castle, PA
John Maneely Company	775	Sharon & Wheatland, PA
Liberty Mutual	715	New Castle, PA
Duferco Farrell Corporation	550	Farrell, PA
New Castle Area School District	475	New Castle, PA
Bruce & Merrilees Electric Company	350	New Castle, PA
Sharon School District	310	Sharon, PA
Dairy Farmers of America	300	New Wilmington, PA
Sharon Tube	294	Sharon, PA
Hermitage School District	280	Hermitage, PA
Infocision Management Corporation	250	New Castle, PA
Dean Dairy	210	Sharpsville, PA
AT&T Relay	205	New Castle, PA

Education

Table 1-8 identifies the school districts and colleges located within the watershed. There are portions of 20 school districts and three technical schools to educate students from kindergarten through twelfth grade. In Crawford County, there is one school district and one vocational school with a combined enrollment of 3,728 students. Eight school districts and one vocational school, with an enrollment of 11,117 students, are located in Lawrence County. In Mercer County, there are 11 school districts, one vocational school, and one education center with an enrollment of 16,788 students. In Trumbull County, five school districts have a combined enrollment of 7,136 students. One school district with an enrollment of 1,426 students is located in the Ashtabula County portion of the watershed.

There are three colleges and three adult technical and vocational education institutions within the Shenango River watershed. Mercer County has two institutions of higher learning: Thiel College and Penn State University Shenango Campus. Thiel College has an enrollment of 1,200 full-time and 79 part-time students, while Penn State Shenango has an enrollment of 582 full-time students and 356 part-time students. The city of Sharon has facilities for the Pennsylvania Business Institute and a nursing school operated by the Sharon Regional Health System. Westminster College is located in Lawrence County and has an enrollment of 1,362 full-time students and 162 part-time students.

Table 1-8. School Districts and Colleges

School District	County	Enrollment	School District	County	Enrollment
Conneaut School District	Crawford	3,163	Lakeview School District	Mercer	1,409
Crawford County AVTS	Crawford	565	Mercer Area School District	Mercer	1,555
Laurel School District	Lawrence	1,467	Mercer County AVTS	Mercer	439
Lawrence County AVTS	Lawrence	413	Reynolds School District	Mercer	1,628
Neshannock Township School District	Lawrence	1,357	Sharon City School District	Mercer	2,441
New Castle Area School District	Lawrence	3,896	Sharpsville Area School District	Mercer	1,284
New Castle Christian Academy	Lawrence	116	West Middlesex Area School District	Mercer	1,210
Shenango Area School District	Lawrence	1,428	Brookfield Local School District	Trumbull	1,576
Union Area School District	Lawrence	817	Hubbard Exempted Village School District	Trumbull	2,345
Wilmington Area School District	Lawrence	1,623	Joseph Badger Local School District	Trumbull	1,234
Commodore Perry School District	Mercer	720	Maplewood Local School District	Trumbull	1,096
Farrell Area School District	Mercer	1,197	Mathews Local School District	Trumbull	984
Greenville Area School District	Mercer	1,648	Pymatuning Valley Local School District	Ashtabula	1,426
Hermitage School District	Mercer	2,335	Penn State - Shenango	Mercer	942
Jamestown Area School District	Mercer	710	Thiel College	Mercer	1,279
Keystone Education Center	Mercer	212	Westminster College	Lawrence	1,524

Management Recommendations:

Land-Use Planning and Regulation

- Alter perceptions of zoning by building partnerships and educating residents about the value of zoning.
- Designate growth and conservation areas based upon data analysis from County Comprehensive Plans, County Natural Heritage Inventories, the Pymatuning Interstate Watershed Plan, and the Shenango River Watershed Conservation Plan.
- Develop individual or joint municipal comprehensive plans.
- Encourage municipalities to utilize regulation control powers available to them, including zoning, to preserve and improve quality of life for watershed residents.
- Enforce existing land-use ordinances.
- Establish environmental advisory committees.
- Establish regional or county-based planning and zoning, in addition to municipal zoning.
- Establish planning and zoning in municipalities where ordinances are lacking.
- Implement smart growth practices when developing residential and commercial areas.
- Protect critical and environmentally sensitive areas with land-use regulations.
- Update and enforce Act 537 sewage plans, especially in areas where development is occurring or where future development is likely to occur.
- Establish a greenway plan for economic revitalization of downtown areas.

Economics

- Attract new businesses to the region with incentives and tax breaks.
- Create tax incentives for private landowners who implement conservation practices.
- Revitalize downtown areas such as New Castle, Sharon, and Greenville.
- Develop riverfront attractions, such as hotels, restaurants, and family entertainment facilities, in the Lower Shenango River subwatershed to highlight the river and its importance to the region.
- Offer incentives to help keep young adults in the area.
- Promote redevelopment of abandoned industrial sites through the Brownfields program, incentives, tax breaks, or other efforts.
- Utilize available nature-based tourism opportunities to increase revenue.
- Encourage the establishment of value-added agriculture processing to provide income opportunities for small agricultural producers.
- Work with elected officials to create a tax reform to assist landowners in maintaining their property.
- Establish tax incentives to keep large tracts of lands intact.

Other

- Establish more collaboration amongst environmental groups, including the development and support for more groups.
- Establish memorandums of understanding between municipalities and public entities to utilize equipment to clean up after local disasters, such as flooding and tornados.
- Conduct workshops and programs to educate the agricultural community about best management practices and new technologies and programs available.

Education

- Conduct workshops, seminars, and demonstrations for decision makers, including developers and government leaders, emphasizing best management practices.
- Identify additional local, state, federal, and private funding for environmental education.
- Increase municipal awareness and cooperation for preserving, protecting, and restoring the natural resources of the watershed.
- Provide public education and awareness programs about the economic benefits and importance of watershed protection.

CHAPTER 2. LAND RESOURCES

Geology

Geology is the science that deals with the study of the earth and its history, and is the name of the natural features of our planet. The modern landscape reflects millions of years of natural events. The different events that took place in various parts of the states are reflected in the vast array of landscapes. Because forces acting on the land had different effects, Pennsylvania is divided into six physiographic provinces, and Ohio into five physiographic provinces. Each province has a particular type of landscape and geology.



Geologic formation in the Upper Shenango River subwatershed

The Shenango River watershed is located in the Appalachian Plateaus Province, extending from Greene and Somerset counties in the southwest to Wayne, Pike, and Erie counties in the north. The Appalachian Plateaus Province covers the greatest area of Pennsylvania and the eastern portion of Ohio. Figure 2-1 shows the surface geology of the watershed.

The Northwestern Glaciated Pittsburgh Plateau section, a portion of the Appalachian Plateaus Province, consists of broad, rounded uplands cut by long, linear valleys. Within the Shenango River watershed, upland linearity is obscure to absent. Uplands are cut by flat-floored, narrow to wide valleys that are separated from adjacent uplands by steep slopes on one or both sides of the valley. For the most part, valleys are very linear and oriented northwest to southeast. The valley floors are often wetlands. Local relief between valley floor and the top of an adjacent upland may be up to 600 feet, but is generally less. Local relief on the valley floors and the uplands is less than 100 feet. Elevation ranges from 900 to 2,200 feet. The drainage pattern of streams in this section is dendritic. Bedrock, which is covered largely by glacial deposits, consists of a variety of sandstone, siltstones, shales, conglomerates, and coal. Many of these rocks are relatively soft and were easily eroded into linear landforms by the continental glaciers.

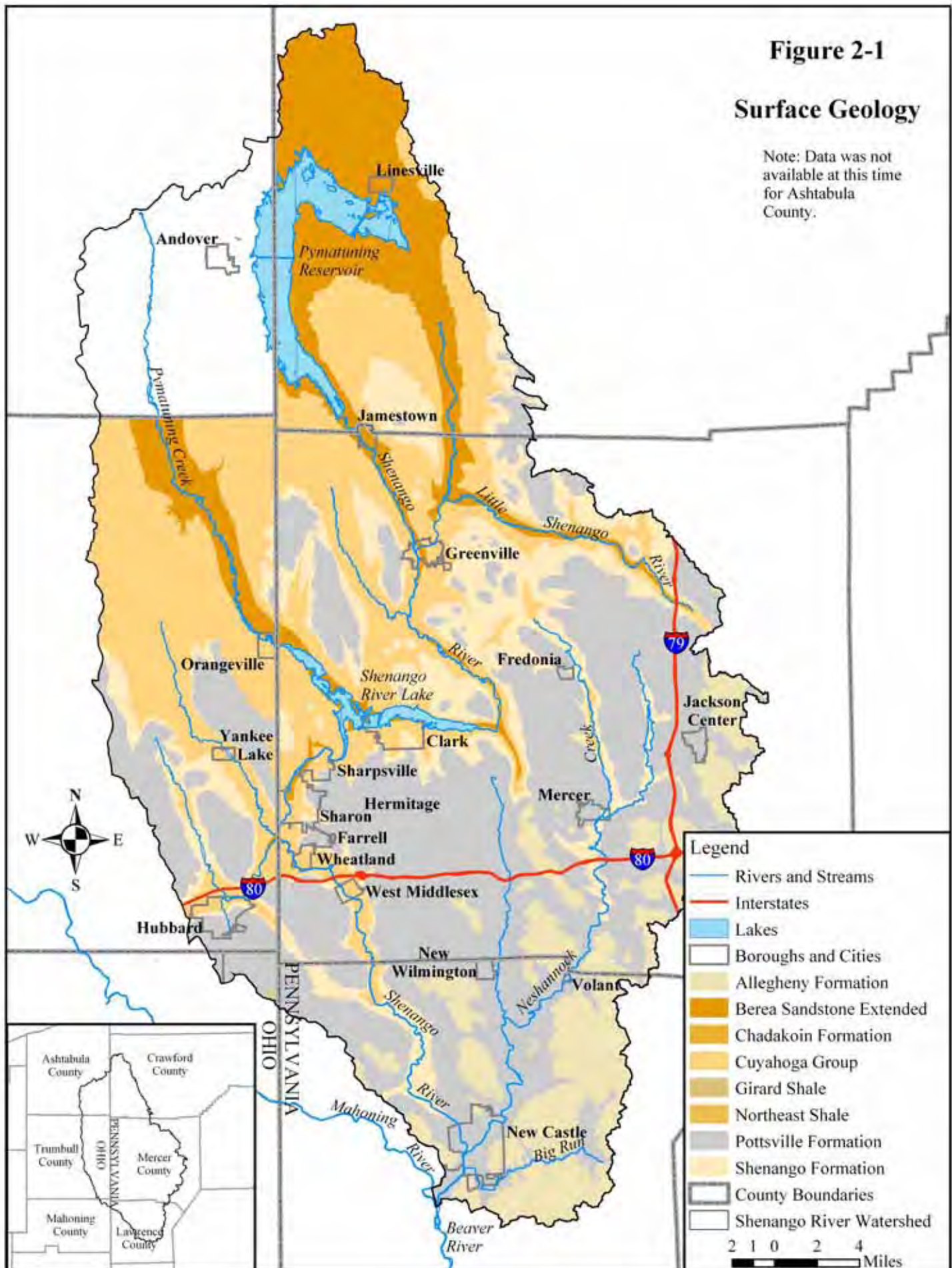
Two glaciers, the Illinoisan and Wisconsinan, changed the surface of the region. Glaciers smoothed off hilltops and ridges, gouged out valleys, and left thick deposits of glacial drift in valleys and thin mantles on uplands. As glaciers moved south, clay, silt, sand, gravel, cobblestones, and boulders were incorporated into the advancing ice. Some of these materials became glacial till when they became trapped and overridden by the ice. As glaciers retreated, more material was deposited in layers or pockets, known as outwash. Numerous knobs, mounds, and terraces along valley walls make up kame deposits of clean-sorted sand and gravel. It is estimated that the most recent glaciations occurred 10,000 to 15,000 years ago.

Northwestern Pennsylvania is underlined with bedrock from the Late Devonian, Early Mississippian, and Early Pennsylvanian ages. The Devonian age bedrock, 365 to 405 million years old, is made up of red sandstone, gray shale, black shale, limestone, and chert. The Mississippian age bedrock, 330 to 365 million years old, is made up of red and gray sandstone, shale, and limestone. The Pennsylvanian age bedrock, 290 to 330 million years old, is made up of cyclic sequences of sandstone, red and gray shale, conglomerate, clay, coal, and limestone.

Figure 2-1

Surface Geology

Note: Data was not available at this time for Ashtabula County.



Upper Shenango River Subwatershed

The Upper Shenango River subwatershed contains sandstone and shale of the Pocono formation (Mississippian age). Devonian rocks underlie the Pymatuning Reservoir. Although Mississippian rocks are found along the lower valley sides, they generally underlie valley sides and upland areas between the north and south ends of Pymatuning State Park. A thin, isolated patch of Pennsylvanian rocks caps the summit to the east of Jamestown.

Middle Shenango River Subwatershed

The Middle Shenango River subwatershed is dominated by bedrock from the Mississippian age, but also has portions from the Pennsylvanian age. Bedrock of the Pennsylvanian age is similar to that of the Mississippian age in content and arrangement. The major difference is that more coal is available in the Pennsylvanian age bedrock and it is available near the surface. Shales and sandstones of the Pottsville group are scattered except in northern lowlands, which contain Pocono formation rocks, and southern uplands, which are capped by the coal measure of the Allegheny group. The Allegheny group includes shale, sandstone, and some coal and limestone that cover the surface.

Lower Shenango River Subwatershed and Neshannock Creek/Big Run Subwatershed

Lower Shenango River and Neshannock Creek/Big Run subwatersheds' bedrock are primarily from the Pennsylvanian age, with a small portion being from the Mississippian age. Three formations of bedrock are found in these subwatersheds: the Pocono, Pottsville, and Allegheny groups.

The **Pocono group** formed during the Mississippian period approximately 310 to 350 million years ago. The formation is massive, hard, gray sandstone and conglomerates exposed in the steep side slopes of the Shenango River Valley.

The **Pottsville group**, formed during the Pennsylvanian age, underlies glacial deposits throughout the Neshannock Valley and northwestern Lawrence County. It predominately consists of sandstone and conglomerate embedded with thin strata of shale, siltstone, and coal.

The **Allegheny group** formed during the Pennsylvanian age but is younger than the Pottsville group. It consists of cyclic sequences of sandstone, siltstone, shale, limestone, and coal.

Soil Characteristics

The development of soil relies on several factors: climate, plant and animal organisms, parent material, time, and differences in elevation. The influence of each factor varies, creating the diversity of soil associations both locally and regionally. The type of soil should determine the use of the land. In Pennsylvania, there are 12 broad soil regions. The Shenango River watershed is located in the Glaciated Appalachian Plateau region.

Soils are derived from glacial till in the Shenango River watershed. Many soils in the region have dense subsoil, known as fragipan, which roots cannot penetrate. The fragipan subsoil allows very slow water and air movement through it. The drainage of soil in the area is poor, as evidenced by the spotted and gray coloring of the soils caused by a suspended seasonal high water table and impeded percolation.

Soil Associations

Soil associations are comprised of two or three major soil types and a few minor soil types. There are 24 associations in the Shenango River watershed. Descriptions of each of the associations are located in Table 2-1 and in the text below (Darrell et al. 1992, Lessig et al. 1971, Reeder and Riemenschneider 1973, Smith 1982, Williams 1992, and Yaworski et al. 1979).

1. The **Canadice-Caneadea association** occupies areas that were lakebeds during the Wisconsin glacial period. The major soils in the association formed on clay and silt sediments that were deposited in the old lakebeds. In most places, the soils are nearly level to gently sloping. Cultivated areas of this association are used mostly as feed crops for dairy cattle. Limitations for farm and non-farm uses of these soils are seasonal wetness, very slow permeability, and the moderately fine to fine texture.
2. The **Canfield-Ravenna association** is dominant on strongly sloping parts of the uplands, near major streams. Less extensive areas occur on high knobs and moraines. Most of the steeper parts of this association are woodlands, with the less steep parts being used for general farming. Erosion control on sloping areas is needed if crops are grown. The slowly permeable subsoil in the major soils and a seasonal high water table in some areas limit the land use for building and community development.
3. The **Canfield-Ravenna-Loudonville association** occupies smooth to hilly uplands and associated drainage ways. Most of this association is farmed. Beef, grain, and dairy farming are the major farm enterprises. Corn, small grain, and hay are major crops. Some previously farmed areas are idle and are reverting to brushland and woodland. Some ridges, steep hillsides, and low wet areas are wooded. In the vicinity of New Castle, New Wilmington, and Mount Jackson, and along major roads, urban development is rapidly increasing. Major limitations include seasonal wetness, slow permeability, shallow depth to bedrock, and steep slope.
4. The **Canfield-Ravenna-Wooster association** generally is located in areas of higher elevation. It consists of loamy, deep, predominately sloping soils that are underlain by loamy glacial till. The dominant soils of this association are easily tilled, have a moderately deep or deep root zone, and have a favorable available moisture capacity. They are well suited for general farm crops, truck crops, and fruit trees. The dominant soils have few limitations for development. They do, however, have limitations for use as septic leach fields.
5. The **Carlisle association** is located in low areas of bogs and swales on terraces, till plains, and in the basins of former glacial lakes. Being ponded much of the year, vegetation is commonly composed of water-tolerant reeds, sedges, and brush. Soils are deep, level, and very poorly drained, with slopes of zero to one percent. Permeability is moderately slow and the available water capacity is very high. A seasonal high water table is near or above the surface for long periods. Most areas of this association are used as habitat for wetland wildlife. Ponding and seepage are major management concerns.
6. The **Chenango-Braceville-Halsey association** occurs as bands on terraces along most major streams and on moraines. The soils of this association are used in a variety of ways. The rolling and complex slopes in some areas make farming and erosion control difficult. There are some productive general farms and some idle lands. Many sites are suitable for building and community development. In some of the dominant soils, contamination of groundwater is a hazard if on-lot sewage disposal systems are not used properly. Because of a high water table and moderately slow permeability, some of the soils have severe limitations for use as septic leach fields.



Farm pasture in the Neshannock Creek/Big Run subwatershed

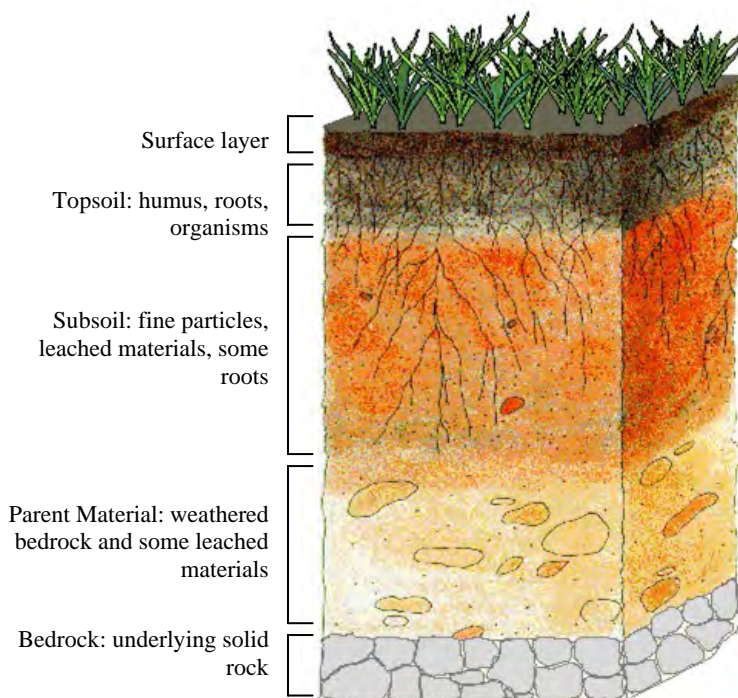
7. The **Chenango-Red Hook-Atherton association** consists of nearly level to moderately steep soils. The major soils in this association are suitable for farming if they are well managed. Dairying is the major farm enterprise. Other than slope and susceptibility to drought, the well-drained Chenango soils have few limitations for many non-farm uses. Seasonal wetness is a limitation of Red Hook and Atherton soils for many non-farm uses.
8. The **Chili-Jimtown-Oshtemo association** is located on broad flats, in undulating areas, and in dissected areas on stream terraces, outwash plains, and kames. Crops, pasture, woodland, or urban development are the main uses of soils in this association. Principal crops include corn, wheat, oats, and hay. Many areas are used for truck crops such as sweet corn, potatoes, and melons. Susceptibility to drought, hazards of erosion, seasonal wetness, and steep slope are major management concerns.
9. The **Conotton-Chili-Holly association** occupies undulating to hilly uplands and adjacent floodplains. Many areas of this association are farmed. Beef and dairy farming are the major farm enterprises. Corn, small grain, hay, and pasture are the major crops. Some previously farmed areas of the association are idle and are reverting to brushland and woodland. Many ridges, steep hillsides, and low wet areas are wooded. This area has potential sources of sand and gravel. Urban development is increasing around small towns. Major limitations include steep slope, low available water capacity, rapid permeability, flooding, and seasonal wetness.
10. The **Fitchville-Haskins-Sebring association** is located on broad flats, in undulating areas on terraces and till plains, and in basins of former glacial lakes. Low gradient sluggish streams are common. Most drained areas are used as croplands and are well suited for row crops. Undrained areas support trees and brush. Seasonal wetness, moderately slow or very slow permeability, hazards of erosion, and ponding are management concerns in this association.
11. The **Holly-Orrville-Tioga association** is located on floodplains bounded by sloping to very steep soils on slope breaks of uplands. The landscape is characterized by narrow to relatively broad valley floors. Flooding occurs during extended rainy periods. Most areas in this association are used as woodland, and a few are used as pasture. Frequent or occasional flooding and seasonal wetness are major management concerns.
12. The **Holly-Red Hook-Chenango association** is located on broad floodplains along major streams, narrow floodplains along smaller streams, and on undulating, rolling, and some smooth stream terraces between floodplains and uplands. The most common type of farming on the more poorly drained soils in the association is dairying. Large areas of nearly level soils that are difficult to drain are in trees and pasture. Cash crops are cultivated on the well-drained and somewhat excessively drained soils in this association. Large areas of nearly level and sloping soils are used for corn, potatoes, wheat, and oats. In dry seasons, the somewhat excessively drained soils are susceptible to drought. In places, the sloping and moderately steep soils are used as a source of sand and gravel. The possibility of groundwater contamination from malfunctioning septic systems exists.
13. The **Loudonville-Mitiwanga association** contains deep soils located in areas on till plains where the shape and landscape are controlled by the underlying sandstone bedrock. Most areas are undulating and those along drainage ways are dissected. Uses of this association are primarily woodland or pasture. Some areas are used as sites for buildings, and few are used as cropland. Most areas are poorly suited for septic leach fields. Hard bedrock at a depth of 20 to 40 inches, seepage, hazards of erosion, steep slope, and seasonal wetness are major management concerns.

14. The **Loudonville-Muskingum-Dekalb association** is extensive along the walls of the valleys of larger streams. It is also located on uplands where rock hills have not been deeply covered by glacial material. Sandstone or shale bedrock is at a depth of one to three and a half feet. Soils are well drained and are mainly gently sloping to strongly sloping. Depth to bedrock limits use of the soils of this association for development. Many of the areas provide good habitat for wildlife.
15. In the **Plateau-Sheffield association**, soils are nearly level to gently sloping, though in some areas along streams they are sloping to steep. Dairying is the major source of farm income in this association. Forage crops, corn, oats, and wheat are the dominant crops. Seasonal wetness and very slow permeability are soil limitations for many non-farm uses in this association.
16. The **Ravenna-Canfield association** is located in undulating areas on till plains that have sloping areas along drainage ways. Slopes are long and uniform in some areas and range from zero to 12 percent. The main use of the soils in this association is for cropland. Some areas are used for pasture, woodland, or development. The slow permeability, seasonal wetness, and hazards of erosion are management concerns.
17. The **Ravenna-Canfield-Frenchtown association** occupies smooth to rolling uplands and associated depressions and drainage ways. Most areas of this association are farmed. Beef and dairy are the major farm enterprises. Some previously farmed land is idle and reverting to brush lands and woodlands. Many ridges and poorly drained areas are wooded. Urban development is rapidly increasing in the vicinity of New Castle, and other population centers, and along major roads. The major limitations are seasonal wetness, slow permeability, and steep slope.
18. The **Ravenna-Frenchtown association** is located in the least sloping parts of the uplands. The landscape is composed of scattered hills on an undulating plain. Many narrow streams dissect the area and many small areas that are very wet, stony, or steep are forested. Some areas have reverted to grass or scrubby trees. Tile drainage is needed to make the area suitable for the cultivation of crops. Erosion control practices are needed on areas with a significant slope. Areas near small towns and cities are being used increasingly for building sites and for other community development purposes. The most common type of farming in this association is dairying. A high water table and restricted permeability are soil limitations that affect many of these uses.
19. The **Sheffield-Plateau association** occupies broad upland areas. Scattered gentle slopes on a broad plain dissected by narrow meandering streams characterize the landscape. Dairy farming is the most common type of farming in the association. Large tracts of land are idle. Many areas are in trees or pasture. The main limitations to soil use are a high water table and very slow permeability.
20. The **Udorthents-Canfield-Ravenna association** occupies hilly areas, smooth to rolling uplands, and associated drainage ways. Most areas of this association are idle land interspersed with woodland and farmland. Dairy farming is the major farm enterprise. A few areas have been planted with trees, mostly conifers. The major limitations are slope, seasonal wetness, small stones, slow permeability, and low available water capacity.
21. The **Venango-Cambridge-Sebring association** is located on broad flats and in undulating areas on till plains with sloping areas in widely separated valleys. Slopes are long and uniform in some areas ranging from zero to 12 percent. This association is used mainly as cropland, but some areas are used for pasture, woodlands, or development. The very slow to moderately slow

permeability, seasonal wetness, ponding, and hazards of erosion are major management concerns.

22. The **Venango-Frenchtown-Cambridge association** is located in broad upland areas consisting mostly of nearly level to gently sloping soils. In some areas of the association, the soils are rolling and have complex slopes. Hills, mounds, knobs, depressions, nearly level areas, and side slopes of valleys characterize the landscape. The majority of this association is used in dairy farming. Some nearly level and poorly drained soils are wooded, pastures, brush, or idle. A significant portion of the cultivated acreage is in forage crops, and the rest generally is planted with corn and oats. In the cultivated areas, erosion-control practices are needed. Steeper soils and hillsides are used for pasture, wildlife, or recreation. Restricted permeability and a high water table are the main limitations for development.
23. The **Wadsworth-Rittman association** is located in undulating areas on till plains that have sloping areas along drainage ways. The soils of this association are mainly used as cropland, pasture, or woodland. Some areas are used as sites for buildings. Slow or very slow permeability, seasonal wetness, and hazards of erosion are the major management concerns.
24. The **Wayland, coarse variant-Papakating-Red Hook association** occurs as bands along floodplains of most of the streams. Most of the areas are flooded when the streams overflow and are seasonally wet. Most of the soils in this association are either too wet to be cultivated regularly, or they occur in such small areas that cultivation is not practical. The wettest areas are pasture or woodland, and cultivation occurs in the best-drained areas. Wetness and flooding are continuing hazards.

Figure 2-2. Primary Layers of a Soil Profile



The **Upper Shenango River subwatershed** includes four soil associations in two states. The soils in the Upper Shenango River subwatershed are deep with various levels of slope and drainage. Underlying materials of the soils include sandstone and shale, glacial till, and alluvium along waterways. The soil associations present in this subwatershed include: Venango-Frenchtown-Cambridge, Holly-Red Hook-Chenango, Sheffield Plateau, and Chenango-Red Hook-Atherton associations.

Sixteen soil associations make up the **Middle Shenango River subwatershed**. Soils in this subwatershed are deep to moderately deep with various slopes and drainage ways. The associations include: Holly-Red Hook-Chenango, Venango-Frenchtown-Cambridge, Ravenna-Frenchtown, Chenango-Braceville-Halsey, Canfield-Ravenna, Venango-Cambridge-Sebring, Ravenna-Canfield, Chili-Jimtown-Oshtemo, Carlisle, Wadsworth-Rittman, Fitchville-Haskins-Sebring, Chenango-Red Hook-Atherton, Plateau-Sheffield, Loudonville-Mitiwanga, Canadice-Caneadea, and Wayland, coarse variant-Papakating-Red Hook.

Table 2-1. Brief Soil Association Descriptions

(Source: Darrell et al. 1992, Lessig et al. 1971, Reeder and Riemenschneider 1973, Smith 1982, Williams 1992, and Yaworski et al. 1979)

Soil Association	Description
Canadice-Caneadea	Deep, nearly level to moderately steep, poorly drained to somewhat poorly drained clayey soils on old glacial lakebeds.
Canfield-Ravenna	Moderately well-drained and somewhat poorly drained, gently sloping to moderately steep soils underlain by glacial till, on uplands.
Canfield-Ravenna-Loudonville	Nearly level to very steep, moderately deep and deep well-drained to somewhat poorly drained soils; formed in glacial till.
Canfield-Ravenna-Wooster	Mainly gently sloping, somewhat poorly drained to well-drained soils that have a fragipan in the subsoil; on uplands.
Carlisle	Level, very poorly drained soils formed in organic deposits.
Chenango-Braceville-Halsey	Well-drained to very poorly drained, gently sloping to moderately steep soils underlain by sandy and gravelly deposits, on stream terraces and moraines.
Chenango-Red Hook-Atherton	Deep, nearly level to moderately steep, well-drained to poorly drained loamy and gravelly soils on terraces and kames.
Chili-Jimtown-Oshtemo	Nearly level to very steep, well-drained and somewhat poorly drained soils formed in coarse textured and moderately coarse textured glacial outwash.
Conotton-Chili-Holly	Nearly level to very steep, deep, somewhat excessively drained, well-drained, and poorly drained soils; formed in glacial outwash and alluvium.
Fitchville-Haskins-Sebring	Nearly level and gently sloping, somewhat poorly drained and poorly drained soils formed in medium textured and moderately fine textured lake material and in medium textured to coarse textured glacial outwash over moderately fine textured and fine textured glacial till or lake material.
Holly-Orrville-Tioga	Nearly level, poorly drained, somewhat poorly drained, and well-drained soils formed in moderately fine textured to moderately coarse textured alluvium.
Holly-Red Hook-Chenango	Deep, very poorly drained to somewhat excessively drained, nearly level to sloping soils that formed in materials weathered from stream deposits and glacial outwash; on floodplains and terraces.
Loudonville-Mitiwanga	Nearly level to moderately steep, well-drained and somewhat poorly drained soils formed in moderately fine textured to moderately coarse textured glacial till.
Loudonville-Muskingum-Dekalb	Gently sloping to steep, well-drained soils that are mostly moderately deep over sandstone or siltstone; on uplands.
Plateau-Sheffield	Deep, nearly level to sloping, somewhat poorly drained to poorly drained silty soils on glaciated uplands.
Ravenna-Canfield	Nearly level to sloping, somewhat poorly drained and moderately well-drained soils formed in medium textured and moderately coarse textured glacial till.
Ravenna-Canfield-Frenchtown	Nearly level to moderately steep, deep, moderately well-drained to poorly drained soils; formed in glacial till.
Ravenna-Frenchtown	Somewhat poorly drained to poorly drained, nearly level to gently sloping soils formed in glacial till; on uplands.
Sheffield-Plateau	Deep, poorly drained and somewhat poorly drained, near level and gently sloping soils that formed in materials weathered from glacial till; on uplands.
Udorthents-Canfield-Ravenna	Nearly level to very steep, deep, excessively drained to somewhat poorly drained soils; formed in material from strip mines and in glacial till.
Venango-Cambridge-Sebring	Nearly level to sloping, poorly drained to moderately well-drained soils formed in medium textured glacial till and in medium textured and moderately fine textured lake material.

Table 2-1. Brief Soil Association Descriptions (continued)

Soil Association	Description
Venango-Frenchtown-Cambridge	Deep, moderately well-drained to poorly drained, nearly level to moderately steep soils that formed in materials weathered from glacial till; on uplands.
Wadsworth-Rittman	Nearly level to sloping, somewhat poorly drained and moderately well-drained soils formed in medium textured and moderately fine textured glacial till.
Wayland, coarse variant-Papakating-Red Hook	Very poorly drained to moderately well-drained, nearly level soils underlain by alluvium on floodplains.

The **Lower Shenango River subwatershed** is made up of deep soils with various slopes and drainage ways. There are 15 soil associations, including Holly-Orrville-Tioga, Chili-Jimtown-Oshtemo, Loudonville-Mitiwanga, Ravenna-Canfield, Ravenna-Canfield-Frenchtown, Canfield-Ravenna-Wooster, Canfield-Ravenna-Loudonville, Loudonville-Muskingum-Dekalb, Conotton-Chili-Holly, Fitchville-Haskins-Sebring, Wadsworth-Rittman, Ravenna-Frenchtown, Chenango-Braceville-Halsey, Canfield-Ravenna, and Wayland, coarse variant-Papakating-Red Hook associations.

The **Neshannock Creek/Big Run subwatershed** is made up of seven soil associations with deep soils. The associations include Ravenna-Frenchtown, Ravenna-Canfield-Frenchtown, Chenango-Braceville-Halsey, Canfield-Ravenna, Canfield-Ravenna-Loudonville, Conotton-Chili-Holly, and Wayland, coarse variant-Papakating-Red Hook associations.

Prime Agricultural Soils

Soils that meet certain physical, chemical, and slope characteristics are identified as prime agricultural soils. Based upon a predetermined set of criteria, they are designated by the United States Department of Agriculture (USDA) Natural Resources Conservation Service in each county. The criteria typically include level to near level slopes, a well-drained structure, deep horizons, an acceptable level of alkaline or acid components, and the capacity for producing food and crops. There are 86 prime agricultural soils in the watershed (Figure 2-3, Figure 2-4, Figure 2-5, and Figure 2-6). A listing of these by county is located in Appendix C.

Agricultural Land Preservation Program

According to the American Farmland Trust, the United States is losing two acres of farmland every minute to new development. From 1992 to 1997, America converted more than six million acres of agricultural land to developed uses, of which, 134,900 acres were prime farmland in Pennsylvania.

Since the inception of the Pennsylvania Agricultural Preservation Program in 1989, over 280,000 acres have been preserved on 2,431 farms (Pennsylvania Department of Agriculture 2004a). The program enables state, county, and local governments to buy development rights or conservation easements from farmers to ensure their property remains as agricultural land indefinitely. Local programs are organized on the county level.



Farm located in Neshannock Township

The preservation of farmland is important and benefits the local economy, the environment, and the culture of the region. Agriculture is considered the number one industry in Pennsylvania, with one out of every six jobs agriculturally related (American Farmland Trust). Locally produced foods are healthier

and typically cost less due to shorter transport and a smaller amount of food preservation necessary. Local production of agricultural products needs to be marketed within the region.

Preserved farm properties are managed by local landowners using best management practices for soil and water conservation. Open farm and forestlands are important for the recharge of groundwater and provide critical habitat for local wildlife populations. Local scenic landscapes are important for attracting visitors and preserving the quality of life. Local family farms add to the tranquil scenery, and history of the local area.

Agricultural Security Areas

Agricultural security areas (ASAs) are lands enrolled in statewide programs to promote and conserve agricultural lands and the agricultural community. ASAs serve as a tool to protect farmland from urbanization. They are designated by local governments in cooperation with landowners to secure agricultural land use and the right to farm.

In Pennsylvania, areas of at least 250 collective acres are eligible to enroll in the program. The acreages need not be contiguous, but each parcel must be no less than 10 acres. Property established as an ASA must be viable agricultural land, including pasture, hay land, woodland, or cropland. The local governing body reviews ASAs every seven years.

The benefits to the landowner include: limited government ability to condemn land for roads, parks, and other infrastructure projects; a municipal agreement not to create “nuisance laws,” including odor and noise ordinances that would limit agricultural practices; and eligibility of landowners to sell the development rights of their farm as a conservation easement to the Commonwealth of Pennsylvania.

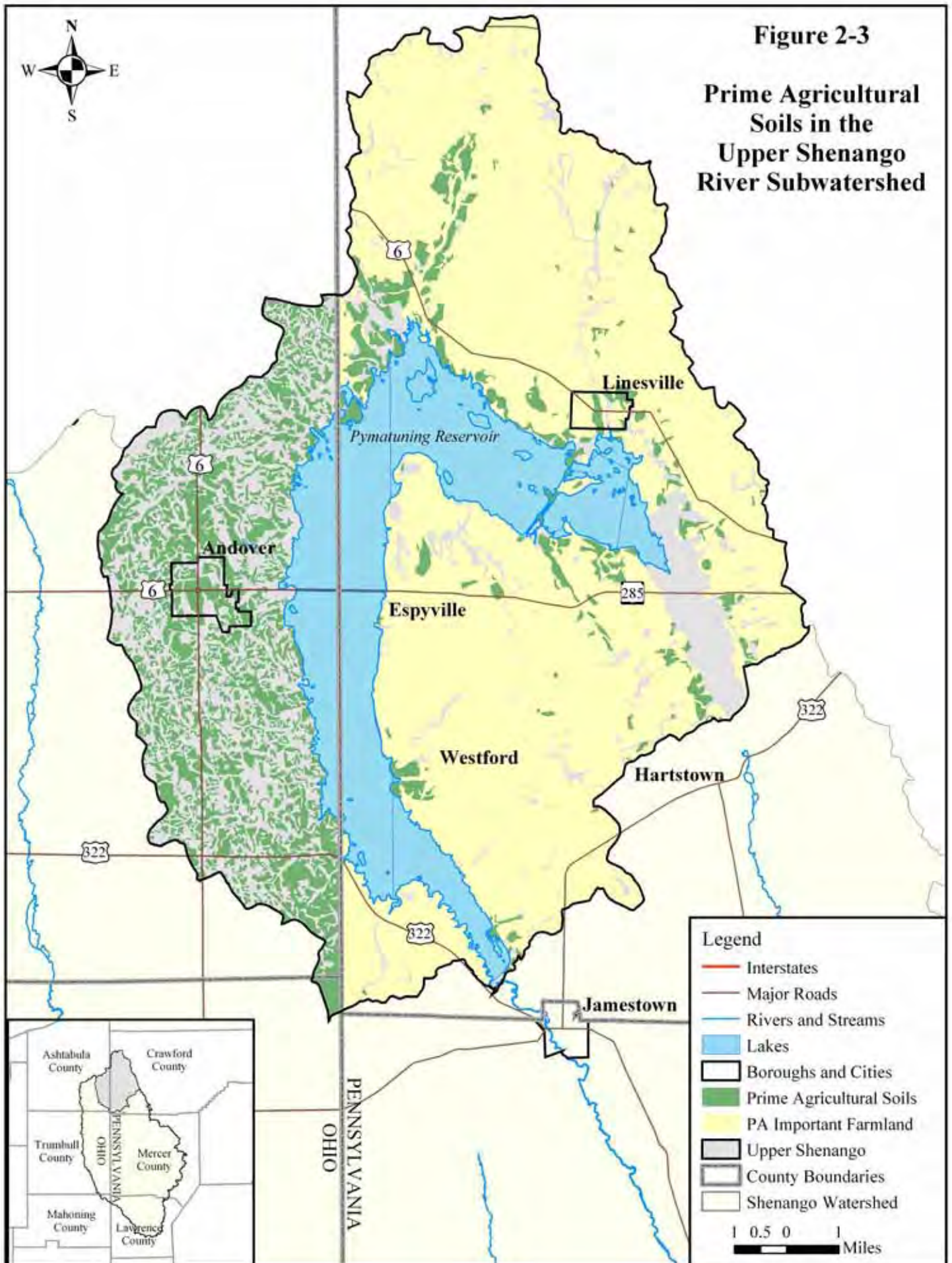
An easement is a deed restriction that landowners may voluntarily place on their property to protect its natural resources. With an easement agreement, the owner authorizes the easement holder to monitor and enforce restrictions set forth in the agreement, and ensures that the property will be protected indefinitely.

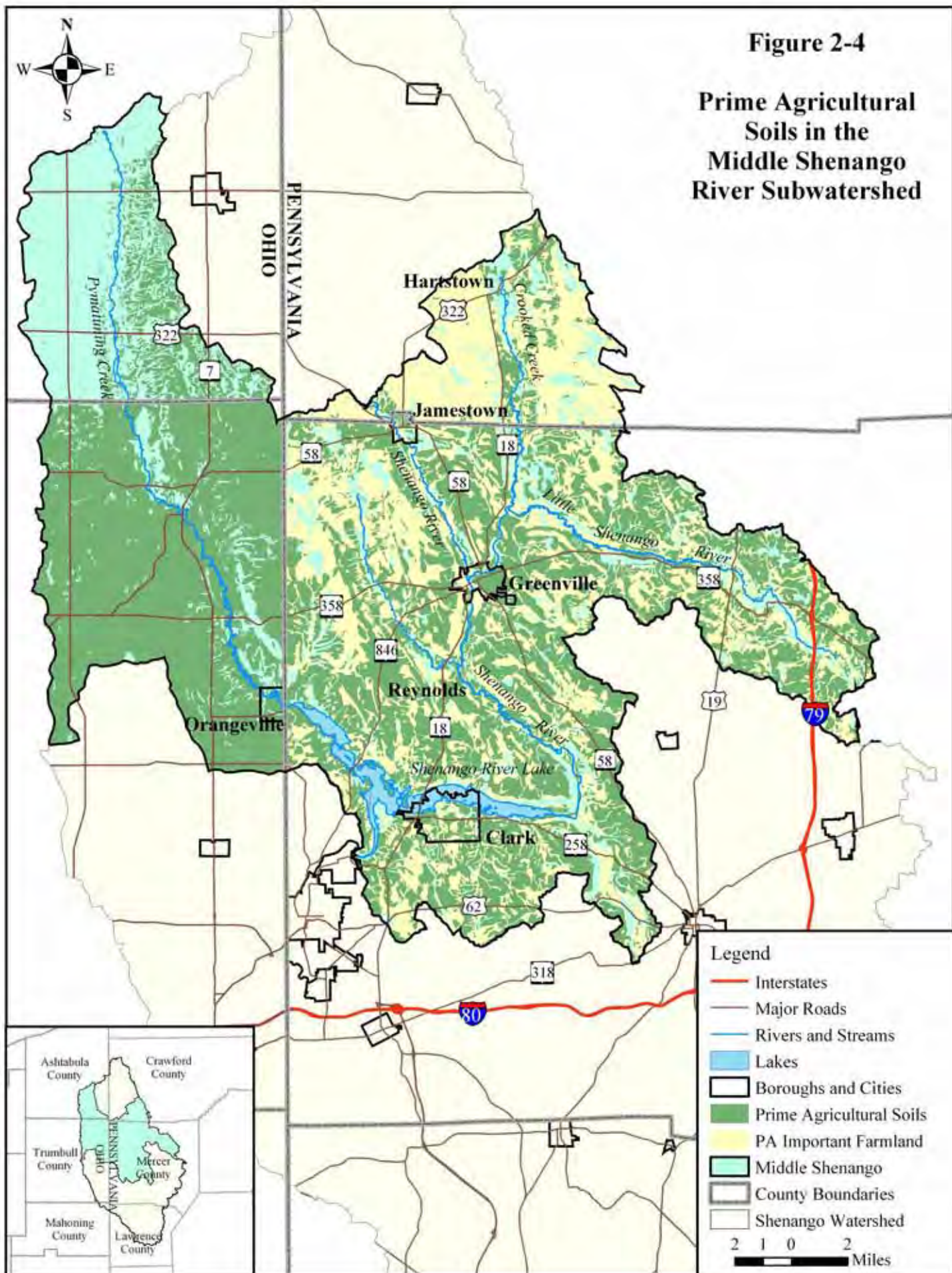
In Ohio, efforts to establish an ASA program are in progress. ASAs in Ohio are defined as viable agricultural lands of specified size owned by one or more persons. They may be made up of several non-connected parcels, in which case, the local government may enact a minimum acreage requirement. The land must be used for the production of crops, livestock, and livestock products. Local governments will consider establishing ASAs when requested to do so by the landowner(s). Once an ASA is designated, the land in the area receives special treatment designed to keep the land in agricultural use and prevent unreasonable restrictions on farm operations.

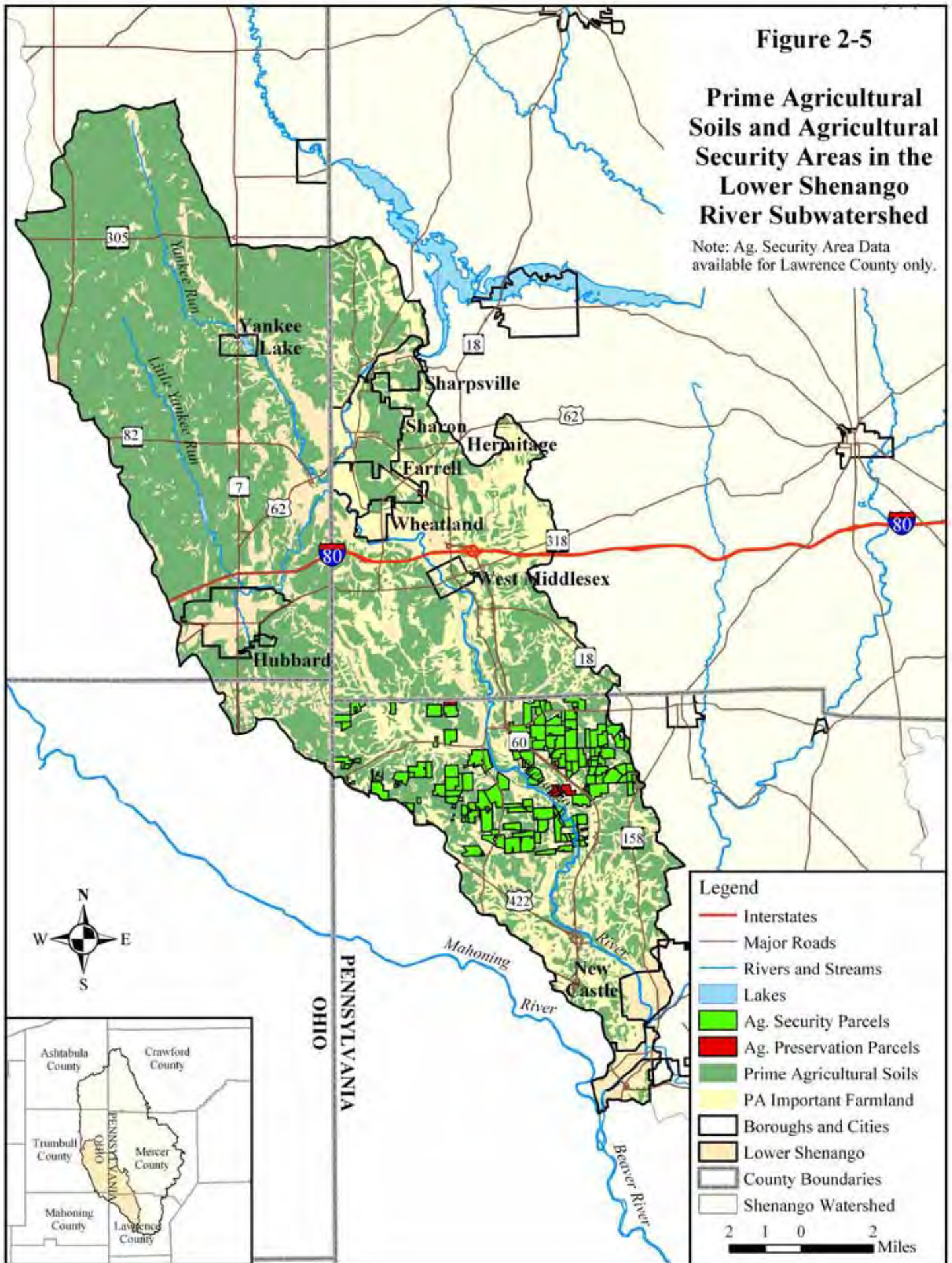
There are approximately 111,433 acres of ASA in the municipalities making up the Shenango River watershed (Figure 2-5, and Figure 2-6). Table 2-2 identifies the municipalities with ASAs.

Land Use

Land use is often cited as a major determinant of environmental quality, and is an issue of much debate at the local, regional, state, and national levels. In Pennsylvania, land use has recently been given significant attention. In 1999, the Sound Land Use Advisory Committee was established to identify sustainable land-use practices and make recommendations about their implementation. The passage of legislation supporting programs such as Growing Greener (1998) and Growing Smarter (1999) is also instrumental in promoting sound land-use practices.







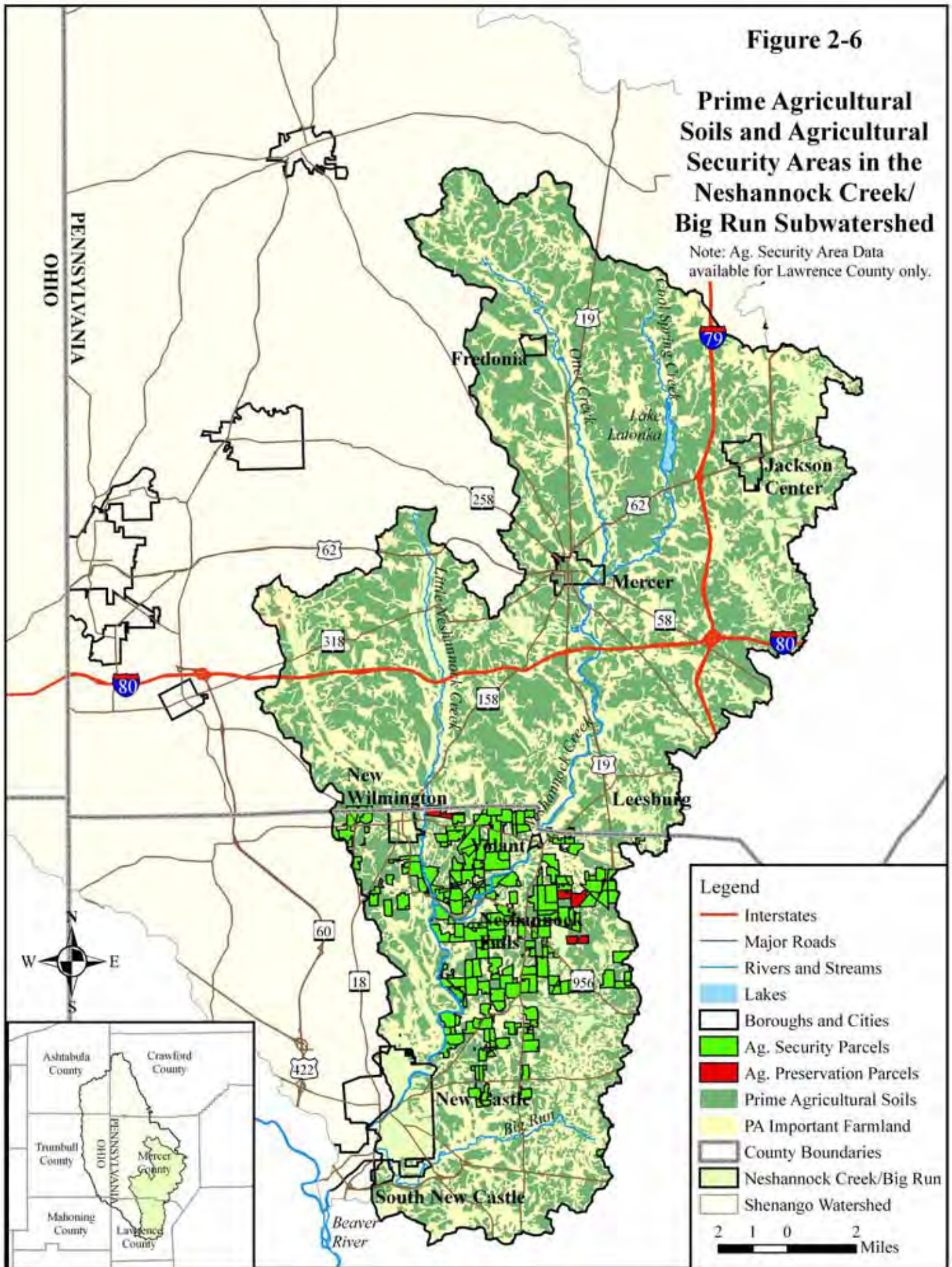


Table 2-2. Municipalities with Agricultural Security Areas
 (Source: PA Department of Agriculture, G. Micsky, personal communication; J. Russell, personal communication; T. Crawford, personal communication; D. Unangst, personal communication)

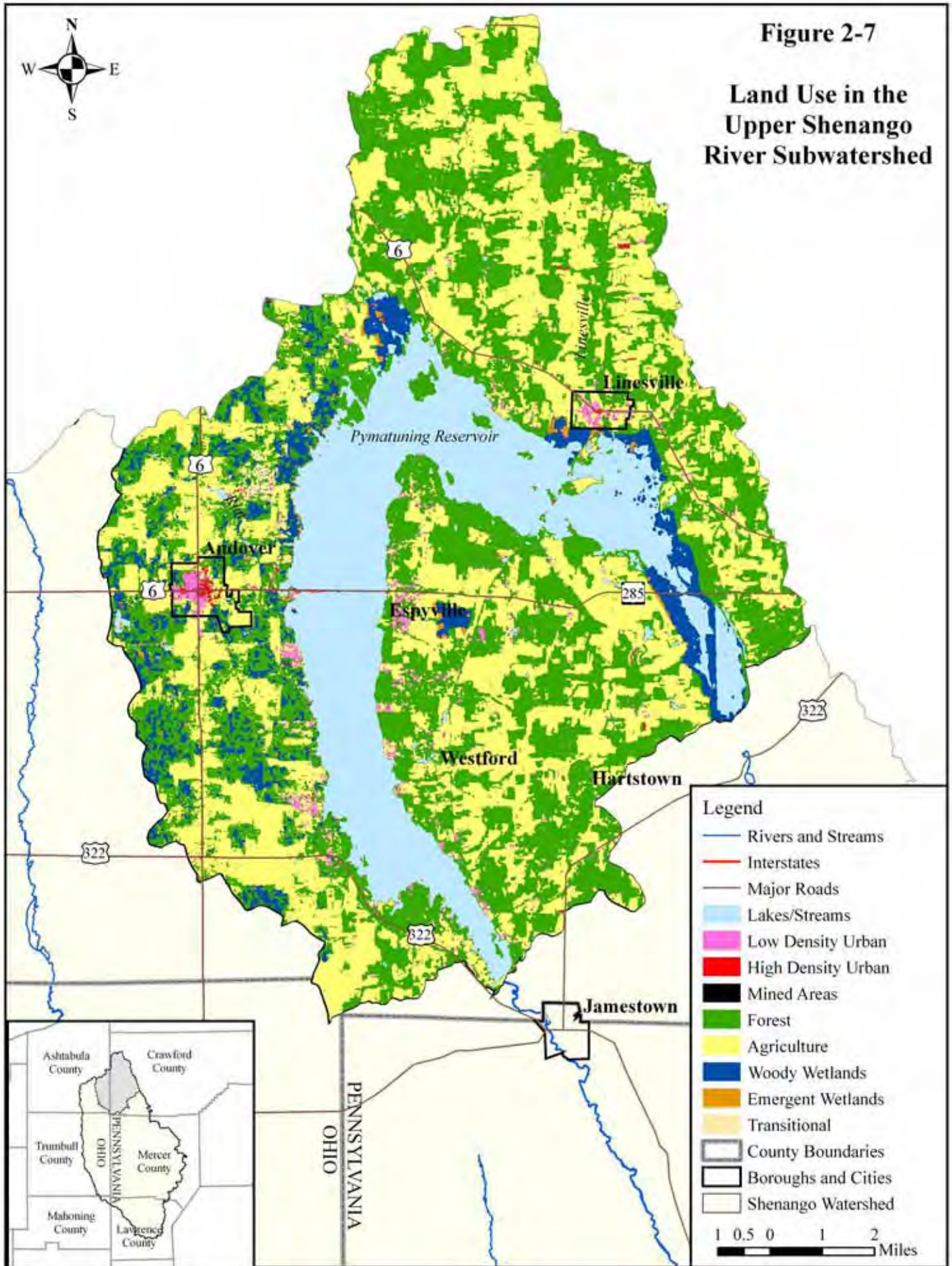
Municipality	Acres	Parcels	Municipality	Acres	Parcels
<i>Crawford County</i>			<i>Mercer County (continued)</i>		
Beaver Township	4,991	38	Jefferson Township	4,034	36
East Fallowfield Township	2,500	6	Lackawannock Township	3,792	43
Sadsbury Township	1,875	10	Lake Township	5,084	46
<i>Lawrence County</i>			New Vernon Township	4,724	46
Hickory Township	3,954	92	Otter Creek Township	3,366	43
Pulaski Township	7,273	98	Perry Township	6,837	93
Shenango Township	802	14	Pine Township	1,837	17
Slippery Rock Township	2,450	8	Salem Township	1,804	10
Washington Township	5,242	43	Sandy Creek Township	2,242	28
Wilmington Township	5,985	57	Sandy Lake Township	2,754	32
<i>Mercer County</i>			South Pymatuning Township	4,724	68
Coolspring Township	5,742	61	Springfield Township	3,086	37
Delaware Township	8,447	130	Sugar Grove Township	2,828	44
East Lackawannock Township	5,387	44	West Salem Township	4,927	47
Fairview Township	5,265	49	Wilmington Township	5,980	56
Findley Township	4,317	74	Wolf Creek Township	3,738	25
Hempfield Township	1,350	22	Worth Township	3,669	30
Jackson Township	4,751	46			

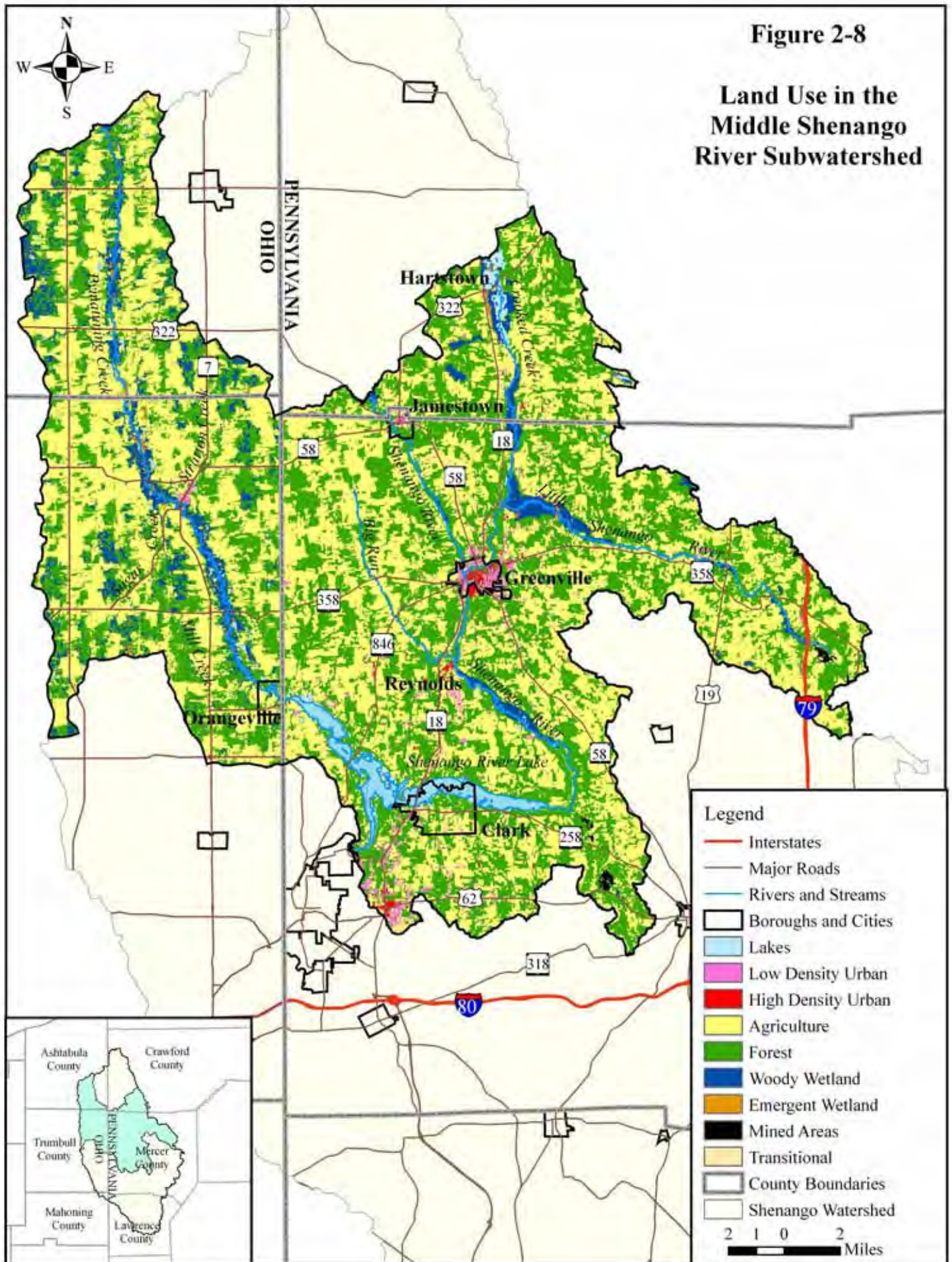
Land use in the Shenango River watershed is dominated by agriculture and forest. Agriculture is the leading land use with 47 percent of the watershed being used as croplands and pastures. Forestry is the second leading land use at 40 percent. Land-use types by subwatershed are identified in Table 2-3, and Figures 2-7, 2-8, 2-9, and 2-10.

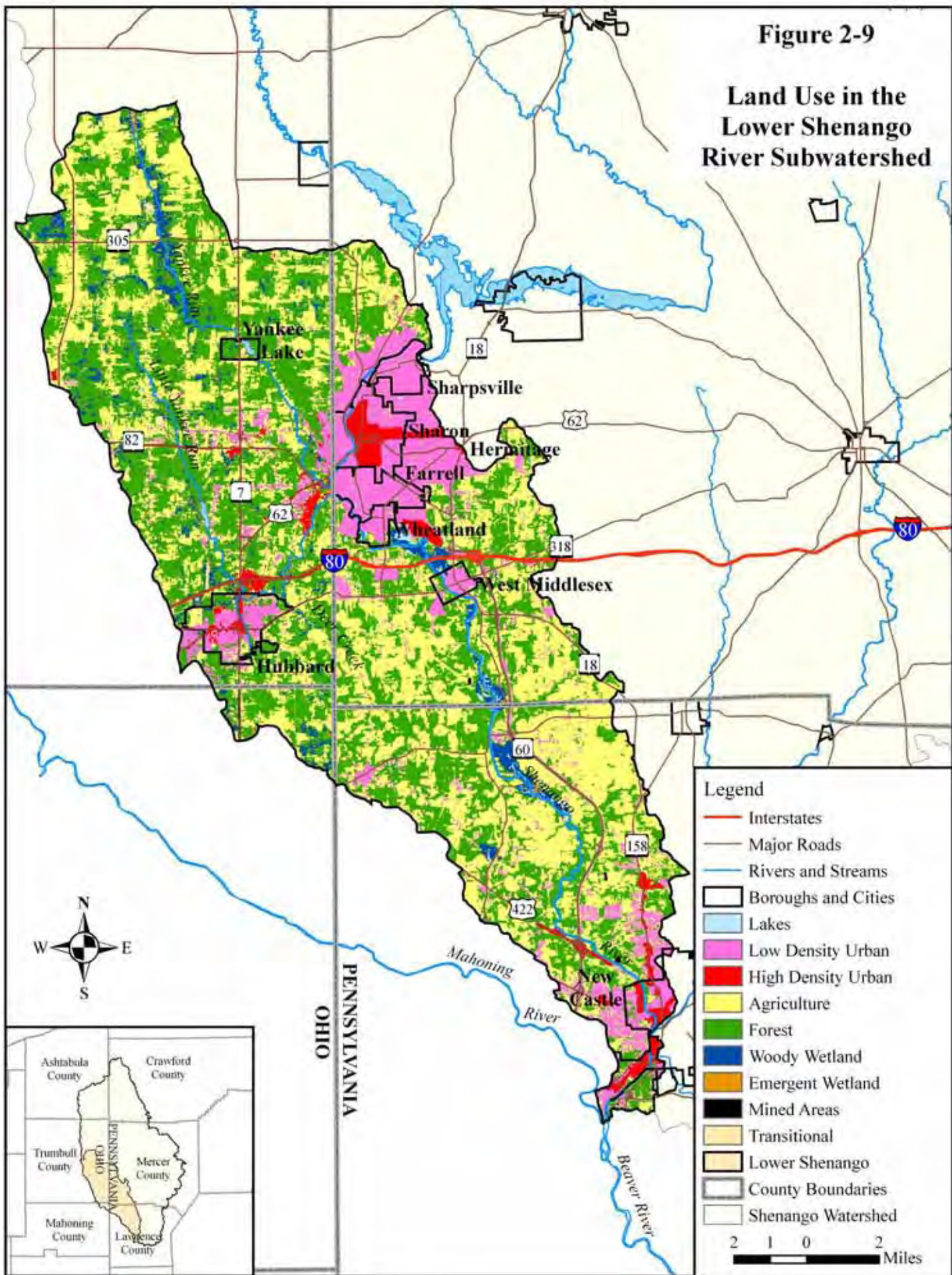
Forestry

Seventeen million of Pennsylvania's 28 million acres are covered by forests. Private landowners own the majority of the forests in Pennsylvania with 12.5 million acres or 71 percent. State Forests and State Game Lands make up 22 percent, and three percent is National Forest Land (Forest Facts).

Forests provide a variety of resources, including timber, wildlife habitat, water filtration, aesthetics, and recreation. Nationally, Pennsylvania ranks number one in hardwood production. Within the Shenango River watershed, there are over 425 square miles of forestland with approximately 90 percent of the forests being deciduous. There are no State Forest or National Forest Lands in the Shenango River watershed. There are five State Game Lands that make up 7,858 acres of the watershed, which will be discussed further in the Biological and Cultural Resources chapters.







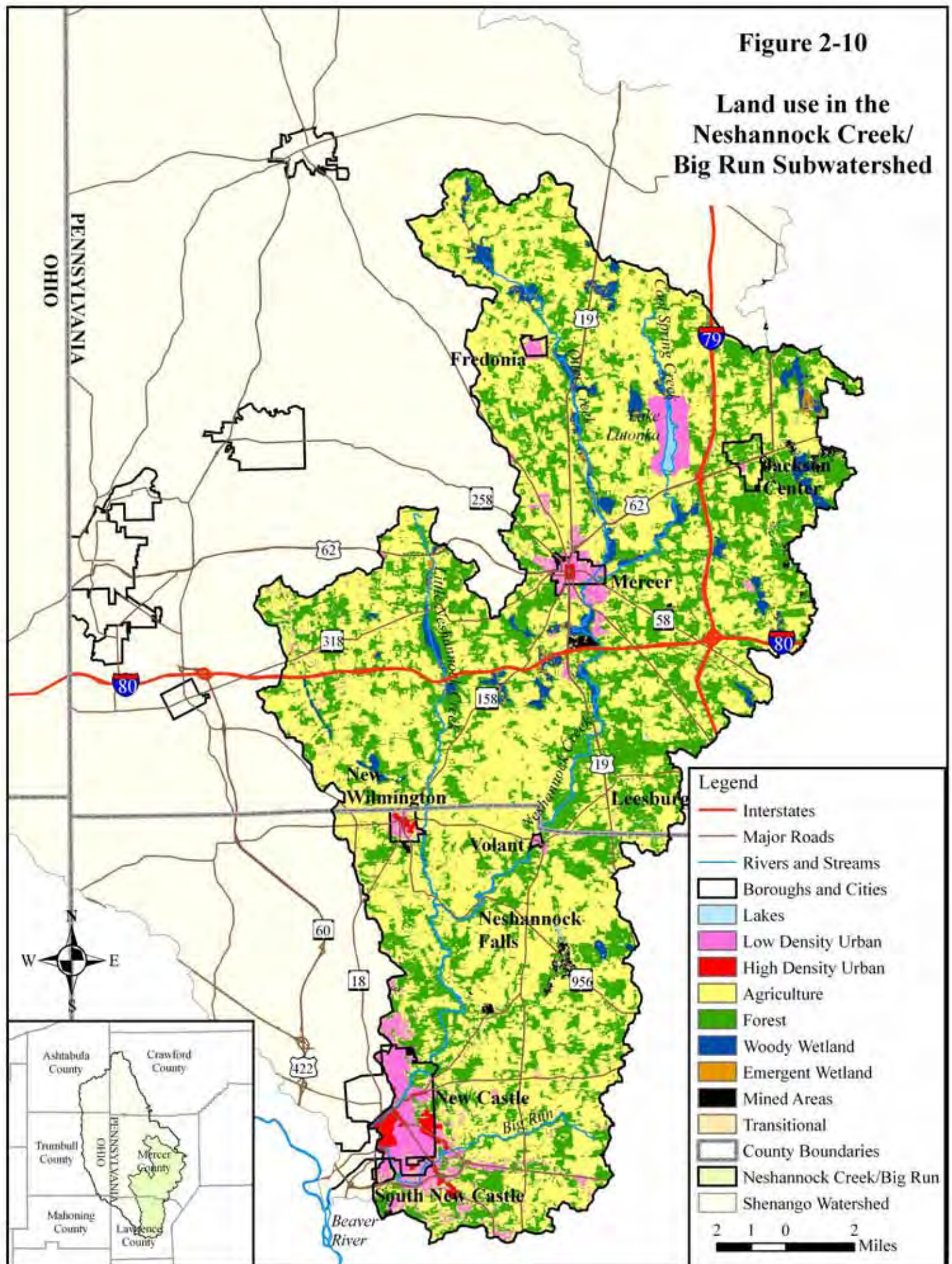


Table 2-3. Land Use

Land-Use Type	Upper Shenango River Subwatershed		Middle Shenango River Subwatershed		Lower Shenango River Subwatershed		Neshannock Creek/Big Run Subwatershed		Shenango River Watershed	
	Square Miles	% of Land Area	Square Miles	% of Land Area	Square Miles	% of Land Area	Square Miles	% of Land Area	Square Miles	% of Land Area
Agriculture	55.01	35.51	213.94	49.16	80.27	38.53	149.89	55.36	499.11	46.68
Pasture/Hay	37.17	23.99	152.73	35.10	62.08	29.80	135.09	49.90	387.07	36.20
Row Crops	17.84	11.51	61.21	14.07	17.22	8.27	14.80	5.47	111.07	10.39
Urban/Recreational Grasses	0.00	0.00	0.00	0.00	0.97	0.46	0.00	0.00	0.97	0.09
Forest	59.65	38.50	175.96	40.44	91.69	44.01	98.32	36.31	425.62	39.81
Deciduous Forest	51.78	33.42	160.87	36.97	83.89	40.27	88.63	32.73	385.17	36.03
Evergreen Forest	3.53	2.28	4.68	1.08	2.33	1.12	1.73	0.64	12.27	1.15
Mixed Forest	4.34	2.80	10.41	2.39	5.47	2.63	7.96	2.94	28.18	2.64
Wetlands	8.93	5.76	24.26	5.57	8.74	4.19	12.08	4.46	54.01	5.05
Woody Wetlands	8.13	5.25	21.68	4.98	7.46	3.58	9.35	3.45	46.62	4.36
Emergent Wetlands	0.80	0.52	2.58	0.59	1.28	0.61	2.73	1.01	7.39	0.69
Development	2.98	1.92	10.92	2.51	25.68	12.32	8.83	3.26	48.40	4.53
Low Density Urban	2.68	1.73	8.89	2.04	16.44	7.89	6.27	2.32	34.28	3.21
High Density Urban	0.07	0.24	0.32	3.32	1.84	127.94	0.15	32.42	2.37	6.01
Commercial/Industrial	0.22	0.15	1.71	0.39	7.40	3.55	2.41	0.89	11.74	1.10
Water	28.05	18.11	9.49	2.18	1.44	0.69	0.46	0.17	39.43	3.69
Open Water	28.05	18.11	9.49	2.18	1.44	0.69	0.46	0.17	39.43	3.69
Barren	0.32	0.21	0.59	0.14	0.52	0.25	1.18	0.43	2.61	0.24
Mining	0.00	0.00	0.57	0.13	0.09	0.04	1.08	0.40	1.73	0.16
Transitional	0.32	0.21	0.02	0.01	0.43	0.21	0.10	0.04	0.87	0.08

Active Mines

Mining operations must have an active permit for the site they are mining to be considered an active mine. Even though the permits may be active, mining may not be physically occurring in the permitted areas. There are various stages to active permits including: not started, active, treatment, reclamation, and forfeited. Permits are generally issued for an area larger than the company is planning to mine to support the movement of material and equipment.

Industry and coal mining account for less than one percent of the land use within the Shenango River watershed. Currently there are 51 active or pending permits. Industrial mineral mining is the dominant mining industry in the watershed. Mining is occurring throughout the entire watershed; however, the

majority of mining in the watershed is occurring in the Middle Shenango River and Lower Shenango River subwatersheds.

The only active coal-mining permit in the Shenango River watershed is located in the Neshannock Creek/Big Run subwatershed. The mine is operated by Amerikohl Mining Company and located in Washington Township, Lawrence County.

A listing of active and pending permits and their status for the Shenango River watershed is available in Appendix D.



*Steel plant along the Shenango River
in the Lower Shenango River
subwatershed*

Agriculture

Trends show that the numbers of family farms are declining while the sizes of farms are increasing. The declining economy and the pressure to meet increased government regulations are causing financial problems for many small farms. Support for agriculture is needed since it is the primary land use in the watershed.

Industrial/Commercial

Approximately 12 square miles, one percent of the total land use of the Shenango River watershed, are used for commercial and industrial purposes. The majority of the industry in the Shenango River watershed, 63 percent, is located in the Lower Shenango River subwatershed near Sharon and Farrell. Another 20 percent is located in the Neshannock Creek/Big Run subwatershed.

Waste Disposal

Landfills

According to the Pennsylvania Department of Environmental Protection (PA DEP), there are currently no active landfills located within the Shenango River watershed. Records from the PA DEP indicate there are five closed landfills within the watershed. They include Henry's Disposal Service Site 1, Henry's Disposal Service Site 2, Kwiatkowski Sanitary Landfill, Carlson Mining Sanitary Landfill, and River Road Landfill. The waste at the Henry's Disposal Service sites is assumed to be from Henry's Disposal Service. It has not been confirmed. The sites are located in Linesville, Crawford County. Kwiatkowski Sanitary Landfill is located in Hickory Township, Lawrence County, and the Carlson Mining Sanitary Landfill is located in Slippery Rock Township, Lawrence County. The River Road Landfill is an abandoned landfill in Mercer County. This site was listed on the Superfund list, but was removed in January 2004 after remediation efforts were completed.

Recycling

Recycling involves the separation and collection of materials such as paper, aluminum, and steel for processing and remanufacturing into new products. Recycling helps conserve natural resources, reduce pollution, saves space in landfills, creates jobs, and saves money.

In July 1988, Act 101 was passed mandating recycling in 415 Pennsylvania communities with populations greater than 5,000. Since Act 101 was enacted, more than 450 communities have voluntarily developed curbside recycling programs, and more than 750 communities are serviced by drop-off centers

for recyclables. Within the Pennsylvania portion of the watershed, solid waste authorities in each county coordinate recycling programs.

Ownership

The majority of the watershed, 93.5 percent, is privately owned. These private holdings include residential areas, farmland, forested areas, commercial and industrial properties, and private camps. Public properties within the watershed include Pymatuning State Park, Shenango River Lake, State Game Lands, schools, community parks, and municipal properties.

Pymatuning State Park contains 21,122 acres in Pennsylvania and Ohio, making up the majority of the Upper Shenango River watershed. Shenango River Lake accounts for 15,071 acres of the Middle Shenango River watershed. State Game Lands make up 7,858 acres of land available for public use.

Critical Areas

Critical areas are areas having constraints that limit development and various other activities. Critical natural areas are those areas containing rare, threatened, or endangered species, natural communities of special concern, or significant ecological and geological landscapes worthy of protection. Steep slopes, ridgetops, floodplains, streambanks, and wetlands are examples of critical natural areas. Figure 2-11 identifies environmentally sensitive areas.

Landslides

Landslides occur throughout Pennsylvania and are heavily concentrated in southwestern Pennsylvania. Most landslides occur in areas with steep slopes where loose colluvial soils exist. However, landslides can also occur in areas containing clay soils, because the characteristics of clay soils vary significantly with water content. Gravity eventually forces this rock and debris down the slope in a gradual or sudden, flashy manner. Landslides can also occur as a slump, where a block of weathered rock or soil slides outward because of the force from the weight rotation of weathered rock or soil above it. Typically, landslides occur along road cuts with unstable bank conditions. Other factors, such as stream erosion, earth moving activities, soil characteristics, weakened or fractured rock, mining debris, and weather, can determine the occurrence of a landslide.



One of several wetlands in the Shenango River watershed

Erosion and Sedimentation

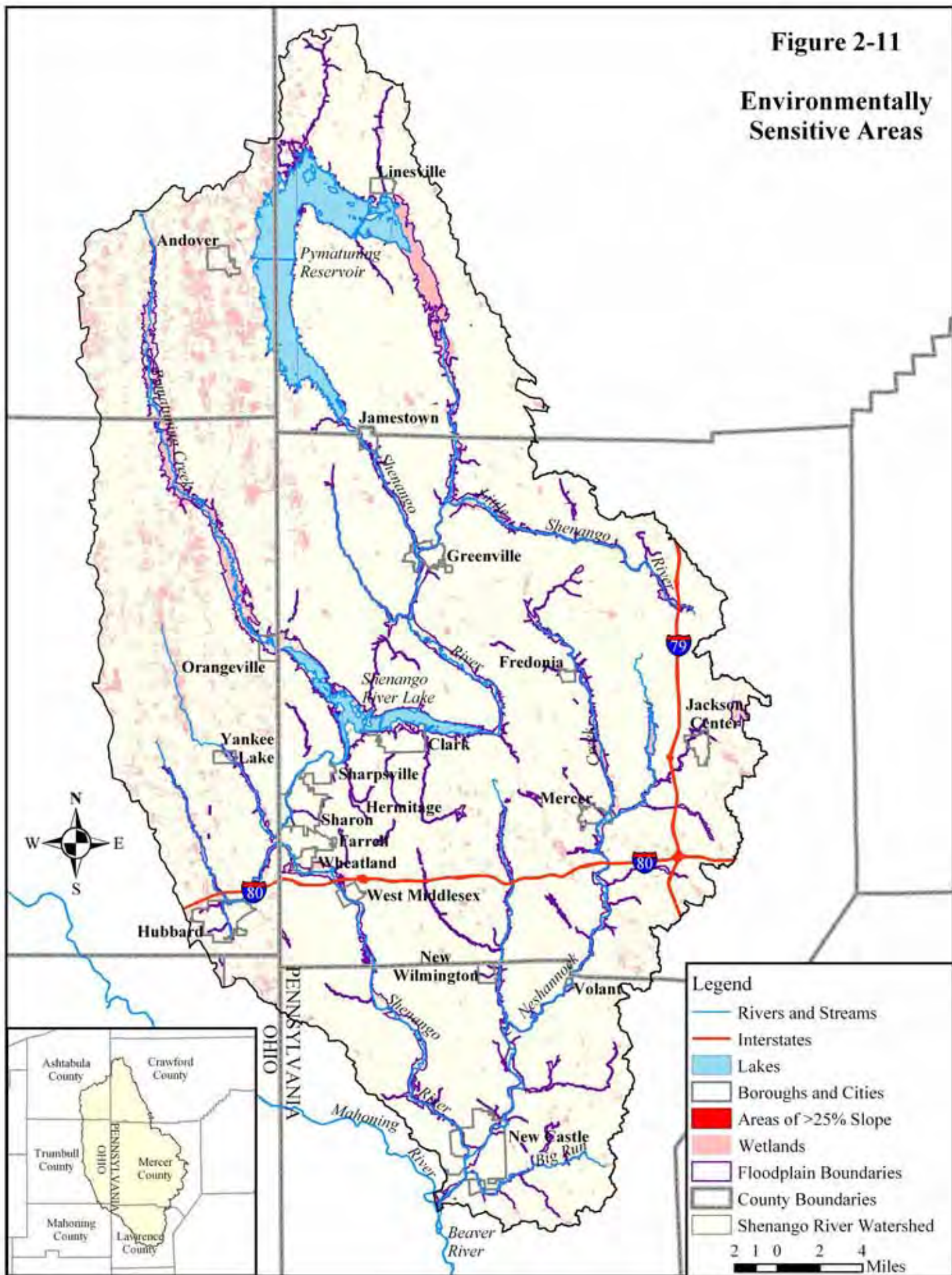
Erosion is the transfer of soil particles through air or water. The relocation of these particles is known as sedimentation. Erosion and sedimentation are natural earth-moving processes, but the extent of this movement can be greater than normal due to poor land-use practices. Erosion and sedimentation are discussed in greater detail in the Water Resources chapter.

Floodplains

A floodplain is the level land along the course of a river or stream that is formed by the deposition of sediment during periodic floods. Floodplains contain features such as levees, back swamps, delta plains, and oxbow lakes. These areas are critical to the waterway. Frequent flooding limits development. These areas often contain a unique diversity of plant and animal species. Floodplains in the watershed are discussed in the Water and Biological Resources chapters.

Figure 2-11

Environmentally Sensitive Areas



Wetlands

Wetlands are, “areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions” (USACE 2002). Wetlands are delineated according to hydrology, soil type, and vegetation. Whether man-made or naturally occurring, wetlands have a variety of appearances. Standing water, inundated soils, or an apparently dry field can be a wetland. More information about the wetlands located in the watershed can be found in the Water and Biological Resources chapters.

Fish and Wildlife Habitat

Habitats are the natural environments in which animals and plants reside. Healthy habitats are important to maintaining a diversity of biological resources. Interferences and changes to habitat affect the variety of plants and animals living there. Habitats where rare, threatened, and endangered species reside are critical to have in nature.

Important habitats within the watershed include riparian areas, forested areas, and wetlands. Riparian areas are lands located next to a body of water. When densely vegetated, they serve as a buffer against polluted runoff and provide habitat corridors for many varieties of wildlife. Forested areas, especially the non-fragmented forested areas, provide critical habitats for plants and animals. More information about fish and wildlife habitats in the watershed can be found in the Water and Biological Resources chapters.

Hazardous Areas

Illegal Dumpsites

In remote areas of the watershed, streambeds, hillsides, back roads, and coal mine refuse piles are inundated with old tires, appliances, and other items that people no longer want. These illegal dumps grow with continued use and can cause a variety of environmental and health impacts. Currently, it is the responsibility of each municipality to identify and clean up dumpsites.

PA CleanWays chapters throughout the state work to clean up and prevent illegal dumping through action and education. Local businesses, organizations, or clubs adopt rural roadways, trails, and/or waterways. These volunteers pick up trash in their adopted area two to three times a year, similar to the Adopt-a-Highway program run by Pennsylvania Department of Transportation.

Chapters of PA CleanWays are organized on a county basis. Lawrence County is the only county in the watershed with an active chapter. It facilitates the cleanup of areas affected by illegal dumping, addresses problem items, and educates the public about proper waste disposal and the environmental and personal consequences of improper disposal. The Lawrence County chapter has been involved in the recycling of electronics, household appliances, and tires. They have also hosted numerous cleanups and are currently surveying illegal dumpsites to identify, assess, and document every illegal dumpsite within the county.

Waste Sites

The **Comprehensive Environmental Response Compensation and Liability Act (CERCLA)**, commonly known as Superfund, was enacted in 1980 to provide broad federal authority to respond directly to releases of hazardous substances that may endanger public health or the environment. By creating a tax on the chemical and petroleum industries, a trust fund was established to provide for cleanup where no responsible party could be identified. In 1986, the Superfund Amendments and

Reauthorization Act (SARA) amended CERCLA. A listing of sites located within the watershed can be found in Appendix E.

Two kinds of action responses were identified in the law, short term and long term. Short-term removals require prompt response for releases or threatened releases. Long-term responses permanently and significantly reduce the dangers associated with releases or threats of releases of hazardous substances that are serious, but not immediately life threatening. These actions can be conducted only at sites listed on US EPA's National Priorities List (NPL).

Three sites have been identified on the NPL in the Shenango River watershed: River Road Landfill, Farrell Works Disposal Area of the Sharon Steel Corporation, and Westinghouse Electric Sharon Plant. All of these NPL sites are located in the Lower Shenango River subwatershed.

1. The River Road Landfill is a 102-acre inactive landfill that operated from 1962 until 1986. Municipal and industrial waste, including foundry and metal processing waste, polychlorinated biphenyl (PCB) wastes, asbestos, and residues from tank car cleaning were accepted at the site. Two sedimentation ponds catch runoff from the site and have controlled drainage into the Shenango River. The landfill was deleted from NPL on January 19, 2004.
2. Sharon Steel Corporation Farrell Works Disposal Area was added to the NPL in July 1998. The area is approximately 400 acres, located near the Pennsylvania/Ohio border and in the floodplain of the Shenango River. Around 1900, the area was used to dispose of blast furnace slag, electric arc furnace slag, basic oxygen furnace slag, and sludge. From 1949 to 1981, millions of gallons of spent pickle liquor acid were dumped over the slag, with hopes that the acid would partially evaporate and then be neutralized by the carbonates in the slag. Instead, groundwater was contaminated.
3. Westinghouse Electric Sharon Plant was added to the NPL in August 1990. This 58-acre facility manufactured electrical transformers from 1922 to 1985. Between 1936 and 1976, Westinghouse used blends of PCBs and trichlorobenzene in manufacturing some transformers. Contamination of soils, groundwater, and sediment in the nearby Shenango River were the result of spills on the land and leaks of solvent and oil from underground storage tanks. Phase III of the cleanup was expected to be completed in 2004.

The **Resource Conservation and Recovery Act (RCRA)**, a federal statute, regulates the transportation, handling, storage, and disposal of solid and hazardous materials. Regulatory responsibilities, including obtaining permits, identifying and listing hazardous waste, adhering to proper procedures when transporting or disposing of waste, developing risk management plans, and maintaining records, may be controlled by federal facilities. Requirements for underground storage tanks, including cover tank design, operation, cleanup, and closure, are also contained in RCRA.

There are 426 listed sites within the watershed with the majority of these sites being located in the Lower Shenango River subwatershed. A listing of all the sites is located in Appendix F.

The **Pennsylvania Hazardous Sites Cleanup Act (PA HSCA)** provides PA DEP with the capability to conduct cleanup activities at sites contaminated by hazardous substances. It also authorizes PA DEP to force the responsible parties to conduct cleanup actions or to repay public funds spent cleaning up the site. The majority of PA HSCA sites involve bankrupt facility owners, abandoned facilities, and inappropriate disposal of hazardous substances, not active facilities with financially viable owners. Funds from this act are also used to pay the state's share of federal Superfund cleanup actions in Pennsylvania.

There are five PA HSCA sites in the Shenango River watershed. They include the DuPont New Castle Junk Yard Site, Johnson Bronze, Carlson Mining Sanitation Landfill, CG Wood Site, and William Taylor Estate Disposal Site. The DuPont New Castle Junk Yard Site is the site of a former salvage yard. For a number of years, lead acid batteries were smashed on the ground and the lead plates were removed for sale to a smelter. Sampling at the site revealed that the soil and groundwater were contaminated with lead. Remediation efforts were completed in January 2000. Efforts to remediate the William Taylor Estate Disposal Site were initiated in 1989 with the landfill being properly closed in December 2000.

Brownfields

Brownfields are abandoned industrial sites that were contaminated during their operation. Although these sites are now vacant, the contamination remains. Brownfields are important areas because they can often be redeveloped after the contamination is mitigated. This is an important planning issue because the amount of remediation needed at a particular site must be determined before the redevelopment of a brownfield site is considered. Brownfield redevelopment is an important concept, because it allows abandoned land to be reused, which helps to reduce sprawl.

There are 16 brownfield sites identified in the Shenango River watershed. They are located in the Lower Shenango River subwatershed area, with one exception in the Middle Shenango River subwatershed. The brownfield sites are identified in Table 2-4. Remediation of a site is conducted to meet background, statewide health, or site-specific standards. A site is deemed in progress when US EPA receives a notice of intent to remediate and has not received a final report. Once a final report is received, the site is then transferred to the completed sites list.

Even though coal refuse piles and abandoned mines would fall under the popular definition of a brownfield, they do not qualify under Pennsylvania's present policy. Refuse piles and abandoned mines often lack the infrastructure needed for redevelopment. However, recent efforts to categorize abandoned mine sites as "greyfields" may lead to the development of a reuse program similar to brownfields.

Table 2-4. Brownfield Sites

Site Name	County	Municipality	Subwatershed	Cleanup Standard	Status
McDuff A	Lawrence	New Castle	Lower Shenango River	Site-specific	Completed
Caparo Steel *	Mercer	Farrell	Lower Shenango River	Statewide health	Completed
Caparo Steel AOC-3 Former Labor Ditch Area	Mercer	Farrell	Lower Shenango River	Statewide health	Completed
Caparo Steel AOC-9 Boilerhouse Fuel Storage	Mercer	Farrell	Lower Shenango River	Statewide health	Completed
Shenango Valley IDC Caparo Finishing Div B	Mercer	Farrell	Lower Shenango River	Statewide health	Completed
New Castle Refractories	Lawrence	New Castle	Lower Shenango River		In Progress
Armco Sawhill Tube *	Mercer	Sharon	Lower Shenango River		In Progress
Natl Castings Former	Mercer	Sharon	Lower Shenango River		In Progress
Nicholas Cianci Greenville Outparcels LLC	Mercer	Greenville	Middle Shenango River	Statewide health	Completed
Ben Pajank Estate	Mercer	Hermitage	Lower Shenango River	Statewide health	Completed
Roemer Industries	Mercer	Sharon	Lower Shenango River	Background	Completed
New Castle Industries	Lawrence	New Castle	Lower Shenango River		In Progress

* Indicates multiple facilities at the site.

Subsidence Areas

Subsidence is the downward movement of surface material involving little or no horizontal movement. Occurring naturally due to physical and chemical weathering of certain types of bedrock, subsidence usually occurs locally as a result of underground mining, excessive pumping of groundwater, or subsurface erosion due to the failure of existing utility lines. Subsidence usually occurs slowly over a long period of time, but can happen rapidly. The development of a sinkhole, for example, occurs when the support of the land is gradually removed over a period of time causing the land surface to sag and finally collapse, leaving a hole or cavity. Although subsidence is not common within the watershed, the potential for it still exists.

Earthquakes

Earthquakes in Pennsylvania and eastern Ohio are rare, but have occurred. In September 1998, a moderate earthquake was experienced in Jamestown, Pennsylvania near Pymatuning Lake. This earthquake was the biggest earthquake in Pennsylvania's recorded history with a magnitude of 5.2 on the Richter scale. As a result of the earthquake, approximately 120 household water supply wells went dry within three months after the earthquake. Eighty of these wells were on a ridge between Jamestown and Greenville, where water levels declined as much as 100 feet. As a result of the decrease of water in the ridge, the valley water levels increased approximately 62 feet.

Management Recommendations

Agricultural Lands

- Enroll agricultural landowners in the Conservation Reserve Enhancement Program (CREP), a voluntary program, to take marginal farmland out of production for wildlife habitat, or other similar programs.
- Identify additional local, state, and federal funding for the implementation of agricultural best management practices.
- Promote and implement conservation practices such as cover crops and crop residue, contour strips, grassed waterways, and minimal pesticide/herbicide use.
- Promote and utilize farmland preservation programs to sustain agricultural base and rural heritage.
- Promote the importance and economic viability of small farms through marketing education and creation of avenues for adding value to locally produced agriculture commodities.
- Protect active farmlands to retain their agricultural uses by designating them as agricultural security areas, purchasing conservation easements, or assisting in the multi-generation transfer of ownership.
- Promote local production of agricultural products, producers, markets, and preservation programs.

Erosion and Sedimentation

- Establish land-use planning and zoning to limit development in floodplains and other critical areas subject to erosion and sedimentation problems.
- Include sound geologic investigation and best management practices during maintenance and construction of roadways.
- Utilize best management practices to control erosion and sedimentation in agriculture, forestry, development, and mining industries.

Forestry

- Host workshops and/or programs promoting sustainable forestland management for loggers, landowners, and municipal officials.
- Decrease forest fragmentation by maintaining contiguous forest tracts and/or by maintaining travel corridors between non-contiguous forest tracts.
- Decrease forest parcelization by protecting large forest tracts with conservation easements, forest stewardship program participation, and zoning ordinances.
- Educate forestland owners by providing them with accurate information regarding sound silviculture practices, forest management plan development, and insect and disease problems that can affect forest health.
- Encourage the development and use of Forest Stewardship Plans or forest management plans and participation in the PA Forest Stewardship Program and/or the Tree Farm Program.
- Discourage the use of high grading practices like diameter limit harvests and selective cutting, and encourage timber harvesters to use sustainable best management practices under the direction of a professional forester.
- Promote tree plantings and sustainable harvesting.
- Work with Woodland Owners Association to educate the public, restore degraded areas, and develop demonstration areas.
- Support laws and regulations to maintain whitetail deer populations at levels that will ensure healthy forests, productive agricultural lands, and healthy deer populations.

Waste Disposal

- Educate citizens about the economic and environmental impacts of illegal dumping.
- Partner with local landowners, businesses, and community groups to sponsor community cleanups to remove trash along roadways, streambanks, and at dumpsites.
- Work with county planning departments to prohibit any new or proposed landfills near water sources and residential areas.
- Establish chapters of PA CleanWays in Mercer and Crawford counties to assist in identification, education, and cleanup of illegal dumpsites.
- Identify additional local, state, and federal funding to address the waste disposal needs of the area.
- Conduct an inventory and develop a remediation plan for illegal dumpsites in the watershed.
- Educate citizens about traditional and innovative ways to reduce, reuse, recycle, and properly dispose of household hazardous waste by providing public service announcements, recycling workshops, and other education and outreach programs.
- Provide convenient and affordable alternative disposal options, such as offering special collection days and drop-off locations for appliances and household hazardous wastes.

Riparian Corridors

- Educate landowners along waterways about the value of riparian buffers.
- Establish greenway corridors and trails along waterways.
- Establish and protect riparian buffers along streams using smart growth practices as identified in the Project Area Characteristics chapter.
- Continue streambank restoration and riparian buffer initiatives on agricultural lands to minimize nutrients and sediments entering the waterways.

Development and Redevelopment

- Establish a planned approach to growth; revitalize existing structures before developing new lands.
- Promote the inclusion or preservation of open space in community development programs.
- Establish more greenways and forestlands that are available for public use.
- Protect natural areas by converting them into parks, purchasing conservation easements, or utilizing other conservation methods.
- Promote redevelopment of abandoned industrial sites through the brownfields program, incentives, tax breaks, or other efforts.
- Redevelop the reclaimed River Road Landfill site for a park/recreation area.

Other

- Conduct outreach campaigns to educate watershed residents about the land uses in their communities.
- Establish a regional sanitary authority.
- Educate the public to utilize practices such as "Leave no trace" on public lands and private lands open to public use.

CHAPTER 3. WATER RESOURCES

A watershed is a basin-like landform defined by high points and ridgelines that descend into lower elevations and stream valleys. A watershed carries water "shed" from the land after rain falls and snow melts. Drop by drop, water is channeled into soils, groundwater, creeks, and streams, making its way to larger rivers, and eventually the sea. Water is a universal solvent capable of dissolving and transporting many chemicals. What we put on the ground—lawn chemicals, agricultural fertilizers, salt on roads in winter, oils from exhaust on highways—affects water quality downstream. When we remove vegetation from the watershed, we remove nature's mechanisms for storing and cleaning water. Asphalt surfaces, rooftops, roads, and parking lots keep water from reaching soils. Rain is piped away before soils can retain it, increasing the likelihood of flooding and erosion. Land development and stormwater management practices can be adapted to have fewer negative impacts on environmentally sensitive areas if the characteristics of natural systems are considered.

The pollutants that come from runoff contribute to non-point source pollution, the leading cause of water quality impairments in Pennsylvania. Non-point source pollution comes from many diffuse sources and is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into streams, lakes, rivers, wetlands, and underground sources of drinking water.

All the factors that go into making a stream, as well as the diversity of in-stream habitats, are extremely complex and interconnected. Factors affecting a stream's composition include: precipitation (seasonal variations), topography (determines stream gradient), geologic substrate (from which minerals are leached), land uses (determine sediment and contaminant loading of surface runoff and groundwater), soil and bedrock types (determine groundwater availability), sunlight or shade (affect temperature and algae growth), and riparian vegetation (for shade, nutrient source, insect habitat, and more). In addition, streams widen and their volumes increase as tributaries and other streams join them. The Shenango River watershed has been shaped by glaciation, resulting in a dendritic drainage pattern and a significant number of lakes (reservoirs), ponds, and wetlands that now characterize the landscape.

How the Water Spirit Got Her Power

Once, long ago, Sun was the ruler of all the earth. Next to him, the other spirits were as the sparrow beside the grizzly bear. So the spirits had a secret meeting and elected the water spirit to approach the Sun to give up some of his power.

Water went to Sun, and formed a clear, deep pool at his feet. When Sun saw his own face reflected in the pool, he was so delighted that he promised water anything she wanted. When she demanded some of his power, he realized that he had been tricked, but according to his word, he gave power to all of the other spirits. Water, for her part, got more than anyone, and became, next to Sun, the most powerful force on earth.

*-From a plaque next to Takakkaw Falls,
Yoho National Park, British Columbia,
Canada*



A portion of the Shenango River watershed

Only 30 to 40 percent of the rain or snow that reaches the ground goes directly to streams. Most of it, surprisingly, is taken up and used internally by plants. Some water infiltrates soils and moves below the surface as groundwater, feeding plants and replenishing aquifers. Water exposed to the air evaporates from streams, rivers, wetlands, and plants. It returns to the atmosphere to fall again as precipitation. This “water cycle” cools the planet, cleans the air, and sustains life as we know it.

Pennsylvania is second only to Alaska in its abundance of running waters, containing approximately 83,161 miles of rivers and streams. The Pennsylvania Department of Environmental Protection (PA DEP) has developed minimum water quality standards (Pennsylvania Code 1997) for these streams based on their designated uses. Streams are protected for their aquatic life, water supply, recreation and fish consumption, high quality or exceptional value, or navigation uses. Shenango River watershed streams and their designated uses are discussed further in the Water Quality section, and Table 3-3.

According to the Ohio Environmental Protection Agency (OhioEPA), beneficial use designations describe existing or potential uses of waterbodies. They take into consideration the use and value of water for public water supplies, protection and propagation of aquatic life, recreation in and on the water, agricultural, industrial, and other purposes. Examples of beneficial use designations include: public water supply, primary contact recreation, and aquatic life uses (warm-water habitat, exceptional warm-water habitat, etc.). For more information about the definitions of Ohio waterway use designations, refer to the Ohio Administrative Code website found in Appendix N.

The intended purpose of this conservation plan is to supplement and expand upon the information contained in the Interstate Pymatuning/Shenango Watershed Plan. A great deal of information about the water resources within the Shenango River watershed is contained in this chapter; however, some additional information can be found in the Interstate Pymatuning/Shenango Watershed Plan.

Major Tributaries

Tributaries are streams that flow to larger streams or other bodies of water. Major tributaries of the Shenango River are listed in Table 3-1, and shown in Figures 3-1, 3-2, 3-3, and 3-4. These streams form a dendritic drainage pattern on the landscape of the Shenango River watershed.

In addition to the impact that streams and rivers have on the natural landscape, humans have also made an impact on the landscape and course of water flow. One such example is the Erie Extension Canal. The Erie Canal crossed New York State from Albany to Lake Erie, and the Pennsylvania Main Line Canal crossed southern Pennsylvania from Philadelphia to Pittsburgh. The Erie Extension Canal was built to connect these two canals and, essentially, the Ohio River and Lake Erie. Irish laborers dug the entire canal, which is 130 miles long. Although the Erie Extension Canal was no longer used after the destruction of an aqueduct across Elk Creek Gorge in 1873, remnants of it still remain.



*Trace of the old canal in Greenville
photo courtesy of Nathan Leary, 1999*

Table 3-1. Major Tributaries

Tributary	Watershed Area (sq. mi.)	Approx. % of Drainage
<i>Upper Shenango Subwatershed</i>	155	14%
Linesville Creek	9.73	
Bennett Run	6.99	
Paden Creek	16.80	
Gravel Run (OH)	11.60	
Black Creek (OH)	unknown	
McMichael Creek (OH)	unknown	
<i>Middle Shenango Subwatershed</i>	434	41%
Sugar Run	8.67	
Little Shenango River	109.00	
Morrison Run	5.21	
Crooked Creek	45.60	
Bluff Run	3.90	
McDowell Run	3.75	
Randolph Run	6.48	
Unger Run	2.21	
Mathay Run	5.77	
Big Run	26.50	
Lawango Run	5.09	
Lackawannock Creek	9.01	
Daley Run	3.12	
Magargee Run	9.08	
Golden Run	4.51	
Brush Run	5.49	
Pymatuning Creek	171.00	
Stratton Creek	unknown	
Sugar Creek	unknown	
Mill Creek	unknown	
Booth Run	10.50	
Pine Hollow Run	4.38	
<i>Lower Shenango Subwatershed</i>	208	
McCullough Run	8.18	
Thornton Run	1.22	
Big Run	4.17	
Pine Run	2.48	
Little Yankee Run	41.79	
Deer Creek	1.28	

Table 3-1. Major Tributaries (continued)

Tributary	Watershed Area (sq. mi.)	Approx. % of Drainage
Bobby Run	2.92	
Hogback Run	8.03	
Turkey Run	2.93	
Buchanan Run	6.99	
Deer Creek	13.80	
<i>Neshannock Creek/Big Run Subwatershed</i>	270	26%
Neshannock Creek	242.00	
Otter Creek	45.90	
Mill Run	4.22	
Oilmill Run	unknown	
Cool Spring Creek	50.80	
Mill Creek	11.30	
Yellow Creek	21.70	
Fox Run	8.23	
Beaver Run	3.41	
Pine Run	8.47	
Mill Run	5.20	
Indian Run	6.72	
Potter Run	5.63	
Little Neshannock	50.60	
West Branch	17.40	
Hottenbaugh Run	13.90	
Big Run	28.50	

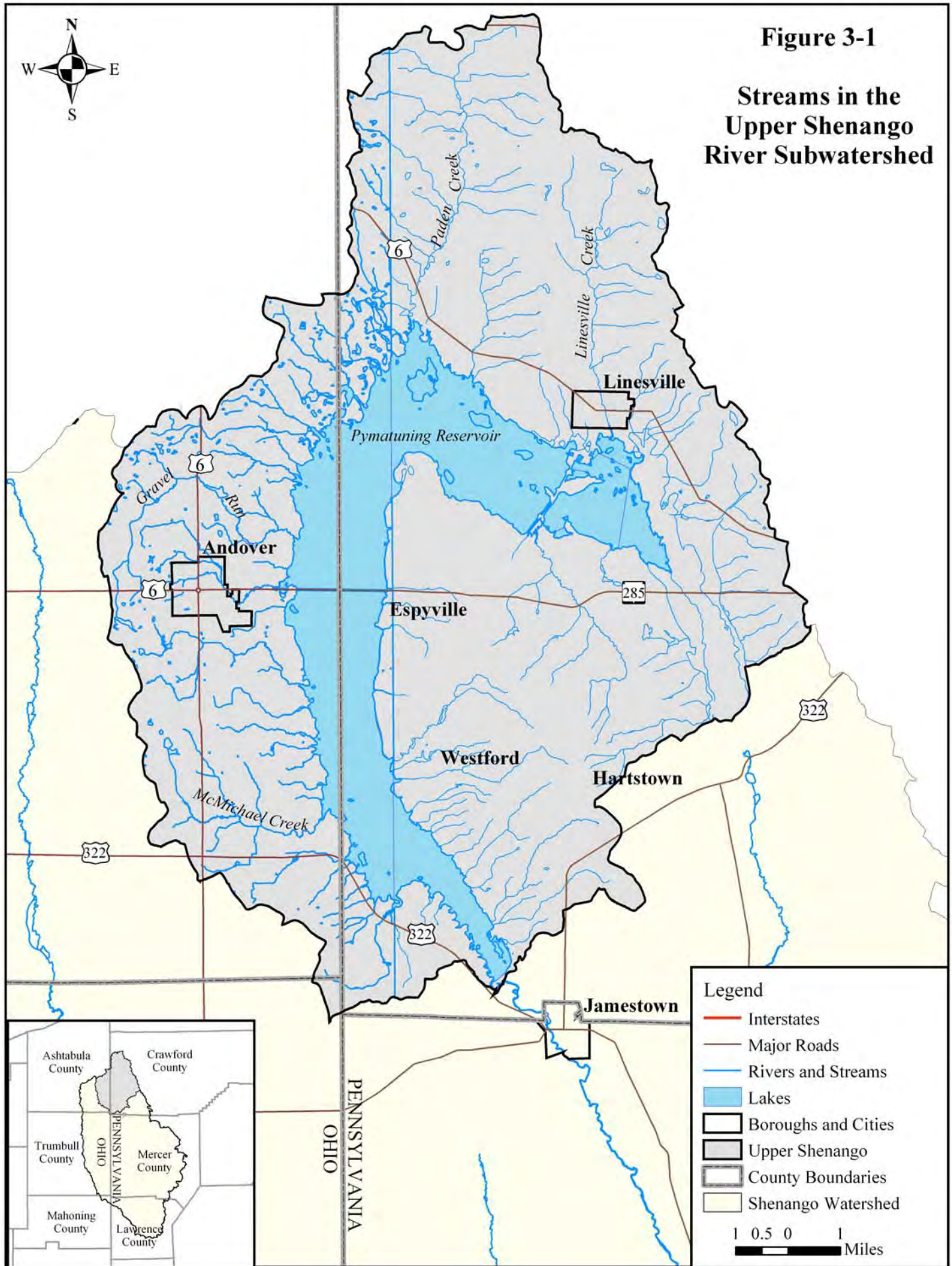
Wetlands

Wetlands can be defined as marshes, bogs, swamps, wet meadows, or shallow ponds (further described in the Biological Resources chapter). To be considered a wetland, an area must have supporting hydrology, vegetation, and soils. Frequently occurring in low areas, wetlands are regulated by the Pennsylvania Dam Safety and Encroachments Act – 25 PA Code, Chapter 105 – which reviews all water-related activities to protect and conserve the natural resources of the commonwealth.



Wetland area at Black Jack Swamp

United States Environmental Protection Agency (US EPA) and United States Army Corps of Engineers (USACE) use the 1987 Corps of Engineers Wetlands Delineation Manual to define wetlands for the Clean Water Act Section 404 permit program. Section 404 requires a permit from the USACE or



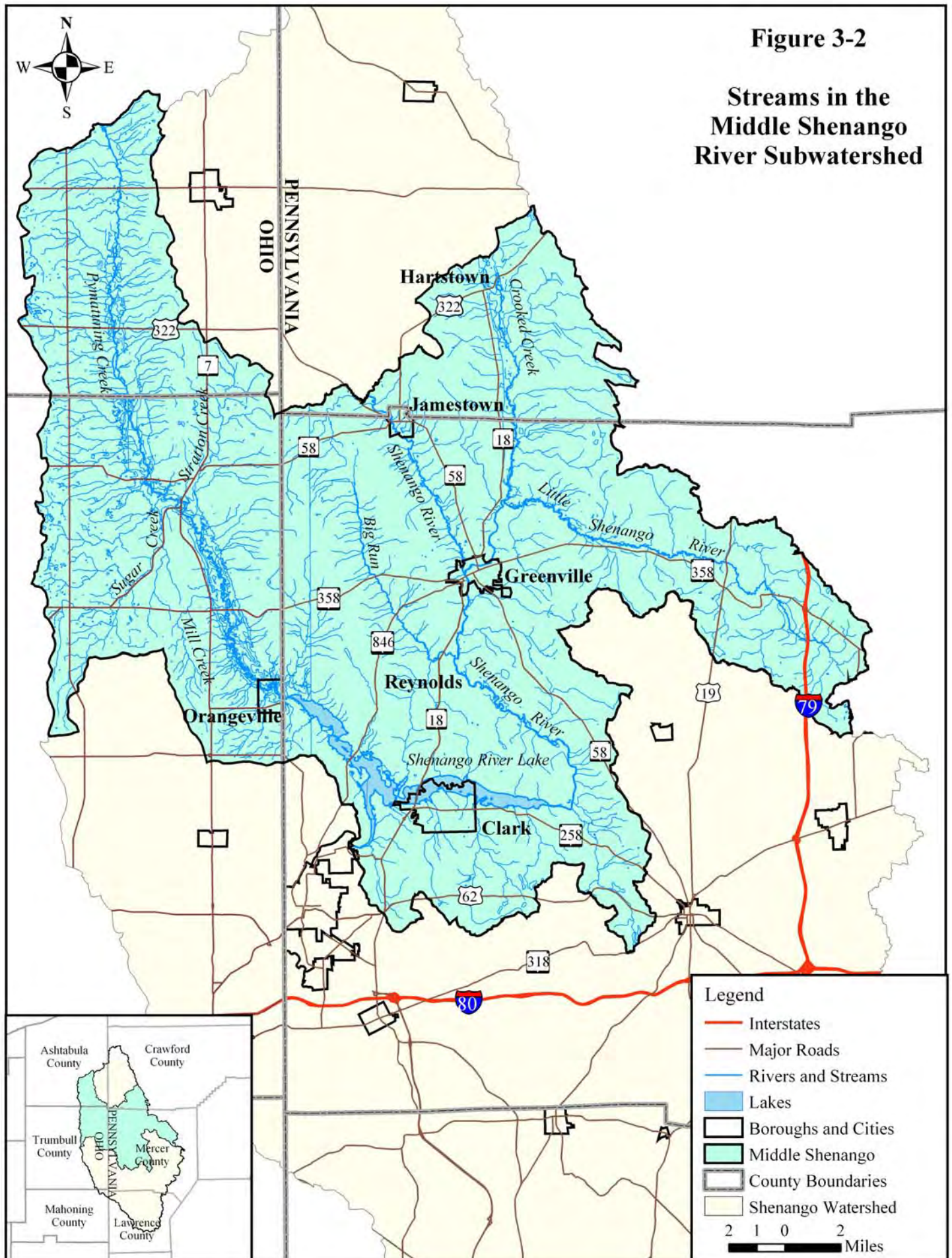
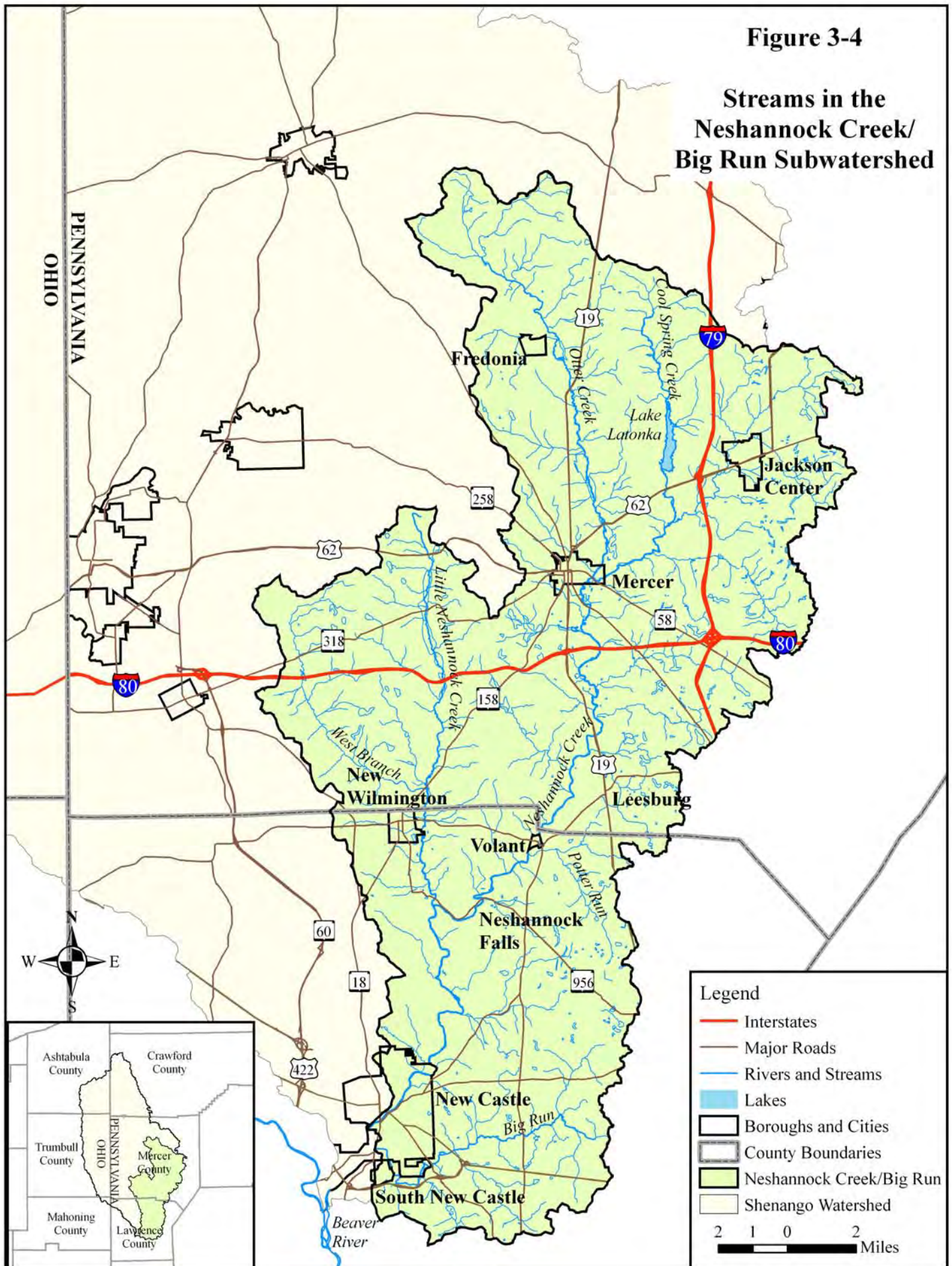




Figure 3-4

Streams in the Neshannock Creek/Big Run Subwatershed



authorized state for the discharge of dredged or fill material into the waters of the United States, including wetlands. In addition, the Food Security Act of 1985 included a Swampbuster provision that discouraged the removal of wetlands for agricultural purposes by denying federal farm program benefits for producers who converted wetlands after December 23, 1985 (Tiner 1999).

Wetlands make important contributions to the health of aquatic systems on a watershed basis by purifying water, filtering runoff, abating floods, and decreasing erosion. In addition, wetlands provide habitat for countless numbers of plants and animals including over 40 percent of all federally listed threatened or endangered species. The functions of wetlands are very important to water quality and quantity, as well as land conservation. Wetlands help reduce soil runoff and limit the effects of non-point source pollution from surrounding areas. Plants found in wetlands help slow the movement of water, allowing the sediment to drop out. Nutrients, such as nitrogen and phosphorus, which cling to the soil particles, are deposited in the wetland where they are used for food and energy. Chemicals, such as pesticides and herbicides, may be trapped in the wetland and broken down by sunlight and microorganisms. Wetlands also prevent downstream flooding by acting as sponges to absorb heavy rainfall.

Approximately 1.4 percent, or 403,924 acres, of Pennsylvania's land surface is covered by wetlands. Wetlands are most abundant in the glaciated portions of northeastern and northwestern Pennsylvania. Wetlands cover at least five percent of the entire Shenango River watershed (28,949 acres in Ohio and 39,226 acres in Pennsylvania). The wetlands in each of the subwatersheds are shown in Figures 3-5, 3-6, 3-7, and 3-8.

Wetland Loss

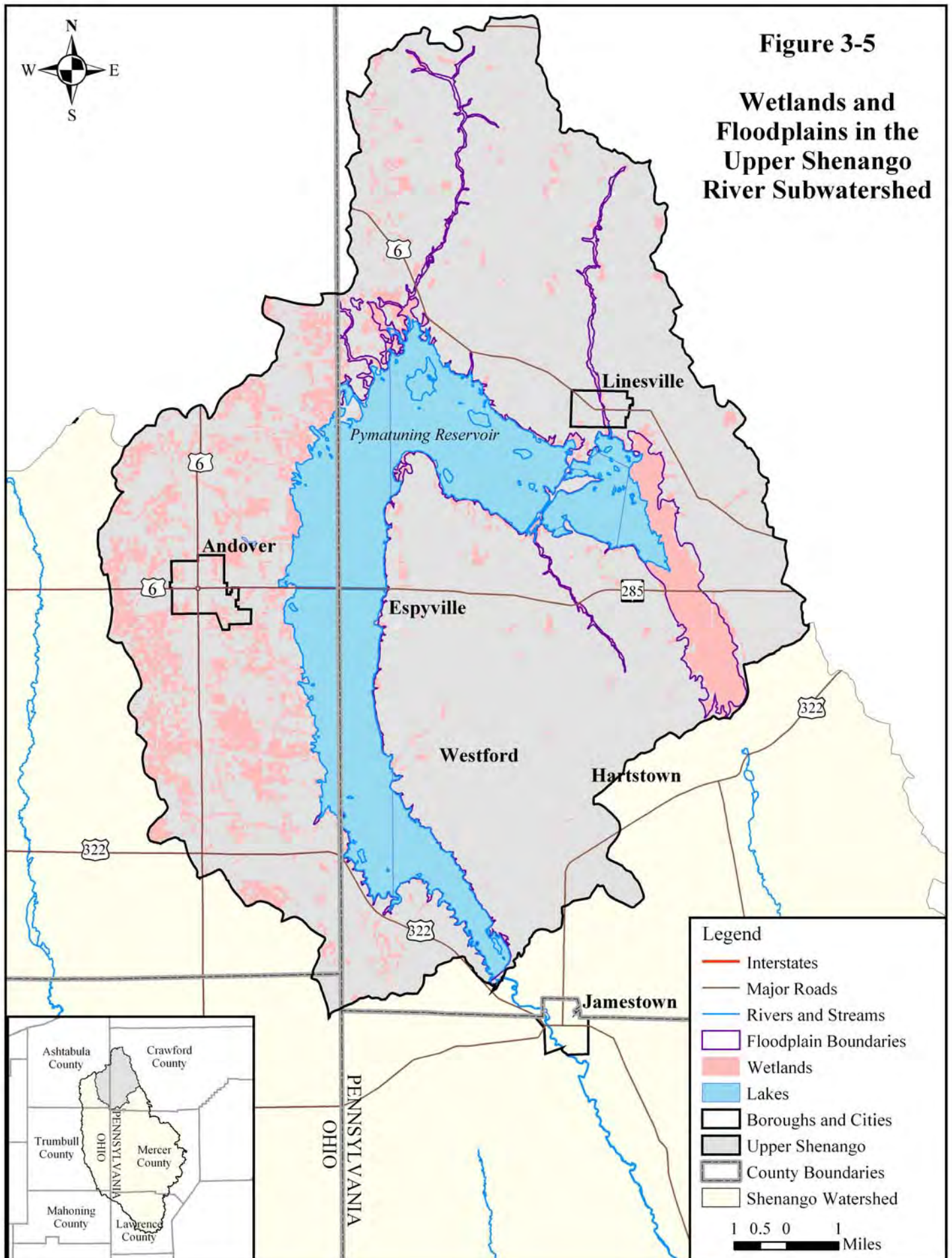
Wetland loss, or the loss of wetland area via the conversion of wetlands to non-wetland land use, from human and natural disturbances is a key issue. In the past 200 years, over 56 percent of wetlands in Pennsylvania have been filled or destroyed (Dahl 1990), and nearly 90 percent of wetlands in Ohio have disappeared (<http://www.dnr.state.oh.us/wetlands/history.htm>). Specific statistics for historic wetland loss within the Shenango River watershed are currently not available.

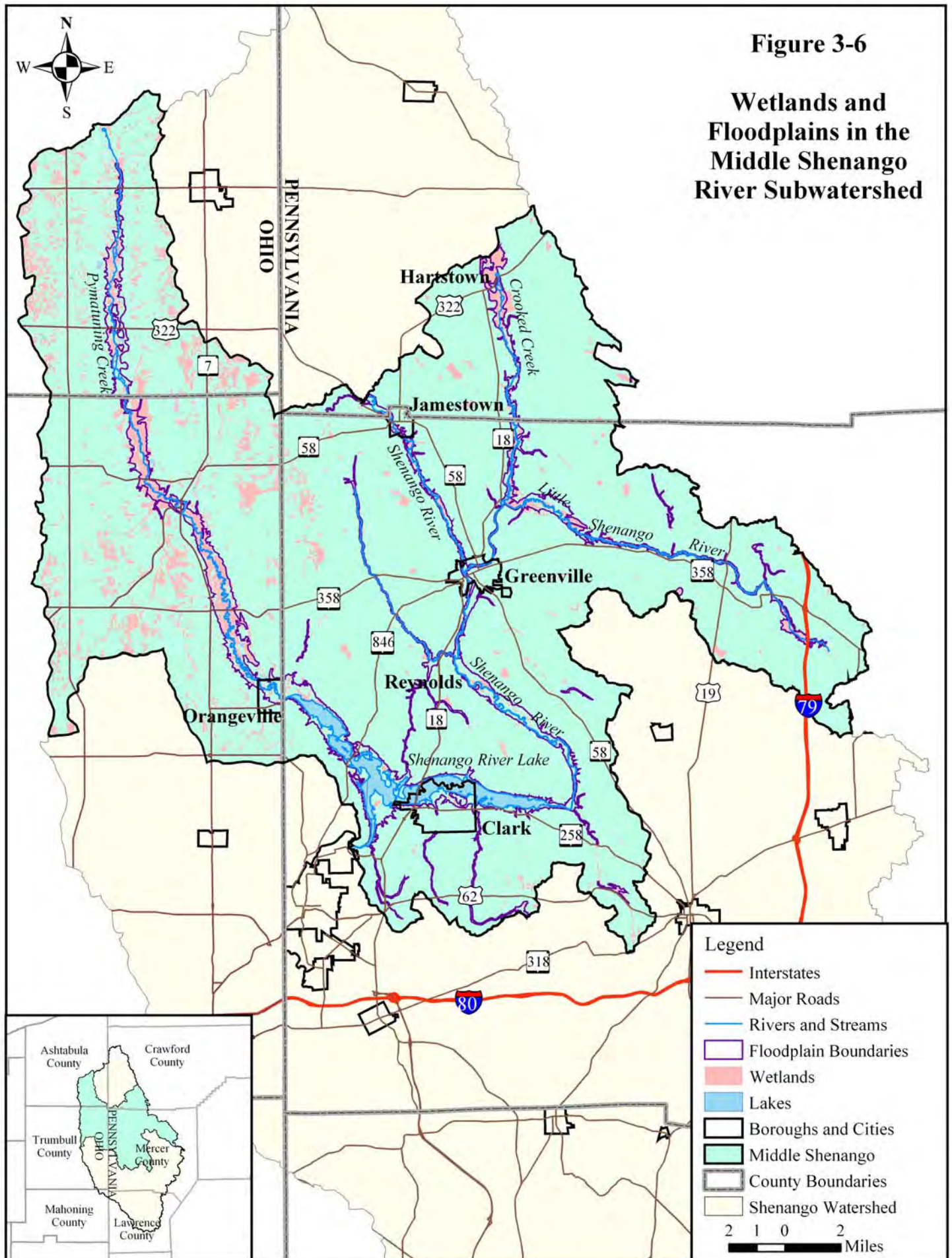
The National Wetland Loss Index indicates that the Shenango River watershed experienced a high level of wetland loss between 1982 and 1992 (US EPA). A high level of loss means that according to the Natural Resources Conservation Service (NRCS), on rural, non-federal lands, wetland loss has been greater than two percent between 1982 and 1992. This loss level is also determined by the U.S. Fish and Wildlife Service on federal and non-federal lands, which indicates historic percent loss from the 1780s to the 1980s was greater than 70 percent.

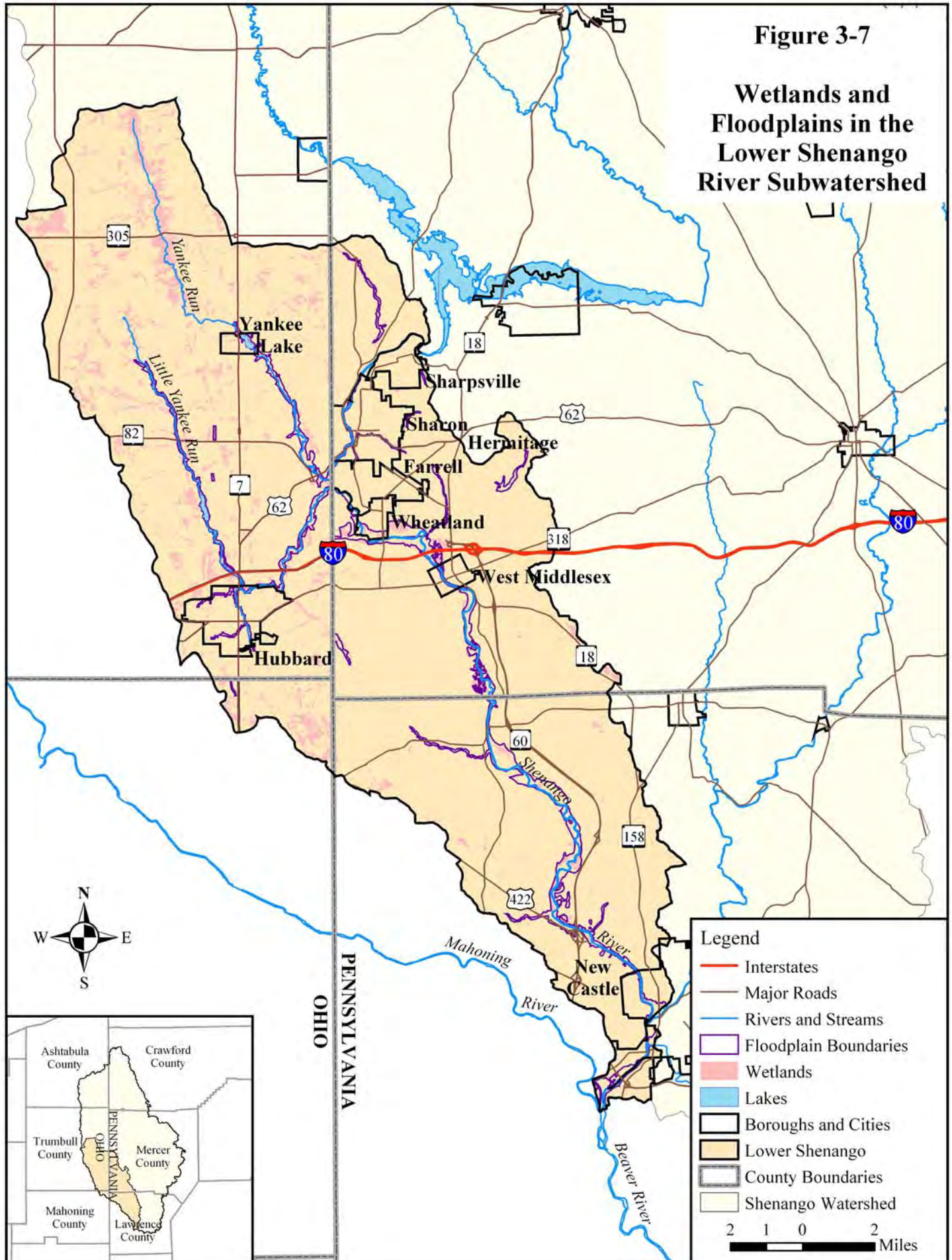
According to a U.S. Department of Agriculture (USDA) NRCS study, the major causes of wetland loss in the northeastern United States, including Pennsylvania, during the 1990s were primarily from development (67.2%), forestry (16.3%), agriculture (9.0%), and other causes (7.5%). The Midwest region of the United States, including Ohio, reports that during the 1990s wetland loss was caused by agriculture (51.9%), development (28.7%), forestry (19.3%), and other causes (0.1%) (NRCS 2000). Historically, conversion of wetlands to agricultural land uses has been the dominant reason for wetland loss. After 1982, development became the primary contributing factor to wetland loss (Petrie et al. 2001).

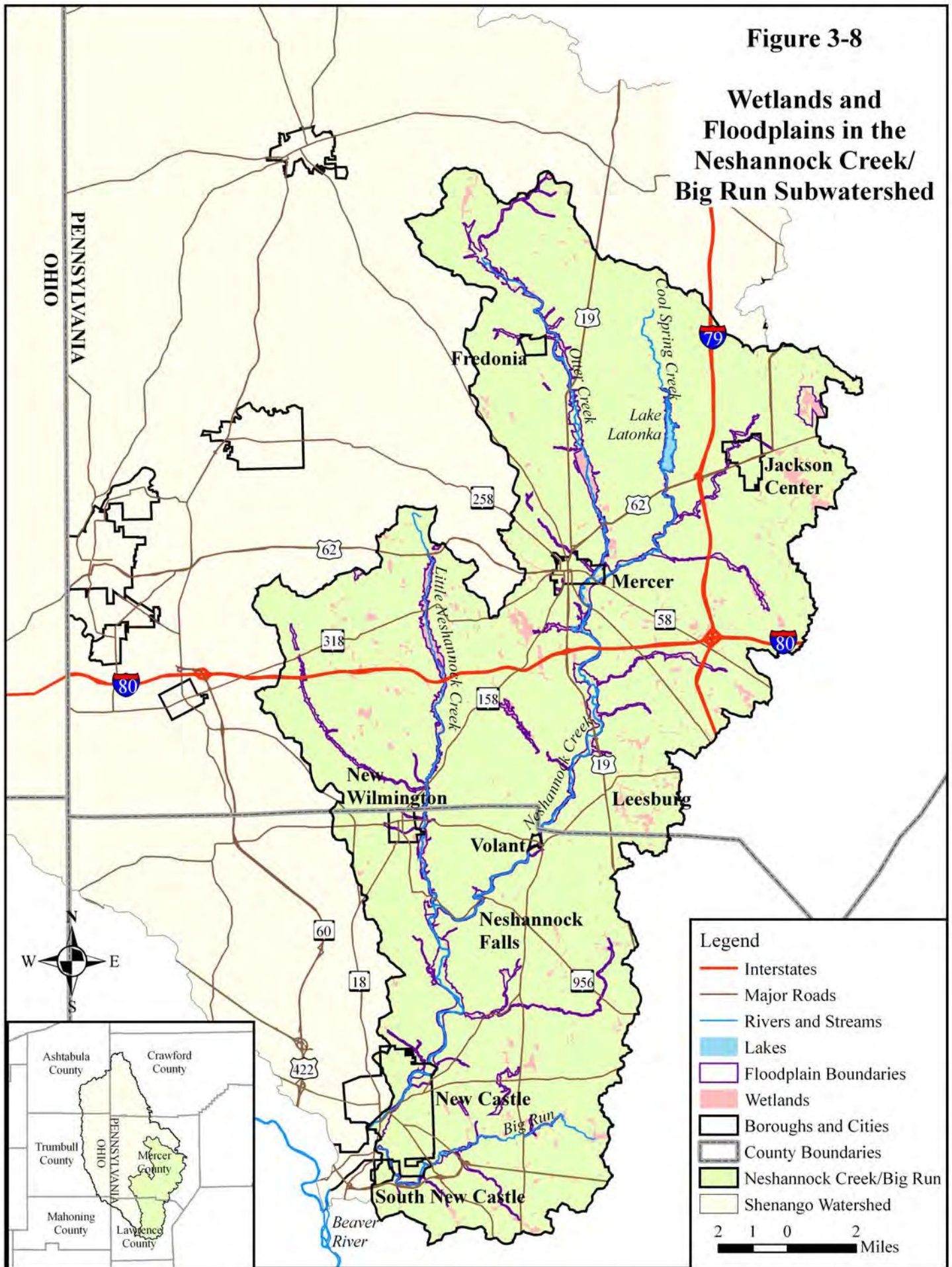


*Headwaters of Paden Creek,
tributary to Shenango River*









Floodplains

Floodplains are another feature of a stream that provide an array of benefits to watershed systems, including:

- Gradual retention and release of groundwater, overland flows, and flood flows;
- Surface and groundwater filtration;
- Sediment deposition; and
- Production of food sources, cover, and thermal protection for organisms living in riparian or floodplain areas.



A Shenango River tributary utilizing its floodplain

Floodplain alterations, such as the removal of vegetation and encroachment by residential and commercial development, interrupt the natural relationship between the stream and its adjacent floodplain. Habitat and food for organisms dwelling within the riparian or floodplain area is also compromised when encroachment or vegetative removal occurs. Adequate vegetation and floodplain integrity, in conjunction with restoration and conservation practices, are key factors in limiting degradation of the water quality and biological resources and protecting those living downstream.

The National Flood Insurance Act of 1968 and Flood Disaster Protection Act of 1973 were implemented to handle issues of floodplain alterations and subsequent watershed flooding. The programs were expanded through the National Flood Insurance Reform Act of 1994 and serve as a foundation for the National Floodplain Insurance Program (NFIP), which assists in community floodplain and flood insurance planning through the implementation of local floodplain management ordinances.

In addition, the federal government published a handbook of federal programs offering non-structural flood recovery and floodplain management alternatives in 1998. In response to severe flooding problems, such as loss of life and property, natural resources, and functional floodplains, the federal government has shifted its focus to improve its floodplain management. This shift in focus entails utilizing non-structural approaches to flooding, as opposed to the traditional structural approaches such as dams, levees, and channels that serve to control flooding. Non-structural approaches tend to modify the susceptibility to flooding. Examples of non-structural approaches include property acquisition, relocation, elevation, flood-proofing of existing structures, rural land easements, and restoration of wetlands. By utilizing the non-structural approach to floodplain management, communities will be made safer and stronger by reducing flood losses, diminishing the mental, physical, and economic toll on towns and farms that have suffered repeated damage, cutting long-term costs, and helping to restore lost or impaired environmental resources. The handbook can be found at <http://www.fema.gov/pdf/hazards/ombflood.pdf>.

All of the Pennsylvania municipalities within the watershed have floodplain ordinances; however, many of them are over 20 years old and should be updated according to land-use changes that have occurred since that time. Table 3-2 shows the dates that municipalities entered the national flood program, which requires that an ordinance be adopted. Should a homeowner have concerns about whether they live in a floodplain, or if they are subject to a floodplain ordinance, they should contact their local municipality. Figures 3-5, 3-6, 3-7, and 3-8 indicate floodplain areas by subwatershed.

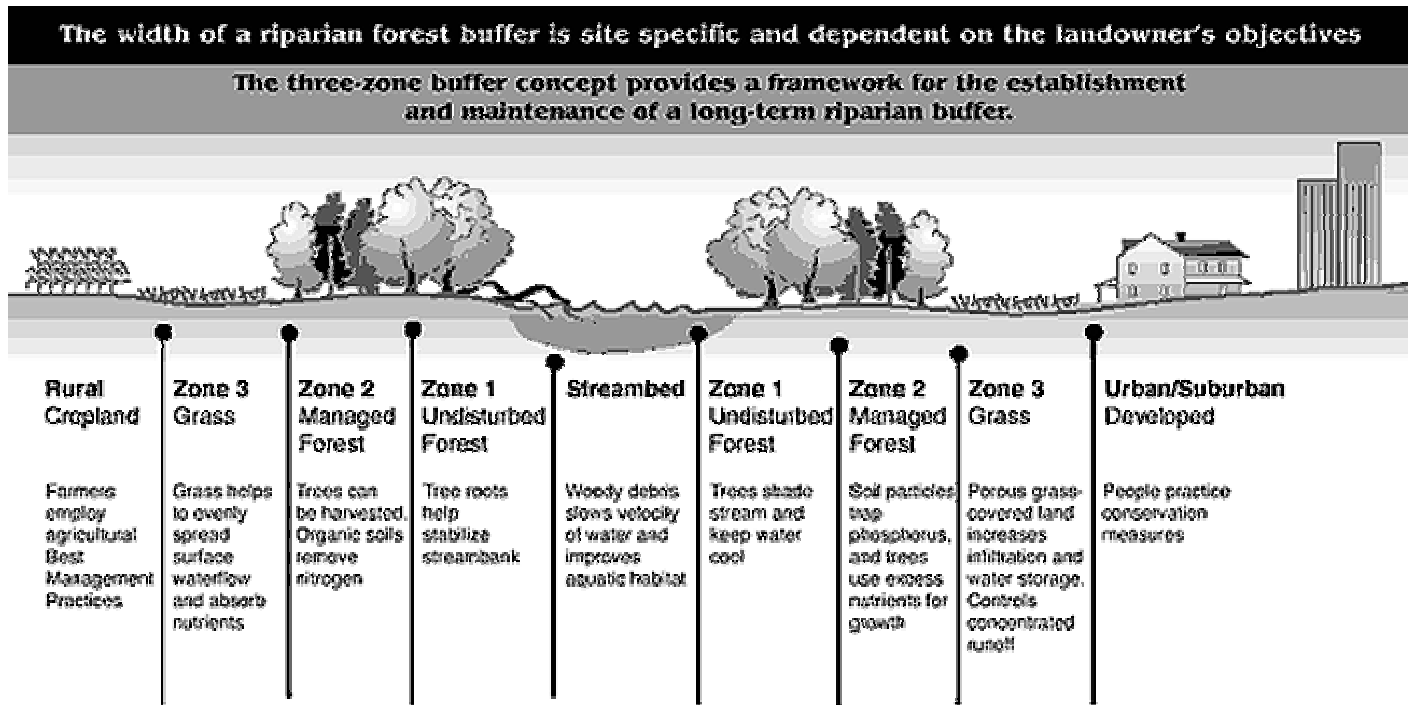
Table 3-2. Municipalities Participating in the National Flood Insurance Program

Municipality	Date of Entry	Municipality	Date of Entry
<i>Crawford County</i>		<i>Mercer County (continued)</i>	
Beaver Township	9/10/1982	Findley Township	2/4/1983
Conneaut Township	9/10/1984	Fredonia Borough	11/17/1978
East Fallowfield Township	9/24/1984	Greene Township	6/30/1976
Linesville Borough	6/5/1985	Greenville Borough	7/16/1981
North Shenango Township	10/1/1986	Hempfield Township	2/15/1991
Pine Township	6/19/1985	Hermitage	9/30/1981
Sadsbury Township	8/19/1991	Jackson Center Borough	6/18/1982
South Shenango Township	7/3/1985	Jamestown Borough	9/10/1982
Summit Township	5/19/1987	Jefferson Township	6/1/1986
West Fallowfield Township	7/3/1985	Lackawannock Township	6/30/1976
West Shenango Township	2/1/1985	Lake Township	6/18/1982
<i>Lawrence County</i>		Mercer Borough	3/15/1977
City of New Castle	8/15/1978	New Vernon Township	10/15/1982
Hickory Township	8/2/1983	Otter Creek Township	12/1/1986
Mahoning Township	2/18/1983	Perry Township	12/17/1982
Neshannock Township	5/17/1982	Pine Township	2/25/1983
New Wilmington Borough	8/3/1984	Pymatuning Township	6/1/1989
Plain Grove Township	8/3/1984	Salem Township	5/1/1986
Pulaski Township	12/31/1982	Sandy Creek Township	10/1/1986
Scott Township	11/1/1986	Sandy Lake Township	9/3/1982
Shenango Township	4/3/1978	Sharon City	10/17/1978
Slippery Rock Township	11/1/1986	Sharpsville Borough	5/25/1978
South New Castle Borough	7/31/1978	Shenango Township	9/4/1991
Taylor Township	8/3/1984	South Pymatuning Township	3/18/1991
Union Township	11/5/1982	Springfield Township	7/16/1982
Volant Borough	9/28/1979	Stoneboro Township	3/18/1991
<i>Mercer County</i>		Sugar Grove Township	9/17/1982
Clark Borough	7/30/1982	West Middlesex Township	9/4/1991
Coolspring Township	9/17/1982	West Salem Township	1/21/1983
Delaware Township	7/30/1982	Wheatland Borough	2/15/1978
East Lackawannock Township	7/23/1982	Wilmington Township	2/4/1983
Fairview Township	1/1/1987	Wolf Creek Township	6/25/1982
Farrell City	4/17/1978	Worth Township	2/4/1983

Riparian Buffers

Riparian buffers are strips of grass, shrubs, and/or trees along the banks of rivers and streams that filter polluted runoff and provide a transition zone between water and human land use. Buffers are complex ecosystems that provide habitat and improve the stream communities they shelter. Figure 3-9 depicts the three-zone buffer concept, which shows how various land uses within riparian corridors can affect the benefits of the buffer. Riparian buffers work to protect our waterways in many ways:

Figure 3-9. Three-Zone Buffer Concept



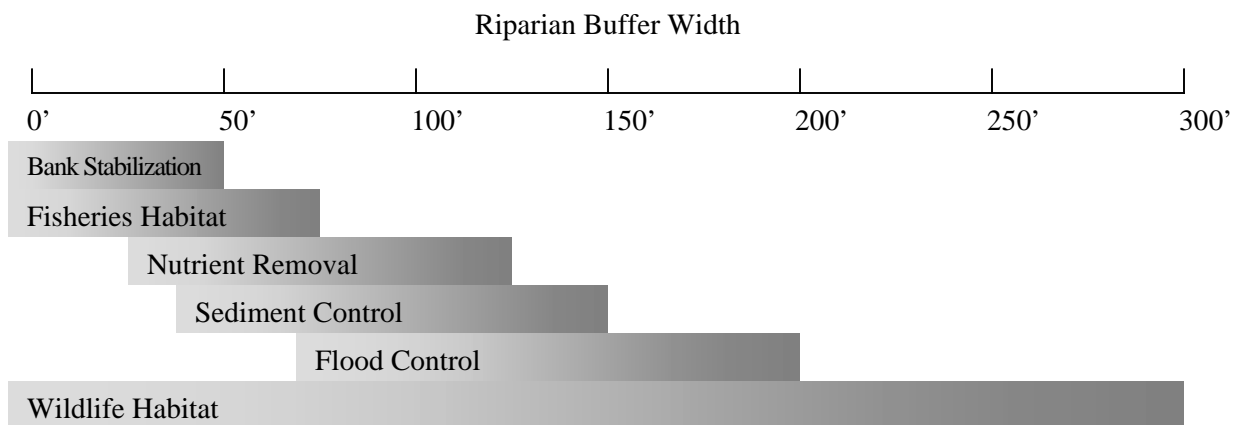
Source: Maryland Cooperative Extension

- **Filter sediment.** Buffers help to trap sediment and debris from surface runoff. Vegetation within the buffer can absorb up to 100 percent of the nutrients in the sediment, depending on its width and characteristics.
- **Filter, transform, and collect pollutants.** Fertilizer and animal wastes contain pollutants, such as excess phosphorus and nitrogen, which bond to soil particles and can be trapped by riparian buffers, preventing them from washing into surface and groundwater. Chemical and biological activity in the soil can capture and transform nitrogen and other pollutants into less harmful forms. Buffers also act as a sink, taking up excess water and nutrients by their root systems and storing them in the biomass of the plant.
- **Regulate stream flow.** Riparian buffers allow water to infiltrate the soil and recharge the groundwater supply by slowing the velocity of the runoff. Since groundwater will reach a stream or river at a much slower rate than surface runoff, buffers help to control flooding during heavy precipitation events and maintain stream flow during the driest time of the year.
- **Stabilize streambanks.** The roots of the buffer vegetation help to stabilize streambanks by holding the soil together. Stems and leaves of the vegetation protect banks by deflecting precipitation and the force of the stream's current.
- **Stabilize streambeds.** Riparian buffers can also reduce the amount of streambed scour by absorbing surface water runoff and slowing water velocity. When vegetation is absent from the riparian area, more surface water reaches the stream, causing the water levels to rise more quickly during heavy rainfalls and snowmelt. This stronger flow can scour streambeds, disturbing the aquatic life there.
- **Provide wildlife habitat.** The unique habitat found in riparian buffers is home to a great diversity of plant and animal species. Some of these species, in fact, are only found within riparian areas. Continuous stretches of riparian buffer also serve as travel corridors for wildlife.

- *Provide food and aquatic habitat.* Forested riparian buffers offer an array of benefits to aquatic habitat. They improve the quality of the water by shading, filtering, and moderating stream flow. Shading is important to maintain cooler temperatures, which hold more oxygen, and reduce stress on fish and aquatic insects. Woody debris and leaves from forested riparian areas feed the aquatic food web, and can also create pools and riffles that provide cover and habitat for fish and aquatic insects. Fallen trees and limbs can also reduce erosion by slowing flow.
- *Enhance recreation and aesthetics.* Riparian buffers can create important greenways along streams and rivers by blocking views of nearby development and allowing privacy for riverfront landowners. Recreational activities, such as hiking trails and camping, are also a possibility with riparian buffers.

The intended purpose of the riparian buffer should determine its width. Topography, hydrology, soil type, and vegetation should be considered when determining the width. Figure 3-10 shows the buffer widths recommended to achieve various protections.

Figure 3-10. Recommended Riparian Buffer Widths



An effort currently underway within the Shenango River watershed is the Riparian Restoration and Protection Initiative. This project has identified the watershed as a priority, based on the following factors:

- Impairment, as identified by PA DEP;
- Watersheds that feed into lakes that are important drinking water supplies, have recreational amenities, or are storehouses of biological diversity;
- Impaired by agriculture and having highly erodible soils;
- High Quality or Exceptional Value designation; and
- Watersheds that have occurrences of threatened or endangered species.

Subwatersheds were then identified for projects based on:

- Willingness of landowner to participate;
- Biotic and abiotic conditions; and
- Location and size of project area.

With 15 of the 25 farms with secured funding being completed, the outcome of this project thus far has resulted in 71,348 feet of stream being fenced from cattle, allowing riparian buffers to establish along many sensitive headwater streams, and 53.4 acres of wetlands protected to create additional riparian areas

free of agricultural practices. More detailed results of this project can be found in the Monitoring section of this chapter.

Lakes and Ponds

Lakes and ponds are valuable ecosystems providing habitats for plant and animal species. Some of these waterbodies are used for recreational purposes, such as swimming, fishing, and boating, while others may be used for flood control and/or drinking water sources.

The Shenango River watershed has two large reservoirs: the Pymatuning Reservoir and the Shenango River Lake. These reservoirs provide a reliable source of drinking water for downstream water suppliers, serving a total population in excess of 250,000.

As a result of nutrient loading from a variety of sources, these large, shallow reservoirs have become very biologically active, negatively impacting recreational use and drinking water quality. The high organic content in the raw water used by the downstream public drinking water suppliers creates difficult and expensive challenges to them and, ultimately, to the consumers. Several times each year, the extremely high biological activity results in the production of chemical compounds known as Geosmin and methylisoborneol (MIB). Depending on seasonal weather conditions, the episodes can be severe and persist for several months. Public water suppliers find that this problem is often impossible to treat adequately, and it is extremely expensive. While the water is safe to drink, consumers find the water quality objectionable even though primary drinking water regulations are not compromised. The only treatment removal technique effectively used by the water suppliers is activated carbon, either in the powdered form or using granular activated carbon filters. Treatment costs to deal with this specific problem can range from \$500,000 to \$800,000 per year and still not adequately address the problem. It is recommended that further study be done on these reservoirs to determine the exact causes and sources of the taste and odor issues (Baumann, personal communication 2003).

In the late 18th century, settlers from Connecticut and New York began to move westward into the northwestern portion of Pennsylvania. Many began to farm the gently rolling hills and flat plains, but found that in certain areas, the land supported rich harvests of grain, while other areas contained swampy depressions. One of the largest wetland areas was known as Pymatuning swamp, derived from the Iroquois, meaning “the Crooked-mouthed Man’s Dwelling Place,” with “crooked-mouthed” referring to deceit.

Although Native Americans used the swamp as a hunting ground, these early farmers found the Pymatuning swamp to be a threat. It swallowed stray cattle and provided habitat to dangerous animals like bears, mountain lions, snakes, and disease-carrying mosquitoes.

In 1868, the General Assembly of Pennsylvania studied the feasibility of draining the Pymatuning swamp. The plan was abandoned when it was determined that draining it would hurt industries downstream. However, severe flooding in the early 19th century led to the construction of a flood control dam in 1932, creating the 23 square-mile (17,088 acre) lake. The **Pymatuning Reservoir** is located in Crawford County, Pennsylvania and Ashtabula County, Ohio, and forms part of the Ohio-Pennsylvania border. The primary purpose of the Pymatuning Reservoir is to conserve the waters entering Pymatuning swamp and to regulate the flow of the Shenango and Beaver Rivers. The secondary purpose is to use the



Pymatuning Reservoir

reservoir to impound floodwater during periods of excessive runoff from the 158 square miles of drainage area above the dam. The reservoir is 16 miles long and 2.5 miles wide.

The Pymatuning Reservoir has two natural areas. Black Jack Swamp consists of 725 acres and provides habitat for unique natural communities. In the northern part of the lake is Clark Island, which has 161 acres of mature hardwood and white pine forest. Visitors are welcome to explore these undeveloped natural areas. Since the reservoir saddles the state lines of Ohio and Pennsylvania, each state offers a park in the name of Pymatuning. The creation of the dam opened countless water recreation opportunities. Today, Pymatuning State Park (PA) offers marinas, boat launching facilities, ball fields, playgrounds, picnic areas, campgrounds, hunting grounds, hiking trails, and environmental education programs.



Shenango River Lake

The **Shenango River Lake**, a six square-mile reservoir, is situated within the suburban Shenango Valley in Mercer County, Pennsylvania and Trumbull County, Ohio. The lake was formed by the construction of the Shenango River Dam. This dam is a concrete gravity dam with an uncontrolled center spillway. The project was authorized by the Flood Control Act of 1938, completed construction in 1965, and began full operation in February 1967. Shenango River Lake is part of the flood-control system operated by the USACE for the Beaver and Upper Ohio Rivers. The dam is located on the Shenango River almost one mile north of Sharpsville, Pennsylvania. It is about 33 miles above the Shenango River's confluence with the Mahoning River near New Castle, Pennsylvania, where the Beaver River is formed. Shenango River Lake hosts a recreation area and is a popular site for many types of activities, including fishing, boating, camping, swimming, picnicking, and hiking.

Lake Latonka is located in Jackson and Coolspring townships, Mercer County. This is a 230-acre private lake formed by a dam on Cool Spring Creek. A residential development has been built around this lake.

There are an estimated 75 additional lakes and ponds in the Upper Shenango River subwatershed; 241 in the Middle Shenango River subwatershed; 123 in the Lower Shenango River subwatershed; and 448 in the Neshannock Creek/Big Run subwatershed. Of special note are Crystal Lake and Dollar Lake. These are two of only eight glacial lakes in Pennsylvania.

Water Quality

According to Title 25 of the Pennsylvania Code Chapter 93 Water Quality Standards, water may not contain substances attributable to point or non-point source discharges in concentrations or amounts sufficient to be unfavorable or harmful to the designated water uses or to human, animal, plant, or aquatic life. In addition to other substances listed within or addressed by Chapter 93, specific substances to be controlled include, but are not limited to, floating materials, oil, grease, scum, and substances that produce color, tastes, odors, turbidity, or settle to form deposits (Pennsylvania Code 1997).

Cold Water Fishery (CWF) and Warm Water Fishery (WWF) designations are based primarily on temperature and dissolved oxygen levels in the surface waters. To be considered a CWF or WWF, the stream must maintain specific temperatures during specific times of the year and not fluctuate from that temperature more than 2°F over a one-hour period as a result of any effluent entering the stream. A CWF must also maintain a daily average dissolved oxygen (DO) level of 6.0 mg/l, whereas a WWF must

maintain a daily average DO level of 5.0 mg/l (Pennsylvania Code 1997). OhioEPA uses a similar definition of designations, with a slightly different name: Warm Water Habitat (WWH), Cold Water Habitat (CWH), Exceptional Warm Water Habitat (EWH), Modified Warm Water Habitat (MWH), and Limited Resource Water (LRW). These designations can be found in Table 3-3.

Table 3-3. Shenango River and Tributaries Water Use Protections
(Source: Pennsylvania Code 1997; OhioEPA 2002)

Waterway	County	State	Use Designation
<i>Upper Shenango River Subwatershed</i>			
Shenango River	Crawford, Mercer, Lawrence	PA	WWF
Linesville Creek	Crawford	PA	WWF
Bennett Run	Crawford	PA	WWF
Paden Creek	Crawford	PA	WWF
Gravel Run (OH)	Ashtabula	OH	WWH
Black Creek (OH)	Ashtabula	OH	WWH
McMichael Creek (OH)	Ashtabula	OH	WWH
Pymatuning Reservoir	Ashtabula	OH	WWH
<i>Middle Shenango River Subwatershed</i>			
Sugar Run	Crawford	PA	WWF
Wade Run	Ashtabula	OH	WWH
Little Shenango River	Mercer	PA	TSF/WWF
Morrison Run	Mercer	PA	Unknown
Crooked Creek	Mercer	PA	TSF/WWF
Bluff Run	Mercer	PA	TSF/WWF
McDowell Run	Mercer	PA	TSF/WWF
Randolph Run	Mercer	PA	TSF/WWF
Unger Run	Mercer	PA	TSF/WWF
Jackson Run	Mercer	PA	TSF/WWF
Patton Run	Mercer	PA	TSF/WWF
Mathay Run	Mercer	PA	WWF
Big Run	Mercer	PA	WWF
Lawango Run	Mercer	PA	WWF
Lackawannock Creek	Mercer	PA	TSF/WWF
Daley Run	Mercer	PA	WWF
Magargee Run	Mercer	PA	WWF
Golden Run	Mercer	PA	WWF
Brush Run	Mercer	PA	WWF
Pymatuning Creek	Mercer / Ashtabula, Trumbull	PA/OH	WWF/WWH
Berry Creek	Ashtabula	OH	WWH

Table 3-3. Shenango River and Tributaries Water Use Protections (continued)

Waterway	County	State	Use Designation
<i>Middle Shenango River Subwatershed (continued)</i>			
Chestnut Run	Mercer	PA	WWF
Clear Creek	Trumbull	OH	WWH
Maple Creek	Trumbull	OH	WWH
Stratton Creek	Trumbull	OH	WWH
Sugar Creek	Trumbull	OH	WWH
Mill Creek	Trumbull	OH	WWH
Booth Run	Mercer	PA	WWF
Pine Hollow Run	Mercer	PA	WWF
Saul Run	Mercer	PA	WWF
Shenango River Lake	Mercer	PA	WWF
<i>Lower Shenango River Subwatershed</i>			
McCullough Run	Mercer	PA	WWF
Thornton Run	Mercer	PA	WWF
Big Run			
Pine Run	Mercer / Trumbull	PA/OH	WWF/WWH
Yankee Creek	Trumbull	OH	WWH
South Branch	Trumbull	OH	WWH
Little Yankee Creek	Trumbull	OH	WWH
Deer Creek	Trumbull	OH	WWH
Bobby Run	Mercer	PA	WWF
Hogback Run	Mercer	PA	WWF
Turkey Run	Mercer	PA	WWF
Buchanan Run	Lawrence	PA	WWF
Deer Creek	Lawrence	PA	WWF
<i>Neshannock Creek/Big Run Subwatershed</i>			
Neshannock Creek	Mercer	PA	TSF/WWF
Otter Creek	Mercer	PA	TSF/WWF
Mill Run	Mercer	PA	TSF/WWF
Oilmill Run	Mercer	PA	TSF/WWF
Kent's Run	Mercer	PA	TSF/WWF
Munnell Run	Mercer	PA	TSF/WWF
Cool Spring Creek	Mercer	PA	TSF/WWF
Mill Creek	Mercer	PA	TSF/WWF
Yellow Creek	Mercer	PA	TSF/WWF
Fox Run	Mercer	PA	TSF/WWF
Beaver Run	Mercer	PA	TSF/WWF

Table 3-3. Shenango River and Tributaries Water Use Protections (continued)

Waterway	County	State	Use Designation
Neshannock Creek/Big Run Subwatershed (continued)			
Pine Run	Mercer	PA	TSF/WWF
Mill Run	Mercer	PA	TSF/WWF
Indian Run	Mercer	PA	TSF/WWF
Potter Run	Lawrence	PA	TSF/WWF
Little Neshannock	Mercer	PA	TSF/WWF
West Branch	Mercer	PA	TSF/WWF
Harthegig Run	Mercer	PA	TSF/WWF
Hottenbaugh Run	Lawrence	PA	TSF/WWF
Big Run	Lawrence	PA	WWF
WWF = Warm Water Fishery; CWF = Cold Water Fishery; TSF = Trout Stocked Fishery; WWH = Warm Water Habitat (Ohio designation)			

Point and Non-point Source Pollution

To effectively regulate and ultimately mitigate the mass load of pollutants entering streams, pollutant sources are classified into two main categories: point and non-point source pollution. Point source discharges are regulated under the National Pollutant Discharge Elimination System (NPDES) permit, established by Section 404 of the Clean Water Act of 1972. A listing of NPDES permits in the watershed can be found in Appendix G. Point source pollutants can be easily traced to their source, such as discharges from industrial or municipal facilities. Non-point source pollutants, sometimes called “runoff pollution,” typically have no readily visible source and often require detailed analysis and research to discern the source. Common sources of non-point pollution are abandoned mines, agriculture, urban runoff, construction activities, malfunctioning on-lot sewage systems, and forestry runoff.

PA DEP's plan for achieving comprehensive assessment of its surface waters includes the Statewide Surface Water Assessment Program (SSWAP) to evaluate all unassessed free-flowing streams using a field-level biological assessment. A major purpose of SSWAP is to delineate areas with water quality impairment and determine the type of pollution responsible. Information from this program, along with data from intensive surveys and other sources, is considered in the development of the Section 303(d) list of waters that may trigger the development of TMDLs, which are discussed in the ‘Pennsylvania’s Impaired Waters’ section of this chapter.

According to the 1999 Pennsylvania Non-point Source Management Plan, the Shenango River watershed has been identified as a high priority agricultural watershed for the Section 319 Nutrient Management Project. This project involved the employment of a nutrient management technician in the sponsoring county, which in this case was Crawford County, with Mercer County Conservation District also participating. Objectives of this project were to hire and train nutrient management personnel, develop nutrient management plans, and to complete best management practice demonstration projects.

Nearly one-third of the entire watershed is comprised of agricultural lands, including cropland, hay land, and pastures (Crawford County Conservation District et al. 1991). The 1990 Water Quality Assessment indicates that agriculture presents a threat to nearly all areas of the watershed, including the middle Shenango River, Pymatuning Creek, Neshannock Creek, Little Neshannock Creek, Otter Creek,

and Cool Spring Creek. The potential problems presented by the agriculturally dominant areas include biochemical oxygen demand, ammonia, fecal coliform, excess nitrification, erosion, and sedimentation.

Pennsylvania's Impaired Waters

The PA DEP has developed a program to assess the quality of waters in Pennsylvania and identify streams and other waterbodies that do not meet water quality standards. The goal is to protect uses the water can support, such as aquatic life, recreation, and potability (drinking water). There are numerical and/or narrative water quality criteria that express the in-stream levels of substances that must be achieved to support the uses. Periodic reports are required under section 305(b) of the federal Clean Water Act. Figures 3-11, 3-12, and 3-13 show impaired waters within the Middle Shenango River subwatershed, Lower Shenango River subwatershed, and Neshannock Creek/Big Run subwatershed.

Section 303(d) of the federal Clean Water Act requires Pennsylvania to identify all impaired waters within the state where technology-based treatment requirements for point and non-point sources of pollution are not stringent enough to attain and/or maintain applicable water quality standards. This list of impaired streams is called the Integrated Waterbody List, formerly known as the 303(d) and 305(b) lists. The Integrated Waterbody List includes water quality limited segments that require the development of total maximum daily loads (TMDLs) to assure future compliance with water quality standards (Table 3-4). Segments for which the source is unknown are listed as either "other" or "unknown."

A TMDL is a document that identifies allowable pollutant loads from point and non-point sources to a specific waterbody. A TMDL also includes a margin of safety to ensure protection of the water. Water quality limited segments are defined as waterbodies that do not meet water quality standards even after the application of technology-based treatment requirements to point and non-point sources of pollution. Water quality standards consist of three components, including: water uses to be protected, water quality criteria necessary to protect those uses, and an anti-degradation statement designed to protect existing water quality and uses.

Table 3-4. Impaired Streams and Lakes Requiring TMDLs

Stream Name	Code	Source	Cause	List Date	TMDL Date	Down RM*	Up RM*	Total Miles	Use Assessed
Bobby Run	35940	Other	Nutrients	1998	2007	0	3.59	3.6	Aquatic Life
Bobby Run (UNT 35942)	35942	Other	Nutrients	1998	2007	0	0.54	0.5	Aquatic Life
Cool Spring Creek (UNT 35820)	35820	Agriculture	Siltation	1998	2007	0.15	1.96	1.8	Aquatic Life
Crooked Creek	36175	Hydromodification	Siltation/Organic Enrichment/Low D.O.	1998	2007	0	2.14	2.1	Aquatic Life
Crooked Creek	36175	Hydromodification	Siltation/Organic Enrichment/Low D.O.	1998	2007	2.14	6.95	4.8	Aquatic Life
Crooked Creek	36175	Hydromodification	Siltation/Organic Enrichment/Low D.O.	1998	2007	6.95	7.93	1	Aquatic Life

Table 3-4. Impaired Streams and Lakes Requiring TMDLs (continued)

Stream Name	Code	Source	Cause	List Date	TMDL Date	Down RM*	Up RM*	Total Miles	Use Assessed
Crooked Creek	36175	Hydromodification	Organic Enrichment /Low D.O.	1998	2007	7.93	8.39	0.5	Aquatic Life
Deer Creek	35888	Unknown	Nutrients	2002	2007	0	3.05	3	Aquatic Life
Fox Run	35793	Abandoned Mine Drainage/Natural Sources	Metals/Organic Enrichment, Low D.O.	1998	2011	0.49	2.44	2	Aquatic Life
Little Shenango River (UNT 36286)	36286	Agriculture	Nutrients	1998	2007	0	1.83	1.8	Aquatic Life
Magargee Run (UNT 36056)	36056	Package Plants	Nutrients	2002	2007	0	1.08	1.1	Aquatic Life
Mill Creek	35754	Abandoned Mine Drainage	Metals	1998	2011	1.61	2.56	1	Aquatic Life
Mill Creek (UNT 35762)	35762	Abandoned Mine Drainage	Metals	1998	2011	0	0.22	0.2	Aquatic Life
Neshannock Creek (UNT 35516)	35516	Abandoned Mine Drainage/Urban Runoff	Metals/Storm Sewers, Siltation	1998	2011	0	1.58	1.6	Aquatic Life
Neshannock Creek (UNT 35533)	35533	Agriculture	Siltation	1998	2007	0	0.89	0.9	Aquatic Life
Neshannock Creek (UNT 35644)	35644	Agriculture	Siltation	1998	2007	0	1.63	1.6	Aquatic Life
Otter Creek	35679	Agriculture/Natural Sources	Nutrients/Organic Enrichment, Low D.O.	1998	2007	11.62	13.1	1.5	Aquatic Life
Otter Creek (UNT 35738)	35738	Agriculture/Natural Sources	Nutrients/Organic Enrichment, Low D.O.	1998	2007	0	1.25	1.2	Aquatic Life
Shenango River	35482	Other	Nutrients	1996	2007	2.99	15.6	12.6	Aquatic Life
Shenango River	35482	Other	Metals	2002	2007	2.99	15.6	12.6	Aquatic Life
Shenango River	35482	Agriculture	Pathogens	2004	2013	5.11	6.1	1	Human Health
Shenango River	35482	Other	Nutrients	1996	2007	15.57	24.2	8.6	Aquatic Life
Shenango River	35482	Other	Metals	2002	2007	15.57	24.2	8.6	Aquatic Life

Table 3-4. Impaired Streams and Lakes Requiring TMDLs (continued)

Stream Name	Code	Source	Cause	List Date	TMDL Date	Down RM*	Up RM*	Total Miles	Use Assessed
Shenango River	35482	Other	Nutrients	1996	2007	25.13	28.1	2.9	Aquatic Life
Shenango River	35482	Other	Metals	2002	2007	25.13	28.1	2.9	Aquatic Life
Shenango River	35482	Hydromodification	Nutrients	1996	2007	32.94	33.8	0.9	Aquatic Life
Shenango River	35482	Hydromodification	Organic Enrichment/Low D.O.	1998	2007	62	66.7	4.7	Aquatic Life
Shenango River (UNT 35850)	35850	Package Plants	Nutrients	2002	2007	0	2.62	2.6	Aquatic Life
Yellow Creek	35778	Abandoned Mine Drainage	Metals	1998	2011	0	7.83	7.8	Aquatic Life
Yellow Creek (UNT 35785)	35785	Abandoned Mine Drainage	Metals	1998	2011	0	1.21	1.2	Aquatic Life
Yellow Creek (UNT 35786)	35786	Abandoned Mine Drainage	Metals	1998	2011	0	0.58	0.6	Aquatic Life

Lake Name	Source	Cause	List Date	TMDL Date	Acres	Use Assessed
Lake Latonka	Unknown	Organic Enrichment/Low D.O.	2002	2007	320	Aquatic Life

*Down RM = Downstream River Mile; Up RM = Upstream River Mile

PA DEP must develop TMDLs for each waterbody on the 303(d) list. A TMDL is designed to reduce pollutant loads to impaired waters and enable those waters to meet water quality standards. Pennsylvania has committed to developing TMDLs for all impaired waterbodies and will use both traditional and new approaches to correct water quality problems.

Two TMDLs were completed and approved by EPA in 2001 for the Shenango River. Both TMDLs are for a 33.8-mile segment of the Shenango River. This segment was assessed through the surface water monitoring program, and the causes of impairment were PCBs and Chlordane, the sources of which were unknown. Table 3-5 shows a list of streams and lakes impaired by pollution that do not require a TMDL. These segments have been exempt from completing a TMDL because they are not impaired by a pollutant, but rather by an alternate source of impairment such as channelization or habitat modification.

PA DEP also lists stream segments that are expected to meet designated uses within a reasonable timeframe, and therefore do not require a TMDL to be established. There are two such stream segments on the Shenango River that have been assessed for aquatic life use. One is a 1.6-mile segment impaired by unionized ammonia (from RM 1.62 to 3.22), and the other is a two-mile segment (from the mouth to RM2.04) impaired by nutrients. The source of impairment for both segments is from package plants.

Table 3-5. Streams and Lakes Impaired by Pollution not Requiring a TMDL

Stream Name	Watershed	Code	Source	Cause	List Date	Down RM	Up RM	Total Miles	Use Assessed
Bobby Run	20A	35940	Other	Other Habitat Alterations	1998	0	3.59	3.6	Aquatic Life
Bobby Run (UNT 35942)	20A	35942	Other	Other Habitat Alterations	1998	0	0.54	0.5	Aquatic Life
Cool Spring Creek (UNT 35820)	20A	35820	Other	Water/Flow Variability	1998	0.15	1.96	1.8	Aquatic Life
Little Neshannock Creek (UNT 35542)	20A	35542	Channelization	Flow Alterations	1998	0	2.6	2.6	Aquatic Life
Little Neshannock Creek (UNT 35542)	20A	35542	Road Runoff	Water/Flow Variability	1998	0	2.6	2.6	Aquatic Life
Pine Run	20A	35951	Habitat Modification	Other Habitat Alterations	1998	0	1.72	1.7	Aquatic Life
Pine Run	20A	35951	Habitat Modification	Flow Alterations	1998	0	1.72	1.7	Aquatic Life
Pine Run (UNT 35952)	20A	35952	Habitat Modification	Other Habitat Alterations	1998	0	1.41	1.4	Aquatic Life
Shenango River (UNT 35924)	20A	35924	Other	Other Habitat Alterations	1998	0	2.04	2	Aquatic Life

Lake Name	Watershed	Source	Cause	List Date	Acres	Use Assessed
Pymatuning Reservoir	20A	Other	pH	2002	14,500	Aquatic Life
Shenango River Lake	20A	Other	pH	2002	3,041.30	Aquatic Life

There are also two TMDLs scheduled for completion in 2005. They are Cool Spring Creek, which is impaired by siltation from agriculture, and Neshannock Creek, also impaired by siltation from agriculture.

Waterbody assessment and data evaluation is a continuous process. The 2002 303(d) list was developed using information from stream and lake surveys and other sources, including PA DEP's Statewide Surface Water Assessment Program (formerly known as 'Unassessed Waters'), the Water Quality Assessment Process, the Non-point Source Program, and existing data submitted by external groups and agencies.

Table 3-6. Unassessed Streams and Lakes

Stream Name	Watershed	Stream Code	% Not Assessed	Total Stream Length (mi)
Little Deer Creek	20A	64901	100	1.59
Pymatuning Creek	20A	35985	100	5.32
Shenango River	20A	35482	37	33.9

Table 3-6. Unassessed Streams and Lakes (continued)

Lake Name	Watershed	Acres
All Unnamed Lakes	20A	46.71
Buhl Lake	20A	6.04
Dollar Lake	20A	0.49
Lower Lake	20A	8.90
Mud Lake	20A	16.98

Ohio's Impaired Waters

The Ohio 2004 Integrated Water Quality Monitoring and Assessment Report is similar to Pennsylvania's Impaired Waterbody List. The report indicates the general condition of Ohio's waters and identifies waters that are not meeting water quality goals. Like Pennsylvania, Ohio's report has combined the Section 305(b) water quality reports and the Section 303(d) list of impaired waters. Table 3-7 shows the impaired waters within the Shenango River watershed in Ohio. Figures 3-11, 3-12, and 3-13 show impaired waters within the Middle Shenango River subwatershed, Lower Shenango River subwatershed, and Neshannock Creek/Big Run subwatershed.

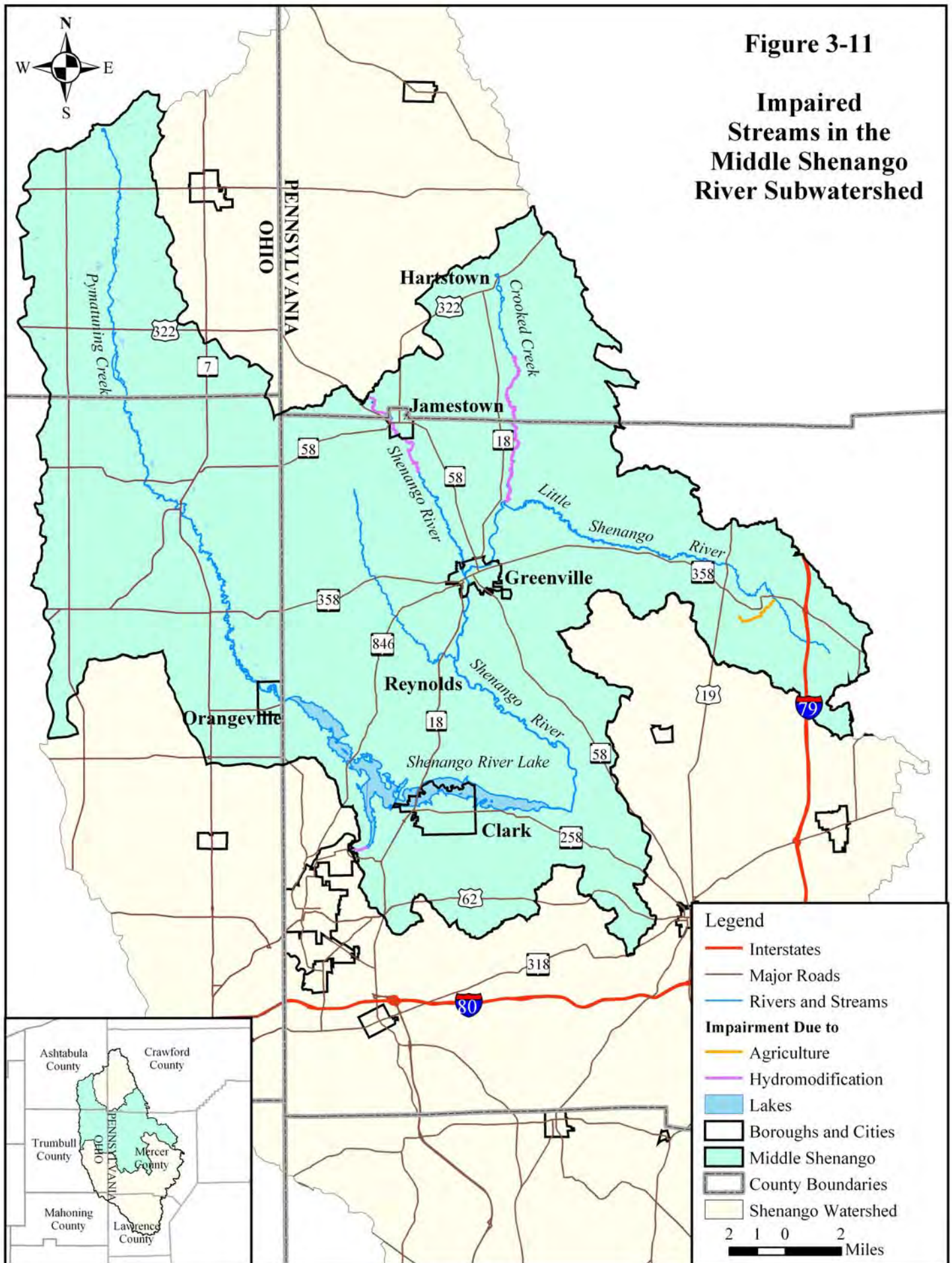
Table 3-7. Ohio EPA 2004 Integrated Report on Impaired Waterways

Assessment Unit	Code	Size (sq mi)	Impairment of Aquatic Life Use	Impairment of Recreation Use	Next Field Monitoring	Projected TMDL Date
Tributaries to Pymatuning Reservoir (within Ohio)	5030102010	40.7	Unknown	Unknown	2008	N/A
Pymatuning Creek	5030102030	149.5	Yes	Unknown	2008	2010
Yankee Creek; Little Yankee Creek	5030102050	94.6	Yes	Unknown	2008	2010

Stormwater Runoff

Stormwater runoff occurs as a result of impervious cover, which is material that covers the land that water cannot penetrate. Examples of impervious cover include roads, parking lots, buildings, sidewalks, and driveways. In a forested or vegetated area, rain soaks into the ground and is either taken up by tree or plant roots, moves down through the soil and into the groundwater, or runs off the land. When rain falls on impervious cover, it cannot soak into the ground and instead becomes stormwater runoff. When it rains on impervious cover, stormwater runoff is increased by 16 times, as compared to a vegetated or forested area.

The amount of impervious cover in a watershed influences dry and wet weather stream flow, channel shape and size, water quality, and plant and animal habitat. Most streams receive their base flow from groundwater. Impervious surfaces block water from contributing to groundwater, and lower stream flows can occur during dry weather. In addition, during rain events water runs off impervious surfaces, enters the storm drain system, and many times is directed straight to the stream. This large amount of stormwater runoff into the stream system can cause more frequent flooding, and higher level flooding. Increased flooding also results in accelerated streambank erosion, enlarged channel width, sedimentation on the stream bottom making the stream shallower, and straightening of the stream channel. When it rains, pollutants that have built up on impervious surfaces are washed into the stream. Examples of such



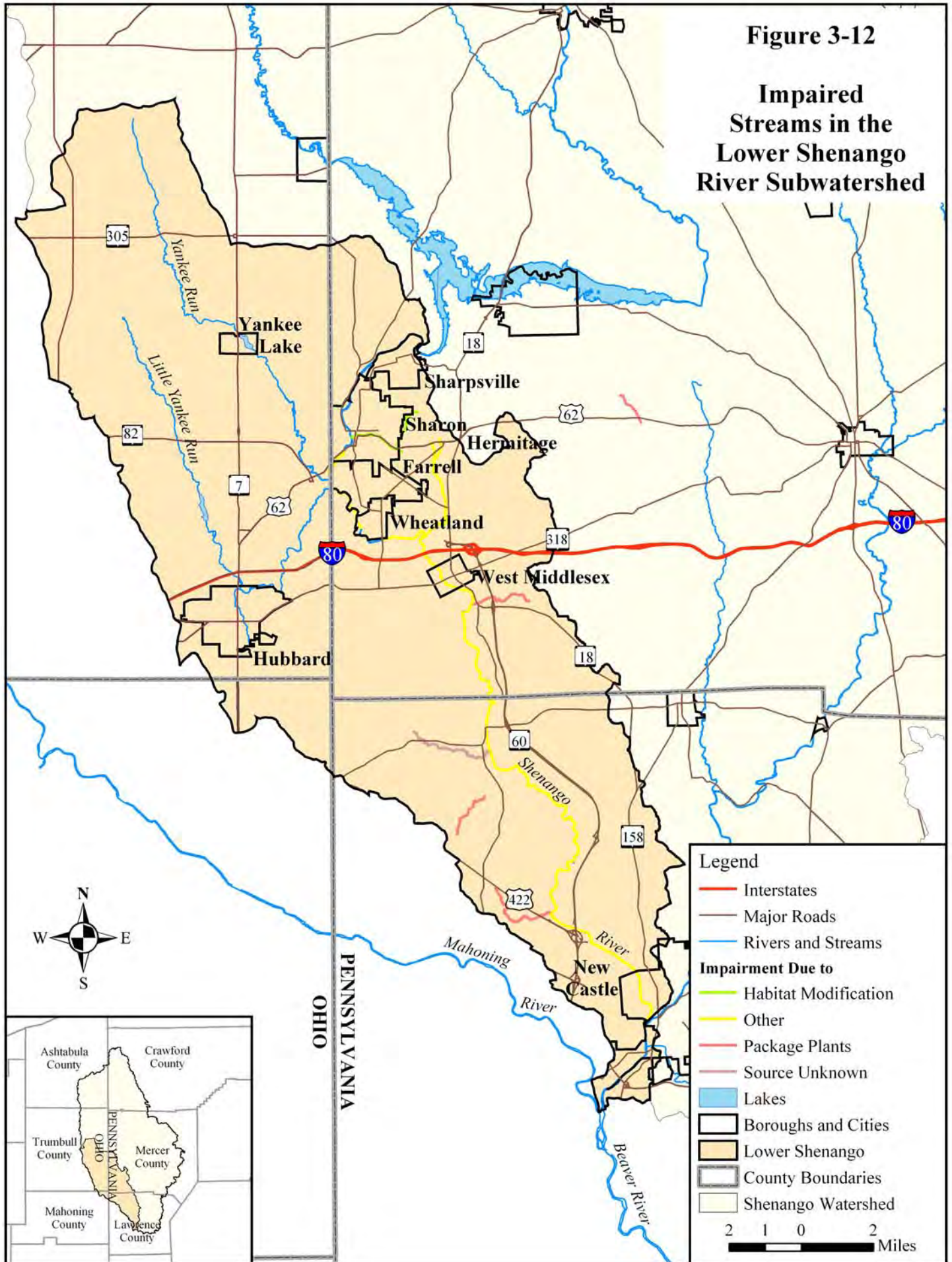
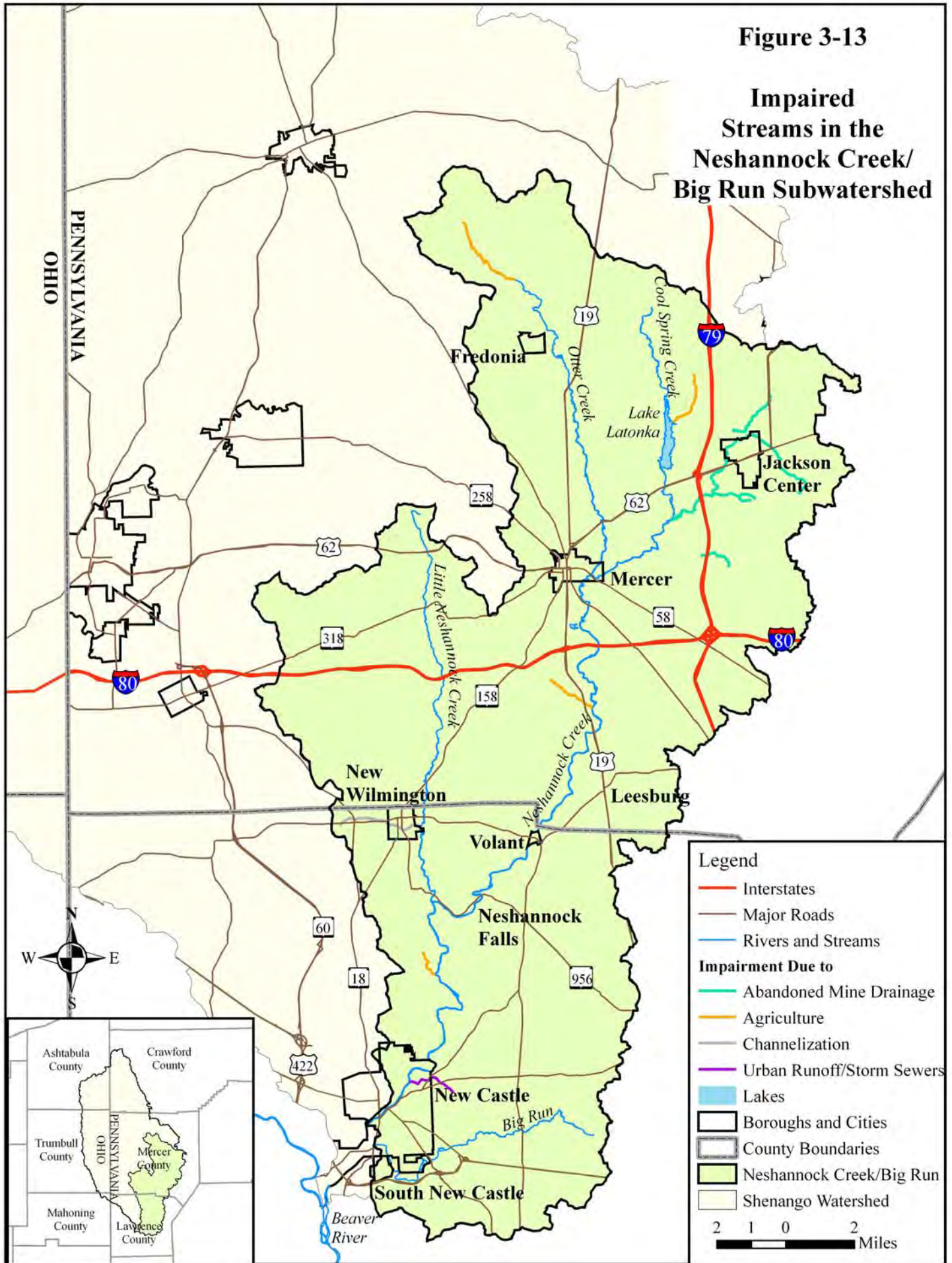


Figure 3-13

Impaired Streams in the Neshannock Creek/Big Run Subwatershed



pollutants include bacteria, nutrients, pesticides, oil and grease, and heavy metals. Impervious cover also changes the natural stream environment resulting in the stream habitat being smothered by sediment deposits, reduction in habitat variety, loss of stream buffer, and the effects on wildlife, such as waterfowl, aquatic insects, amphibians, and fish.

As the amount of impervious cover in a watershed increases, the number and diversity of aquatic species decreases. Watersheds having 10 percent or less impervious cover are considered sensitive, meaning that they contain healthy streams with good water quality that support diverse aquatic life. These streams are very vulnerable to development and require a great level of protection, including land conservation. Few streams within the Shenango River watershed meet these requirements.

Watersheds having 10 to 25 percent impervious cover are considered impacted. These streams are typically suburban streams that can support a fairly diverse aquatic life population. Streambank erosion is noticeable and the water quality is dependent upon watershed protection techniques employed by the local communities. These streams require extensive protection, including stormwater management. Many streams within the Shenango River watershed would be considered impacted.

Damaged streams are found in those watersheds containing 25 to 60 percent impervious cover. The stream channels are highly eroded and water quality is poor. These streams support very few aquatic species, and human use of the streams is limited by health concerns. Careful restoration and stewardship can improve water and habitat quality. Those streams found around residential and commercial areas of the watershed would be considered damaged. However, many of these streams within the Shenango River watershed still possess a significant amount of biodiversity and immediate restoration could prevent them from becoming severely damaged.

Severely damaged streams are found in those watersheds containing over 60 percent impervious cover. Typically, these channels are highly modified and have few natural features. Water quality is poor and aquatic life is limited. These streams do not support many human uses, including fishing. Not much can be done for aquatic habitat, but pollution prevention can help improve water quality delivered downstream. Within the Shenango River watershed, severely damaged streams would include those within the most industrialized areas, and where the streams/rivers have been channelized, such as Neshannock Creek in New Castle.



Neshannock Creek in New Castle

In urban areas of the watershed, such as Sharon, Hermitage, and New Castle, combined sanitary storm sewers are responsible for numerous raw sewage discharges to local streams during significant precipitation events. Combined sanitary storm sewers are those that carry both sanitary wastewater and stormwater. In such systems, both sanitary wastewater and stormwater is transported to a facility for treatment. When it rains, the volume of stormwater and wastewater may exceed the capacity of the combined sewers or of the treatment plant, and a portion of the combined wastewater may be allowed to overflow untreated into the nearest stream or river. This is often referred to as a combined sewage overflow (CSO). In addition, even when the capacity of the treatment plant is not exceeded, stormwater is being treated unnecessarily, leading to additional operation and maintenance costs.

In October 2004, US EPA awarded a nearly \$6.8 million grant to Pennsylvania to fight pollution from stormwater runoff. Matched with over \$4.5 million from Pennsylvania, this program will allow

numerous stormwater projects to be completed to protect waterways for drinking water, recreational activities, and to preserve the natural habitats surrounding them.

Erosion and Sedimentation

Erosion is the mechanical transfer by water and air of soils and rocks that have been weathered into finer particles. Sedimentation refers to the deposit of these particles on the earth's surface. Erosion and sedimentation (E&S) are natural earth surface processes. These processes can be severely escalated by land-use practices that strip land of its vegetation and elevate amounts of sediment that enter stream



Gravel bar developing on Neshannock Creek as a result of erosion and sedimentation

systems during rainfall. Areas that are sensitive to erosion processes are those with steep slopes and erodible soils. Deposition of eroded sediment occurs in low-lying areas, such as wetlands and floodplains, or in streams.

Streams compensate for increased sediment loads from elevated erosion levels by reconfiguring themselves to carry or deposit the sediment. Stream reconfiguring results in down cutting, excess sediment deposits choking the stream, vertical deepening of the stream channel, and subsequent horizontal erosion of streambanks. If streams continue on these paths, erosion can eventually slice off the soil supporting roads, homes, and businesses located near tributaries and streams. In addition to the physical changes that increased supplies of sediment bring to the stream system, sediment can also carry large amounts of nutrients and chemicals, such as nitrogen,

phosphorus, pesticides, and herbicides, from runoff that drains from residential lawns, animal feed lots, golf courses, and farms. Increased sediment delivered to streams can also destroy streambed habitat and decrease the ability of aquatic organisms to survive.

The effects of erosion and sedimentation on aquatic life are numerous. As particles become deposited on the streambed, areas around rocks and boulders that were home to a variety of aquatic insects become filled in, thus choking the habitat. As aquatic insect habitat is lessened and populations dwindle, fish populations suffer as a result of the decrease in available food. Another implication is an increase in temperature resulting from the shallow channel created from streambed widening. This widening occurs when the stream is unable to accommodate high sediment loads and sediment erodes the streambanks. An increase in temperature is also directly related to a decrease in the amount of dissolved oxygen available, which can lead to the suffocation of some aquatic species.

Siltation, also known as sedimentation, is the number one cause of impairment in Pennsylvania streams (PA DEP 2004d). Erosion and sedimentation occur as a result of many activities that take place on land, such as dirt and gravel roads, logging, development, agricultural practices, and mining. These activities expose unprotected soil to the air and water, making it susceptible to erosion and sedimentation.

The county conservation districts address erosion and sedimentation in a number of ways. They review E&S control plans, perform inspections of disturbance sites, process complaints, and process permit applications pursuant to the NPDES program. An E&S control plan is a site-specific plan that identifies best management practices (BMPs) to minimize accelerated erosion and sedimentation. BMPs are practices that help reduce or prevent sediment from entering a stream or waterway. Some common construction-related BMPs include keeping equipment on the bank, working during low-flow times, pumping water around the project, blocking around the work area, temporary seeding and mulching, and using silt fencing, straw bales, rock filters, vegetative filter strips, etc. Examples of forestry BMPs include seasonal and weather timing considerations, skid trail design, layout of removal roads, reduced-

impact timber harvesting technology, special consideration for compaction potential of high-quality soils, forest regeneration promotion, application of nitrogen fertilizers where necessary to avoid soil acidification, and special consideration for wet or stony soils.

All disturbance activities require E&S plans. The conservation districts are also involved in all instances where soil is being disturbed by development, timber harvesting, or by highway development. The E&S plans that are submitted to the conservation districts must include measures that will promote the maintenance and protection of existing water quality and its uses.

There are 11 basic areas that should be addressed in an E&S plan (adapted from Crawford and Lawrence County Conservation District websites, Appendix N):

1. Topographic Features;
2. Soil type and characteristics;
3. Location characteristics and proposed alterations;
4. Amount of runoff from upstream watershed and project area;
5. PA DEP Chapter 93 designation;
6. Location and description of BMPs;
7. Sequence of installation and removal of BMPs;
8. Supporting calculations;
9. Plan drawing or photos;
10. Maintenance program for inspection of BMPs; and
11. Proper measures for recycling or disposal of materials.

For more information about E&S Control Plans, contact your local conservation district.

With the vast number of roads in Pennsylvania, they unfortunately become convenient disposal avenues for road runoff into streams. Traditionally, road maintenance practices have called for removal of water into streams by the quickest means possible. These practices have resulted in thousands of tons of sediment, and what is carried with it, being deposited into the streams (Dirt & Gravel Roads Program). The Dirt and Gravel Road Pollution Prevention Program is an innovative effort to educate the public about pollution problems from roads and to fund environmentally sound maintenance of unpaved roadways that have been identified as sources of dust and sediment pollution. This law, effective April 1997 as Section 9106 of the PA Vehicle Code (§9106), is based on the principle that informed local control is the most effective way to stop pollution. The law created a dedicated, non-lapsing fund to provide money to communities for education and road maintenance by way of streamlined appropriations to county conservation districts for use by road maintenance entities under the environmental guidance of a Quality Assurance Board. More information about the Dirt and Gravel Road Program can be found on the Center for Dirt and Gravel Road Studies website (Appendix N).

Another significant cause of increased erosion and sedimentation within the watershed is agricultural practices. In particular, unrestricted cattle access to streams is extremely detrimental. When cattle have full access to streams, the supporting streambanks become trampled and devegetated, leaving the soils exposed and unprotected. Tilling techniques also can contribute to accelerated erosion and sedimentation. Combined, these agricultural impacts pose a serious threat to stream health throughout the Shenango River watershed. The streams are not only impacted by erosion and sedimentation, but they also can be overcome with excess nutrients from fertilizers and manure as a result of runoff. Some examples of agricultural BMPs often used to address these issues include contour strips, no-till farming, filter strips, field borders, cover crops, field terracing, grassed waterways, water and sediment control basins, and wetland development or restoration. More information about agricultural BMPs can be obtained from the local conservation district, farm bureau, or NRCS office.

Other factors that can contribute to accelerated erosion and sedimentation in the watershed include an increase in gas well drilling, logging and deforestation, and construction and development activities. All of these activities involve removal of vegetation and temporary road construction, which leads to destabilization of soils and increased erosion and sedimentation.

Sediment from roads and other sources can build up in culverts, especially during high rain events. This is especially true if the culverts are not large enough or designed well enough to handle the water and sediment during high flows. This can contribute to flooding problems upstream.

Sewage

Residential sewage and wastewater are treated and disposed of by various methods, ranging from large municipally owned sewage treatment plants to community or individual on-lot disposal systems, also called septic systems. Malfunctioning sewage disposal systems, regardless of type, pose a serious threat to public health and the environment. They can pollute public and private drinking water sources, often by discharging directly to ground and surface waters. Raw sewage can expose humans and animals to various bacteria, viruses, and parasites. However, repairs to sewage systems can often lead to financial hardships for affected municipalities or homeowners.

In response to malfunctioning sewage systems in the state, the Pennsylvania Sewage Facilities Act, Act 537, was enacted in 1966 to correct existing sewage disposal problems and prevent future problems. Act 537 requires proper planning, design, and permitting for on-lot disposal systems. Most residential systems in the state, however, were built before the act and are in need of repair. On-lot systems that are not properly functioning channel nitrogen-laden water back into the groundwater, possibly contaminating drinking water supplies (Launch 1996).

Major Provisions of Act 537:

- All municipalities must develop and implement an official sewage plan that addresses their present and future sewage disposal needs. These plans are modified as new land development projects are proposed or whenever a municipality's sewage disposal system needs upgraded. PA DEP reviews and approves the official plans and any subsequent revisions.
- Local agencies are required to employ both primary and alternate Sewage Enforcement Officers (SEO). After successfully completing training and being certified by a state board, a SEO works for the local agency and is responsible for implementing the daily operation of that agency's permitting program. SEOs are not PA DEP employees.
- Local agencies, through their SEO, approve or deny permits for construction of on-lot sewage disposal systems prior to system installation.
- PA DEP provides grants and reimbursements (funded by annual legislative appropriations) to municipalities and local agencies for costs associated with the Act 537 planning and permitting programs.
- An Environmental Quality Board must adopt regulations establishing standards for sewage disposal facilities. These regulations apply throughout the commonwealth.
- A Sewage Advisory Committee (SAC) reviews existing and proposed rules, regulations, standards, and procedures and then advises the Secretary of PA DEP. This advisory committee is comprised of members representing many sectors of the regulated community.

Municipalities are required to develop and implement comprehensive official sewage plans that address existing sewage disposal needs or problems; account for future land development; and provide for future sewage disposal needs of the entire municipality. Table 3-8 shows that all of the municipalities

Table 3-8. Act 537 Municipal Sewage Plan Aging (PA DEP 2004c)

Municipality	Plan Approval Date	Age of Plan	Municipality	Plan Approval Date	Age of Plan
<i>Crawford County</i>			<i>Mercer County</i>		
Beaver Township	6/1/1970	20+ years	Fairview Township	1/1/1968	20+ years
Conneaut Township	2/10/1976	20+ years	Farrell City	2/13/1997	5-10 years
East Fallowfield Township	6/1/1970	20+ years	Findley Township	1/1/1968	20+ years
Greenwood Township	6/1/1970	20+ years	Fredonia Borough	1/1/1968	20+ years
Linesville Borough	7/24/1989	10-20 years	Greene Township	1/1/1968	20+ years
North Shenango Township	8/27/2003	< 5 years	Greenville Borough	3/15/1991	10-20 years
Pine Township	9/12/1974	20+ years	Hempfield Township	5/10/1973	20+ years
Sadsbury Township	6/29/1995	5-10 years	Hermitage City	8/26/2003	< 5 years
South Shenango Township	11/6/1992	10-20 years	Jackson Center Borough	4/8/1997	5-10 years
Summit Township	2/17/1982	20+ years	Jackson Township	1/1/1968	20+ years
West Fallowfield Township	10/4/1999	< 5 years	Jamestown Borough	4/26/1999	< 5 years
West Shenango Township	6/1/1970	20+ years	Jefferson Township	1/1/1968	20+ years
<i>Lawrence County</i>			Lackawannock Township	1/1/1968	20+ years
Hickory Township	8/13/1974	20+ years	Lake Township	1/1/1968	20+ years
Mahoning Township	9/27/1971	20+ years	Mercer Borough	5/5/1986	10-20 years
Neshannock Township	9/16/2003	< 5 years	New Vernon Township	12/8/1993	5-10 years
New Castle City	8/27/2003	< 5 years	Otter Creek Township	1/1/1968	20+ years
New Wilmington Borough	1/16/1974	20+ years	Perry Township	1/1/1968	20+ years
North Beaver Township	5/24/1999	< 5 years	Pine Township	5/19/1999	< 5 years
Plain Grove Township	9/27/1971	20+ years	Pymatuning Township	10/7/1975	20+ years
Pulaski Township	9/23/2002	< 5 years	Salem Township	1/1/1968	20+ years
Scott Township	9/27/1971	20+ years	Sandy Creek Township	12/8/1993	5-10 years
Shenango Township	1/4/1966	20+ years	Sandy Lake Township	2/16/1994	5-10 years
Slippery Rock Township	11/11/1971	20+ years	Sharon City	1/1/1968	20+ years
South New Castle Borough	1/9/1996	5-10 years	Sharpsville Borough	3/22/2000	< 5 years
Taylor Township	10/28/1971	20+ years	Shenango Township	5/26/1982	20+ years
Union Township	9/7/1993	5-10 years	South Pymatuning Township	11/15/2000	< 5 years
Volant Borough	4/7/1992	10-20 years	Springfield Township	5/25/1973	20+ years
Washington Township	12/30/1971	20+ years	Stoneboro Borough	2/16/1994	5-10 years
Wilmington Township	5/17/2001	< 5 years	Sugar Grove Township	1/1/1968	20+ years
<i>Mercer County</i>			West Middlesex Borough	5/23/1989	10-20 years
Clark Borough	12/30/1975	20+ years	West Salem Township	5/1/1999	< 5 years
Coolspring Township	7/2/1999	< 5 years	Wheatland Borough	1/1/1968	20+ years
Deer Creek Township	1/1/1968	20+ years	Wilmington Township	1/1/1968	20+ years
Delaware Township	1/1/1968	20+ years	Wolf Creek Township	5/1/1978	20+ years
East Lackawannock Township	1/1/1968	20+ years	Worth Township	1/1/1968	20+ years

within the watershed have approved municipal sewage plans, but many are quite outdated and should be revised.

Official plans contain comprehensive information, such as:

- Population figures and projections;
- Drinking water supplies;
- Waterways, soil types, and geologic features;
- Sanitary survey results;
- Location, type, and operational status of existing sewage facilities;
- Local zoning and land-use designations;
- Estimates of future sewage disposal needs;
- Identification of potential problem-solving alternatives;
- Cost estimates necessary to carry out those alternatives; and
- The selection of appropriate problem-solving alternatives.

A much more affordable system for clusters of homeowners that are located too far away from public sewage is the community sewage system. Community sewage systems are those disposal systems serving multiple structures, residential or commercial. As in the case of Broad Top Township, Bedford County, Pennsylvania, wastewater facilities utilizing innovative techniques and a cluster approach would provide safe sewage facilities that restore growth and allow commercial development to return to rural towns. This type of system, as well as a properly function on-lot system, reduces the amount of sewage and nutrients being discharged into ground and surface water that adversely affect drinking water supplies, and streams and lakes. Examples of low-cost and simply operated and maintained community systems include lagoons with sand filters and ultraviolet disinfection, and septic tank sand filter systems. Another key to the success of Broad Top Township is the management of all wastewater systems in the municipality by one local government entity. Many areas within the Shenango River watershed could benefit from a similar approach to community systems, but few, if any, currently exist. Officials at Broad Top Township are available for more information about this matter.



Example of a community sewage treatment system in Broad Top Township, Bedford County, PA

In addition to some areas within the watershed needing sewage treatment plants, some smaller communities and rural areas need education and assistance with keeping their existing septic systems working properly. A three-year Septic Cost Share program began in Trumbull County, Ohio in 2002 and was completed in 2004. Funded by Ohio Department of Natural Resources (ODNR), this program provides funding for septic pumping, maintenance, and replacement. Areas being targeted due to current sewage issues include Kinsman, Brookfield, and Hubbard, Ohio. Many other rural communities within the watershed could benefit from a program similar to this one to update and maintain existing systems. However, increased funding is needed to implement improvements to both on-lot septic systems and treatment plants to reduce the amount of sewage discharging into streams in the watershed.

Within urbanized areas of the watershed, such as Sharon, Hermitage, and New Castle, combined sanitary storm sewers are responsible for numerous raw sewage discharges to local streams during significant precipitation events (described previously in the Stormwater section of this chapter). Table 3-9 shows recent and current wastewater projects within the Pennsylvania portion of the watershed, according to PENNVEST. The project descriptions also include cost estimates for some projects.

Numerous other communities within the watershed also have CSO problems that have yet to be addressed. A new sewage treatment plant is proposed to be built along the I-80 interchange near Mercer by 2008 by the Neshannock Creek Watershed Joint Municipal Sewer Authority.

Table 3-9. Wastewater Projects within the Shenango River Watershed

Municipality	Project Description
<i>Crawford County</i>	
Linesville Borough / Pine Township	This is a corrective action plan and joint 537 Plan with Pine Township for a sewage treatment plant upgrade and possible sanitary sewer extension. Funding is provided by PENNVEST.
North & South Shenango Municipal Authority	Corrective action plan for sanitary sewer interceptor #4. Project includes a sanitary sewer extension and pump station upgrade. A possible re-rating or upgrade at the sewage treatment plant for sanitary sewage overflows at 14 pump stations. Funding is provided by Rural Utility Services (RUS). Project cost is estimated at \$2 million. This system will serve 113 equivalent dwelling units.
<i>Lawrence County</i>	
Mahoning Township, Edinburg	This project is for a sanitary sewer extension and possible new sewage treatment plant. Funding is provided by RUS in the amount of \$10.4 million. This project services 549 equivalent dwelling units.
Neshannock Township (Millennium Industrial Park)	This project is for a sanitary sewer extension and is funded with a bond.
Neshannock Township (needs areas)	This project is for a sanitary sewer extension that will service 300 equivalent dwelling units.
Pulaski Township	This project is for a new sanitary sewer and a new sewage treatment plant. Funding is provided by PENNVEST and the project is estimated to cost \$11 million. Construction is expected to begin in 2005.
Wilmington Township	This project is for a sanitary sewer extension that will service 148 equivalent dwelling units. Funding is provided by PENNVEST in the amount of \$3 million.
<i>Mercer County</i>	
Hermitage	This project is a result of a consent order and agreement for a sewage treatment plant upgrade and pump station upgrades to service 6,528 equivalent dwelling units. Funding is provided by PENNVEST and RUS in the amount of \$5.4 million.

Table 3-9. Wastewater Projects within the Shenango River Watershed (continued)

Municipality	Project Description
<i>Mercer County (continued)</i>	
Jefferson Township	This project is for a sanitary sewer extension to service 92 equivalent dwelling units. Funding for this project is provided by PENNVEST and RUS in the amount of \$2.1 million.
Findley/Coolspring Townships	This project is for a new sanitary sewer. The project is eligible for RUS finding.
Mercer Borough	This project is for sewage treatment plant repairs in the Route 19 area, in agreement with Coolspring Township. PENNVEST funding may be available.
Neshannock Creek watershed	This project is awaiting development proposals for I-80 interchanges and involves a new sewage treatment plant and new sanitary sewer.
Sandy Lake Township	This project is for a sanitary sewer extension to service 30 equivalent dwelling units.
Sharon	This project is a result of a consent order and agreement for a sewage treatment plant expansion. The project is funded by PENNVEST in the amount of \$22.5 million.
South Pymatuning Township	This project is awaiting the Sharon final plan and is for a sanitary sewer extension and sanitary sewer rehabilitation.
Stoneboro Borough	This project is for a new sanitary sewer to service 60 equivalent dwelling units. Funding is provided by RUS in the amount of \$750,000.

Abandoned Mine Drainage

Abandoned mine drainage (AMD) is a term applied to a polluted groundwater discharge that emanates from former underground or surface mines, for which no legally responsible entity exists. AMD is the number one source of impairment in Pennsylvania streams (PA DEP 2004d). The water quality of AMD is typically degraded by the increase of dissolved metals and decrease of pH, a measure of hydrogen ions in a solution. The rate of AMD production and the chemical characteristics of the AMD are dependent on factors such as the mine hydrology, the relative abundance of acid-forming and alkaline materials, and the physical characteristics of the spoil (waste/byproducts of mining) within the mine site (Rose and Cravotta 1998).



Fox Run AMD Passive Treatment System (photo courtesy of Mercer County Conservation District)

AMD is formed through a complex series of chemical reactions. During the coal mining process, sulfides in the bedrock are exposed to oxygen. When oxygen comes into contact with these often acid-bearing rocks containing pyrite, a series of chemical reactions produce iron hydroxide and sulfuric acid.

Acidic water can appear clean and clear while being severely impaired and toxic to aquatic organisms and plant life.

If a mine discharge containing high metals and acidity is exposed to oxygen and/or alkalinity, the dissolved iron hydroxide will settle out of solution leaving a red iron coating, or “yellow boy,” within the stream and on the stream bottom. Two other metals commonly precipitate in the stream and follow the same process. These metals are aluminum, which leaves a grayish-white coating, and manganese, which leaves a black coating on the stream bottom.

Due to the geology of the region, coal mining has been minimal throughout the watershed. One known discharge exists in the Neshannock Creek/Big Run subwatershed. This discharge is located on Fox Run, a tributary to Yellow Creek, near Jackson Center Borough. A passive wetland treatment system has been constructed and the discharge is currently being treated.

In the 1970s and 1980s, a project was undertaken to fill another mined area, in the vicinity of Shenango High School, with a sand slurry. However, it is difficult to determine whether any mining discharges are affecting the watershed in this area because most of the streams have been piped and rerouted.

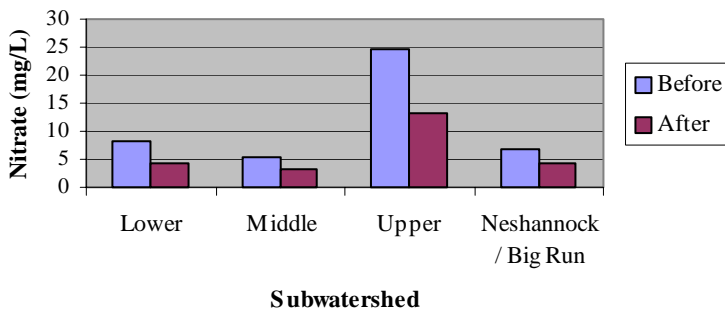
There are a number of gravel mines throughout the watershed, but these do not typically produce AMD. The glacial till and limestone present in the soils help to keep the water buffered from such pollutants.

Agriculture

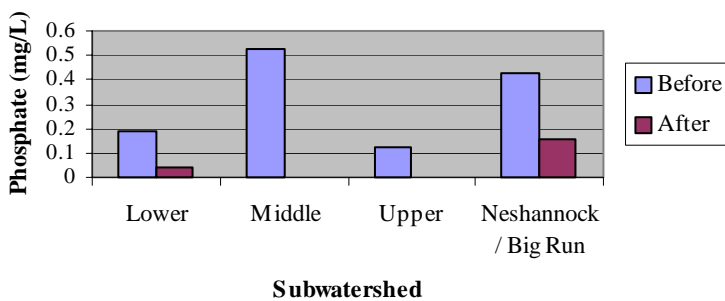
Agriculture is one of the leading industries within Pennsylvania, providing pleasing countryside aesthetics and the livelihood of many residents throughout the state. However, agriculture is also the number two source of impairment in Pennsylvania streams (PA DEP 2004d). Most farms within the Shenango River watershed can be classified as family farms. Unfortunately, wastes from these farms may degrade surface and groundwater quality. Fertilizers, pesticides, and manure from concentrated lots, fields, and from cattle access to the stream channel can easily be washed into streams during high rainfalls, increasing nutrient levels and contaminants in the stream. Too many nutrients, such as nitrogen and phosphorus, stimulate the growth of nuisance vegetation, such as algal blooms, which subsequently use much of the dissolved oxygen needed to help healthy aquatic plants and animals grow.

The county conservation districts oversee Nutrient Management Programs aimed at using nutrients (mainly nitrogen, phosphorous, and potassium) wisely for optimal economic benefit to the farmer, while minimizing the impact on the environment. The goal of a nutrient management plan, prepared by a certified plan writer for each individual operation, is to address nutrient-related water quality issues. Issues addressed in nutrient management plans include, but are not limited to: animal numbers and density, crops grown and expected yields, manure generated and used on the operation, manure and fertilizer application rates and timing, nutrient losses from manure storage and handling areas, nutrient runoff from cropland and pastures, nutrient runoff from animal concentration areas, and alternative uses of manure and manure export arrangements. The Nutrient Management Act Grant Program provides financial assistance to producers who have approved nutrient management plans to install BMPs that are listed in the plans. Some common agricultural BMPs that may be included in a nutrient management plan include: animal trails and walkways, barnyard runoff control, composting, crop rotation, filter strips, grassed waterways, manure storage facilities, prescribed grazing, riparian forest buffers, spring development, and wetland restoration. A complete listing of agricultural BMPs can be found in the Natural Resources Conservation Service (NRCS) PA Technical Guide (web address located in Appendix N).

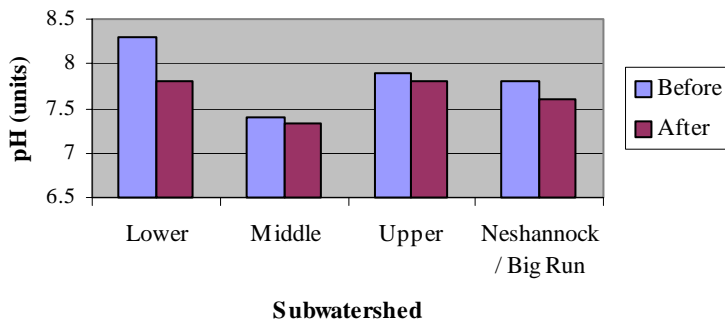
Change in Nitrate Concentrations Before and After Fencing



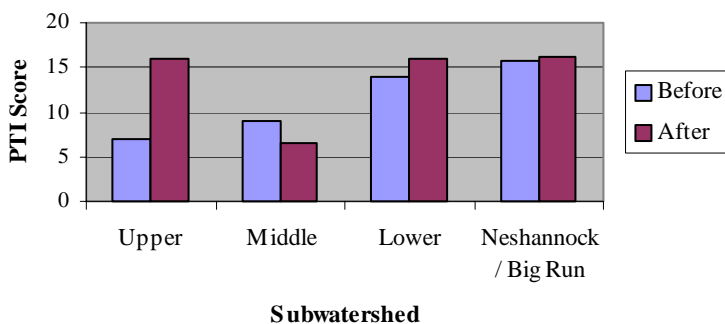
Change in Phosphate Concentration Before and After Fencing



Change in pH Before and After Fencing



Change in Pollution Tolerance Index



Monitoring results from the Riparian Restoration and Protection Initiative

Monitoring

Monitoring is the observation or measurement of selected watershed features in order to assess watershed ecosystem health, assess the ability of the watershed ecosystem to support human, plant, and animal uses, detect early warning of changes, provide insight into the causes of problems, and determine achievement of management goals. Monitoring is an essential tool that helps people understand what is going on within their particular watershed. It builds public awareness and support for watershed programs and activities. It helps identify and understand the causes of problems, determines whether implemented solutions are making a difference, and determines whether changes in land and water uses are affecting the health of the ecosystem.

Watershed monitoring is generally grouped into three categories: physical, chemical, and biological. Physical monitoring studies characteristics such as temperature, clarity, turbidity, solids, flow (the amount of water flowing past a given point), channel structure, riparian areas, and stream bottom habitat. Chemical monitoring involves testing for chemical elements and compounds dissolved or suspended in the water column. Biological monitoring includes living things in their various habitats, including the water column, the stream channel, and the riparian areas.

Currently, the Shenango River Watchers are monitoring various sections of the Shenango River and its tributaries for physical, chemical, and biological parameters. The public water supply companies also test the water regularly to ensure compliance with drinking water standards. PA DEP currently has four monitoring stations, three of which are along the Shenango River mainstem, and one that is along the Little Shenango River. The first (WQN 911) is located just downstream from Pymatuning Dam at Pymatuning State Park in West Shenango Township, Crawford County. The second (WQN 0910) is at the SR3025 bridge below Shenango River Lake in Sharpsville, Mercer County. The third (WQN 0909) is located at the Grant Street

bridge in New Castle, Lawrence County. The fourth (WQN 0913) is on the Little Shenango River at Greenville (Williamson Road bridge--SR4006), Mercer County. The stations are being sampled by the U.S. Geological Survey (USGS) on a bi-monthly basis. Sampling results are available on the US EPA STORET database website (Appendix N).

Water Quality Studies

Riparian Restoration and Protection Initiative

Western Pennsylvania Conservancy, in partnership with the Shenango Conservancy, developed the Riparian Restoration and Protection Initiative (RRPI). This program is intended to improve water quality and wildlife habitat by excluding livestock from riparian areas. When livestock trample streambanks, the soil is left unprotected and is prone to accelerated erosion or collapse. Sediment can then enter the stream and have detrimental impacts on aquatic life and important related habitat. PA DEP states that, by volume, sediment causes the most water pollution in Pennsylvania. Limiting livestock access to streambanks has proven to be one of the best ways for a farmer to prevent erosion and loss of productive land, as well as reduce nutrient runoff into the water. RRPI accomplishes this through streambank fencing within the Shenango River watershed. Information is provided below about each of the subwatersheds and the current results of the project.

With 15 of the 25 farms being completed, the outcome of this project thus far has resulted in 71,348 feet of stream being fenced, 16 agricultural crossings installed, 53 acres of wetlands protected, and 10 acres of warm season grasses planted.

Upper Shenango River Subwatershed

One landowner participated in the RRPI in this watershed. After fence construction took place, a decrease in pH, nitrates, phosphates, total dissolved solids (TDS), conductivity, and turbidity was found. A trend could not be established for dissolved oxygen or temperature with present data.

The average pollution tolerance index increased by a score of nine after fencing was installed. This indicates that more pollution-sensitive individuals now inhabit the streams in this watershed.

Middle Shenango River Subwatershed

Four landowners participated in the RRPI in this watershed. After fence construction was completed, a decrease in pH, nitrates, phosphates, TDS, conductivity, and turbidity was found. An increase in dissolved oxygen occurred. A trend could not be established for temperature with present data.

The average pollution tolerance index decreased by a score of two after fencing was installed. All farms in this watershed were recently fenced, and pollution tolerance scores are expected to increase once the streams have had time to recover.

Lower Shenango River Subwatershed

Two landowners participated in the RRPI in this watershed. After fence construction was completed, a decrease in pH, nitrates, phosphates, TDS, and conductivity was found. An increase in dissolved oxygen occurred. No trend could be established for temperature or turbidity with present data.

The average pollution tolerance index increased by a score of two after fencing was installed. This indicates a greater diversity of macroinvertebrates once cattle were prevented from entering the stream.

Neshannock Creek/Big Run Subwatershed

Eight landowners participated in the RRPI in this watershed. After fence construction was completed, a decrease in pH, nitrates, phosphates, TDS, conductivity, and turbidity was found. An increase in dissolved oxygen occurred. No trend could be established for temperature with present data.

There was a slight increase in the pollution tolerance index in the Neshannock Creek watershed. This indicates a positive trend towards an increase in pollution-sensitive individuals, and improved water quality.



Completed RRPI project on Elder farm in Neshannock Creek/Big Run subwatershed

Shenango River NPS Study

The 1991 Shenango River NPS Study was conducted to identify non-point source pollution potential within the watershed, identify the subwatersheds that are major contributors and rank them, and identify the BMPs appropriate to solve the agricultural non-point source pollution problems. Ultimately, the goal of this project is to prevent future pollution from agriculture, and remediate current non-point sources of pollution. A ranking system was used to prioritize restoration activities based on an animal nutrient factor, watershed delivery factor, groundwater delivery factor, management factor, stream density, row crop intensity, highly erodible land, and soil loss tolerance. The subwatersheds were ranked in the following order:

1. Crooked Creek – high priority
2. Little Shenango River – high priority
3. Shenango River Lake – high priority
4. Otter Creek – high priority
5. Cool Spring Creek – high priority
6. Big Run (Neshannock Creek/Big Run subwatershed) – high priority
7. Big Run (Middle Shenango River subwatershed) – high priority
8. Pymatuning Creek – high priority
9. Shenango River I – high priority
10. Neshannock Creek – high priority
11. Shenango River II – high priority
12. Little Neshannock Creek – medium priority
13. Pymatuning Reservoir – medium priority

Among the recommendations in this study, it was suggested that the following BMPs should be implemented: 300 acres of permanent vegetative cover, 15 animal waste management systems, 10,000 acres of strip cropping and contour farming systems, 500 feet of diversion systems, 30 grazing land protection systems, 75 acres of waterways systems, 500 acres of cropland protection systems, 500 acres of conservation tillage systems, 1,500 feet of stream protection systems, 70 acres of permanent vegetative cover on critical areas, 15 sediment retention erosion and water control structures, 900 soil and manure analyses, and 15 constructed wetlands for non-point source pollution abatement. The estimated cost for all of these measures in 1991 was \$1,015,000 (Crawford County Conservation District et al. 1991).

One factor that was not taken into consideration during the animal census for this study was the waterfowl population. Waterfowl are found in very substantial numbers in and around the lakes within the watershed and contribute a significant amount of waste, which, in turn, contributes nutrients to the immediate waterbodies. This issue is one that needs further study and subsequent remedial action.

Pymatuning Laboratory of Ecology

During the summer of 2002, students at the **Pymatuning Laboratory of Ecology** initiated a study of the phosphorus loadings associated with tourist activity, including feeding the fish, at Pymatuning Reservoir and the consequences suffered by the reservoir. Each year, an average of 450,000 people visit the Linesville Spillway area of Pymatuning State Park. Many of these visitors enjoy feeding the great number of carp and waterfowl that congregate there. This study considered only the bread, probably the most popular item, which was fed to the fish during a 35-day period. It was determined that, on average, this bread contributed 1.45 times more phosphorus to Pymatuning Reservoir than the entire Linesville Creek watershed. Excessive phosphorus loadings can result in low water clarity, low dissolved oxygen, fish kills, increases in algal growth, and an increased likelihood of exotic species invasion. Since that study was conducted much of the bread has been replaced by fish food pellets, an honest effort on the part of the businesses and visitors; however, fish food contains even more phosphorus than bread, so the problem is now compounded.

Shenango River Watchers

The **Shenango River Watchers Monitoring Program** began in 2000 when volunteers recognized the need to record water quality conditions. They report on chemical, physical, and biological factors. There are no sampling sites located in the Upper Shenango River subwatershed. Results from the May 2003 monitoring effort are as follows:

Middle Shenango River Subwatershed

Shenango River - Station 1

Macroinvertebrates indicate excellent water quality, with stoneflies and dobsonflies present. Water appearance is clear with good bank stability.

Little Shenango River

Macroinvertebrates indicate excellent water quality, with an abundance of mayflies and stoneflies. Land use within the watershed includes agriculture and forest. Riparian buffer is excellent with many trees that provide good shade for the stream. Substrate consists of cobble and gravel, with little silt.

Thornton Run – Sharpsville

Macroinvertebrates indicate fair/poor water quality. Land use in the area consists of residential housing developments mixed with forest areas. Large quantities of household trash line the banks. Dark green algae present in the stream may be due to runoff from the housing development.

Chestnut Run - Route 846

Macroinvertebrates indicate good water quality. Land use includes new housing developments in the area. Good riparian buffer keeps banks stable and the stream shaded.



Shenango River Watchers volunteers collecting macroinvertebrates from the Shenango River in Sharon (photo courtesy of Shenango River Watchers)

Lower Shenango River Subwatershed

Shenango River – Station 5, above Pine Run

Macroinvertebrates indicate poor water quality. Land use consists of housing developments and industry. The stream has been cleared of vegetation, resulting in high erosion and little shade. Two pipe outfalls occur on this stretch of the Shenango River. One is storm runoff and the other comes from the Duferco plant.

Shenango River – West Middlesex

Macroinvertebrates indicate excellent water quality, with mayflies, stoneflies, and caddisflies present. Land use in the area includes forest and urban development. Substrate mainly consists of cobble and boulder, with very little silt. The stream also has a good riparian zone that contributes to streambank stability and shade.

Shenango River – Quaker Steak & Lube

Macroinvertebrates indicate poor water quality. Land use in this section of stream is urban. Streambank erosion, a small riparian area, algal blooms, and runoff contribute to the poor water quality in this area.

Pine Run – Downstream from diesel fuel spill site

There was a diesel fuel spill on November 7, 2001. Two days after the spill, a number of dead macroinvertebrates were found. Water quality based on macroinvertebrates was poor. Land use includes urban and housing developments. There was a moderate amount of streambank erosion with good shade from riparian buffers.

Pine Run – Upstream of diesel fuel spill site

Macroinvertebrates indicate fair water quality. Land use within this area includes housing and urban developments. Stream shade is excellent due to a good riparian buffer.

Pine Run – North Myers

Macroinvertebrates indicate poor water quality. Land use in this area includes urban and housing developments, as well as active construction. Road widening construction has removed riparian vegetation and left loose dirt on streambanks. The stream occasionally smells like soap that could be coming from a nearby car wash.

Neshannock Creek/Big Run Subwatershed

Neshannock Creek - Hope Mills

Macroinvertebrates indicate good water quality, with an abundance of caddisflies and stoneflies. Land use in the area includes agriculture with urban/residential development. Site has recently begun to get silt deposits.

Pennsylvania Fish and Boat Commission

The Pennsylvania Fish and Boat Commission conducted two studies of the Pymatuning Reservoir, one in 1989 and the other in 1990. Samples were taken to measure pH, temperature, and dissolved oxygen at various depths. These studies found that the reservoir is suitable for only warm-water fishes.

Nonpoint Source Pollution Potential in an Agricultural Watershed in Northwestern Pennsylvania

Fred J. Brenner and James J. Mondok studied the Mercer County portion of the watershed in 1995 in order to address the impacts of agriculture on water quality. This study, entitled *Nonpoint Source Pollution Potential in an Agricultural Watershed in Northwestern Pennsylvania*, identified potential sources of non-point source pollution within 11 subwatersheds (Crooked Creek, Little Shenango River,

Shenango Lake, Otter Creek, Cool Spring Creek, Big Run, Pymatuning Creek, Shenango River Reach 1, Shenango River Reach 2, Neshannock Creek, and Little Neshannock) in the drainage basin, ranked those subwatersheds as to their potential for non-point source pollution, and determined the correlation and impact of those factors on water quality in receiving streams. This study concluded that livestock concentrations, along with the storage and disposal of manure, are principal sources of bacteriological and nutrient contamination of surface and groundwater. However, the nutrient content of manure may also be an asset if properly applied to croplands as a fertilizer (Brenner et al. 1995).

Of the 190 farmers interviewed for this study, 55 percent did not exclude livestock from streams and only seven percent had an effective nutrient management plan. Using an equation involving factors such as animal nutrient, watershed delivery, groundwater delivery, and management, numerical ratings indicated that all drainage basins included in this study had a medium to high potential for non-point source pollution from agriculture. The variation in the rating factors among the different subwatersheds reflects differences in drainage patterns (stream density), groundwater geology, and livestock, as well as the degree of management by farmers within the watershed. In any watershed, the only factors that can be altered to reduce the impact from agricultural non-point source pollution are number of animal units and management, with management being the most important (Brenner et al. 1995).

The results of this study indicate the adverse impact of agricultural runoff on freshwater ecosystems, and emphasize the need for proper land and livestock management. A variety of practices designed to reduce erosion may also decrease nutrient influx into receiving streams, but the effectiveness of traditional conservation practices have been shown to vary seasonally. Several previous studies have demonstrated the effectiveness of riparian vegetation and natural and constructed wetlands in reducing nutrient loads from non-point source pollution. Based on these results, prime consideration should be given to development of wetlands for water and nutrient management on agricultural lands (Brenner et al. 1995).

Nonpoint Pollution Abatement: A Watershed Approach

A portion of this study, conducted by Fred J. Brenner, addressed agricultural degradation within the Neshannock Creek watershed. Agriculture is the principal land use within the Neshannock Creek watershed, comprising approximately 40.5 percent of the area, with dairy cattle accounting for 40 percent of animal units (Brenner).

Of great concern within this watershed is the number of Amish farms, which include over half of the active farmers within the watershed. Few, if any, of these landowners exclude livestock from streams, incorporate conservation practices, or accept funding assistance from the federal government to improve water quality on their farms. Because of these concerns, it is recommended to develop an overall pollution abatement and land-use plan for the watershed that takes into account the cultural, economic, and ecological diversity. It has been demonstrated that the maintenance and restoration of riparian wetlands, along with constructed wetlands and streambank fencing, are an efficient means of reducing bacterial and nutrient loading into freshwater ecosystems. It is recommended that wetland restoration on Amish farms involve species that may be used as an agricultural crop, while at the same time providing food and cover for wildlife, such as berry bushes and wetland herbs (Brenner).

Groundwater-Surface Water Interaction in an Agricultural Watershed

This five-year study began in June 1988 to study the effects of the interaction between soil characteristics and land use on ground and surface water quality within the Munnell Run watershed in Mercer County. Lysimeters were used in this experiment at 14 locations, with varying soil types and land uses. Lysimeters are devices used for measuring percolation and leaching losses of water and solutes from a column of soil under controlled conditions. In addition, nine stream locations were sampled

monthly for nine water quality parameters (pH, total alkalinity, conductivity, calcium, magnesium, phosphate, ammonia, fecal coliform, and fecal strep) (Brenner et al. 1996).

This study found that seasonal variations in the chemical and biological characteristics occurred among the 14 lysimeters, as well as among the different soil types and land uses, but there was not a significant interaction between either soil type or land use for any of the water quality parameters. It has been determined that fencing cattle out of the stream and the restoration of a riparian wetland had a significant impact on water quality. There was a 30.2 percent reduction in fecal coliforms and a 60.3 percent reduction in phosphorus directly below the restored wetland during the first 13 months. In addition, there was a 21.9 percent reduction in fecal coliforms, and a 44.2 percent reduction in phosphorus at sampling stations located one to three kilometers downstream from the restored wetland. These results indicate that extensive pasturing of cattle on hydric soils has an adverse impact on the water quality of surface and sub-surface drainages, as well as on the receiving stream (Brenner et al. 1996).

Impact of Riparian Areas and Land Use on Four Non-Point Source Pollution Parameters in Pennsylvania

The impact of riparian vegetation and land use patterns on non-point source pollution within the Otter Creek watershed was analyzed over an 11-year period. The major causes of non-point source pollution within the watershed were found to be crop and pasture lands and on-lot sewage systems. The major sources of fecal coliform and suspended solids were agricultural lands, whereas on-lot sewage systems in urban areas were the major sources of phosphorus and ammonia. It was found that wetlands were effective in reducing fecal coliform, suspended solids, phosphorus, and ammonia, whereas woodlands were effective in reducing fecal coliform and suspended solids. Total phosphorus was significantly lower where the riparian vegetation was at least 50 percent intact within 100 meters of the stream. Therefore, it was recommended that the various agricultural agencies should encourage the establishment and maintenance of wetlands and riparian vegetation as cost-effective means of reducing non-point source pollution (Brenner, et al. 1991).

Wilmington Area High School Water Quality Data

Wilmington Area High School students have been monitoring chemical and biological parameters in Little Neshannock Creek since 1999 (full results of this study can be found at <http://www.watershed.dcnr.state.pa.us/cgi-bin/reports/dump.cgi>). In 1999, chemical analysis showed good dissolved oxygen and low nutrients, but high turbidity. Macroinvertebrate sampling indicated a poor to fair water quality, with a number of stoneflies, mayflies, crane flies, and caddisflies.

Macroinvertebrate sampling showed a slight improvement in 2000, with a fair score for water quality. A number of mayflies, stoneflies, midges, and caddisflies were collected, as well as some damselfly and dragonfly nymphs, worms, crane flies, alderflies, and water pennies. Chemical analysis indicated good dissolved oxygen, low nutrients, and high turbidity.

In 2001, macroinvertebrate sampling indicated fair water quality, with stonefly, caddisfly, crane fly, dobsonfly, and mayfly larva present. Chemical analysis showed good dissolved oxygen, low nutrients, and high turbidity.

Macroinvertebrate sampling indicated good water quality in 2002, 2003, and 2004. Organisms present included midges, watersnipe flies, blackflies, scuds, snails, sowbugs, worms, fingernail clams, crayfish, and dobsonfly, stonefly, caddisfly, crane fly, mayfly, alderfly, and waterpenny larva. Chemical analysis showed good dissolved oxygen, low nutrients, and low turbidity.

Lawrence County Conservation District

The Lawrence County Conservation District is involved in two monitoring activities. One monitoring program involves six farms where BMPs are being employed. On most of these farms, it is too early to establish trends, but the practices implemented are expected to reduce the amount of nutrients and pollutants entering the streams.

The other monitoring program being conducted by the Lawrence County Conservation District is general water quality monitoring at eight stations along the Shenango River, Neshannock Creek, and several tributaries. This monitoring began in 1995 for some stations and continues today. Among the parameters being measured are ammonia nitrogen, pH, orthophosphate, nitrate nitrogen, dissolved oxygen, and fecal coliform. Contact the conservation district for more information about the monitoring and water quality analysis.

Drinking Water

Pennsylvania's Source Water Assessment and Protection Program (SWAP), required under the 1996 Safe Drinking Water Act reauthorization, assesses the drinking water sources serving public water systems for their susceptibility to pollution. SWAP reports have been completed for all 14,000 public water systems throughout the state. Requirements of the program are to delineate the boundaries of the areas providing source waters for all public water systems and to identify the origins of regulated and certain unregulated contaminants in the delineated area to determine the susceptibility of public water systems to such contaminants. The most important objective for conducting source water assessments is to support the development of local, voluntary Source Water Protection Programs (PA DEP 2000).

Major public water suppliers within the Shenango River watershed (those serving over 1,000 residents) include Linesville Municipal Water Authority, Aqua PA (formerly Consumers Water Company), Greenville Municipal Authority, Reynolds Water Company, Sharpsville Borough Water Company, South Pymatuning, New Wilmington Borough Water Department, and Pennsylvania American Water.

As a follow-up to the SWAP report, source water protection grants will be available from PA DEP for municipalities and water suppliers to develop local source water protection programs. PA DEP will also provide technical assistance and loans to communities to assist them in developing protection plans. Other organizations providing assistance include the League of Women Voters through the Water Resource Education Network and the Pennsylvania Rural Water Association. The source water protection plan will address emergency response plans, land-use planning, municipal decisions, and public health and safety. Groundwater protection plans should include a description of hydrogeology and groundwater quality; use and value of the groundwater resource; performance-based practices directed toward preventing releases, spills, or leaks to groundwater; surveillance programs to demonstrate the effectiveness of specific protection practices and provisions for regular inspection; reasonable recordkeeping requirements; and education and training (PA DEP 1996).

About 80 million people in the United States, including nearly half of Pennsylvania's residents, rely on groundwater as a source of drinking water. As a public water supply, groundwater is less expensive to use than surface water due to land acquisition costs and various treatment requirements for surface water supplies. However, if groundwater contamination occurs, it is very costly to employ remedial activities and to provide the necessary treatment to comply with drinking water standards. Also, once groundwater is polluted, it remains contaminated for a long period of time (LWV). For this reason, Section 1428 of the federal Safe Drinking Water Act (SDWA) requires the state to submit plans to US EPA that describe how they will protect groundwater sources used by public water systems from contamination. The

Wellhead Protection Program (WHPP) is a proactive effort designed to apply proper management techniques and various preventive measures to protect groundwater supplies thereby ensuring public health and preventing the need for expensive treatment of wells to comply with drinking water standards. The underlying principle of the program is that it is much less expensive to protect groundwater than it is to try to restore it once it becomes contaminated.

The responsibilities for wellhead protection are shared among many stakeholders, including public water suppliers, local governments, the commonwealth, facility operators, landowners, local agencies, and the public. The WHPP emphasizes technical, financial, and educational assistance to facilitate the development of local voluntary programs. Although the WHPP is voluntary for existing wellhead areas, it is mandatory for any new wells or expansion of existing wells.

Homeowners should be aware of proper protection measures to take to help ensure healthy drinking water. Periodic laboratory testing is also recommended to be sure the water quality meets all state and local requirements for safe drinking. To learn more about protecting your private drinking water source, visit the League of Women Voters website to view the Groundwater Primer for Pennsylvanians (Appendix N).

Major sources of groundwater contamination in Pennsylvania include industrial site contamination, underground storage tanks, hazardous waste sites, abandoned landfills, aboveground storage tanks, manure/fertilizer applications, chemical facilities, on-lot sewage disposal systems, and oil, gas, and mineral extraction activities.

Water Resources Legislation

Water Resources Plan

On November 27, 2002, the Pennsylvania Senate passed the Water Resources Planning Act, ending a more than 20-year effort to adopt water resources legislation in Pennsylvania. This legislation will answer basic questions, as how much water we have, how much water we use, and how much water we need.

Major components of the legislation are:

- Requirement to update the State Water Plan within five years.
- Requirement to register and report certain water withdrawals:
 - Users of 10,000 gallons per day or more will register and periodically report their water use, with no fees.
 - The act expressly prohibits any requirement of metering of homeowner wells.
- Identification of Critical Water Planning Areas:
 - Areas where the demand for water exceeds, or is projected to exceed, available supplies.
 - “Water budgets” will be established for the areas.
 - Planning areas will be identified on a regional basis.
- Creation of Critical Area Resource Plans:
 - The plans will include a water availability evaluation, assess water quality and water quantity issues, and will identify existing and potential adverse impacts on water resource uses.
- Establishment of a Voluntary Water Conservation Program:
 - Establishes a formal program to promote voluntary water conservation practices.

- Creates a Water Resources Technical Assistance Center to promote the use and development of water conservation and water use efficiency education, and technical assistance programs.

More information about the Water Resources Plan is available on the PA DEP website (Appendix N).

Water Quality Trading

Water quality trading is an approach used by the US EPA to improve and preserve water quality. Water quality trading allows one discharger to meet their regulatory standards by using clearly defined units of trade created by another discharger who has exceeded their obligations in the same watershed. Pollutant specific credits are examples of tradable units for water quality trading. Currently, the trading program is mainly geared to nutrient trading. More information about water quality trading is available on the US EPA website (Appendix N).

Management Recommendations

Water Conservation

- Establish guidelines that require installation of low-flow devices for all new construction.
- Promote and establish a program for retrofitting homes and businesses for water conservation practices through tax breaks and rebates.
- Launch a watershed-wide water conservation program to educate the public about the value of reducing water consumption and utilizing water conservation products and techniques.
- Upgrade antiquated water service lines to eliminate wasteful leaks.

Wetlands

- Encourage interstate collaboration on standardizing methods used to delineate and identify wetlands.
- Protect wetland habitats for their many uses and benefits.
- Update wetland maps and assess wetlands within the watershed for the purpose of prioritizing future conservation projects.
- Expand outreach to municipal and county officials for planning and implementation of future wetland mitigation and the establishment of new wetlands.
- Inventory and monitor wetland plants and animals; take action when and where necessary to eradicate any invasive species.
- Educate landowners about the importance of wetlands for habitat and water quality.
- Encourage state acquisition of important wetlands for protection of groundwater recharge areas.
- Enhance/promote programs that restore wetlands to agriculture areas of limited value.
- Stop the conversion of wetlands to non-wetland uses.

Floodplains

- Update municipal floodplain ordinances and strengthen the enforcement of them.
- Conduct a detailed flood-prone area assessment, and update floodplain maps.
- Develop educational programs about flood prevention and recovery.
- Acquire properties that are frequently impacted by serious flooding and convert them to public open space such as a park or ball field.
- Encourage non-structural approaches to floodplain management.
- Establish adequate vegetation and floodplain integrity to limit degradation of water quality and biological resources.

Riparian Buffers

- Protect and enhance existing riparian buffers to achieve maximum protection of water resources.
- Establish riparian buffers along all types of waterways following the guidelines in Figure 3-10.
- Educate all watershed stakeholders about the importance of riparian corridors.

Lake Management

- Control and mitigate exotic species that directly affect lake uses.
- Assess and inventory lakes within the watershed for size, use, and water quality.
- Study water quality in Pymatuning Reservoir and Shenango River Lake to determine causes of nutrient loading and subsequent sources of taste and odor issues.
- Conduct a study of Crystal and Dollar Lakes to document and protect their unique qualities as rare glacial lakes.

Water Pollution

- Educate homeowners about the significance of water use designations and ways to minimize non-point source pollution.
- Develop and implement education workshops and/or outreach programs about point source pollution, how to report point source violations, and how to research permit information.
- Encourage the transfer of permit violation fees to a local organization for water quality improvements within the watershed.
- Work with PA DEP and OhioEPA to develop TMDLs on all impaired streams.
- Implement TMDLs that have been developed.
- Encourage the establishment and maintenance of wetlands and riparian vegetation as cost-effective means of non-point source pollution reduction.

Stormwater

- Complete and implement an Act 167 stormwater management plan for the Shenango River watershed.
- Utilize the developed Act 167 plan to develop stormwater ordinances.
- Minimize the amount of impervious cover created by development by implementing stormwater BMP recommendations made by the Center for Watershed Protection from their Eight Tools of Watershed Protection.
- Increase local, state, and federal funding for adequate stormwater management facilities.
- Work with PENNVEST to address current drainage issues.
- Continue educational outreach with municipal and county officials about planning for future stormwater BMP implementation.
- Protect those watersheds with 10 percent or less impervious cover.
- Employ watershed protection and stormwater management techniques in stormwater-impacted watersheds.
- Inventory individual watersheds to determine percent impervious cover and stormwater impacts.
- Employ restoration efforts in those watersheds considered damaged from stormwater runoff to improve water and habitat quality.
- Employ pollution prevention techniques in those (urbanized) watersheds containing over 60 percent impervious cover.

Erosion and Sedimentation

- Implement streamside stabilization improvement projects using bioremediation techniques.
- Promote tax incentives and cost-share programs for streambank fencing, barnyard stabilization, and other BMPs.
- Utilize Munnell Run Farm as a “model farm” demonstrating agricultural BMPs and educating farmers about conservation practices.
- Increase local, state, federal, and private funding to continue the Riparian Restoration and Protection Initiative within the watershed.
- Continue support of, and municipal participation in, the Dirt and Gravel Roads Program to reduce erosion and sedimentation.
- Reduce erosion and sedimentation by incorporating BMPs in all earth-moving activities, including logging and deforestation, construction and development, and natural resource extraction.

Sewage

- Upgrade sanitary sewer systems to eliminate CSOs, specifically in Sharon, Hermitage, Kinsman, Brookfield, and Hubbard.

- Lobby for increased state and federal funding for the implementation of adequate sewage treatment and septic facilities.
- Encourage PA DEP to approve more alternative sewage treatment types in rural areas; construct demonstration sites for alternative systems and develop outreach information.
- Work with local sewage enforcement officers, PA DEP, and municipalities to regularly update and enforce Act 537 Sewage Plans.
- Provide programs for homeowners about maintenance and repair of on-lot sewage systems.
- Perform a watershed-wide assessment of on-lot and municipal sewage systems to identify raw sewage discharges, combined sewage overflows, and sanitary sewage overflows.
- Encourage installation of community sewage systems in residential development areas, following the model from Broad Top Township, Bedford County, Pennsylvania.
- Establish and/or continue cost-share programs similar to that in Trumbull County to assist homeowners with septic repair, maintenance, and replacement.

Agriculture

- Encourage farmers to take advantage of current cost-share programs to implement BMPs.
- Encourage farmers to have nutrient management plans developed to boost productivity and protect water resources.
- Secure additional funding for agricultural BMPs.
- Encourage the establishment and maintenance of wetlands and riparian vegetation as cost-effective means of non-point source pollution reduction.

Monitoring

- Host workshops or trainings about stream monitoring for adult and student volunteers.
- Conduct sub-basin watershed assessments and develop restoration plans.
- Conduct seasonal chemical, biological, and visual assessments for at least one year to provide background data for prioritization of future projects.
- Increase local and state funding to continue watershed monitoring efforts currently being conducted, in particular for the RRPI, local educational institutions, and the Shenango River Watchers.

Source Water

- Develop a locally based program for disseminating information about protecting private well supplies to homeowners.
- Educate homeowners about the effects on groundwater caused by the overuse of fertilizer, pesticide, and herbicide.
- Educate community residents about potential threats to the public water supply.
- Partner with water suppliers to identify the source of the taste and odor issues of public drinking water.
- Promote groundwater quality awareness when conducting education and outreach programs for the watershed.
- Develop Source Water Protection Plans for all public water supplies.

Other

- Study and monitor the effects of gas well drilling on surface and groundwater to determine its impact on water quality; work to minimize those impacts.

CHAPTER 4. BIOLOGICAL RESOURCES

The Shenango River watershed is well known for its high biodiversity, providing habitat for wildlife and natural communities not found elsewhere in Pennsylvania. Variations in features, such as slope, elevation, and soil type caused by the Wisconsin glacialiation 20,000 years ago, led to the development of specialized plant and animal communities (Sevon and Fleeger 1999). Poorly drained glacial alluvium (or outwash) deposited during the retreat of the glaciers underlies the Shenango River watershed and is responsible for the numerous natural lakes and wetlands within the watershed (Coxe 2003). The excessively drained uplands formed from materials weathered by the glaciers, or glacial till, are the foundation for the upland forest communities (Coxe 2003).

In addition to being important habitat for wildlife, the wealth of water resources and rich soils have also provided for the needs of people. The Shenango River watershed is an important area for agriculture, industry, and recreation. These uses are not incompatible with providing habitat for wildlife. In fact, often it is the abundance and health of natural resources that provide for the economy and draw people to an area. However, in order to provide for various land-use needs, it is valuable to understand, properly manage, and protect the resources that exist. This chapter provides detailed information about the biological resources of each of the Shenango River subwatersheds. The first section of the chapter describes the biodiversity and natural communities within the Shenango River watershed. The second section provides habitat descriptions and biodiversity characteristics of each of the subwatersheds, the locations of which are described in Chapter 1 and Figure 1-1. The third section presents detailed information about areas of conservation concern, including Important Bird Areas and Natural Heritage Areas. Finally, the last section lists the threatened and endangered species found within each of the subwatersheds. A summary and recommendations conclude the chapter.

Biodiversity

Natural Communities

A natural community is an assemblage of plants and animals living within a geographic area and potentially interacting with each other and with the physical environment (Fike 1999). Plants and animals often have close relationships with each other. For instance, a common butterfly within the Shenango River watershed is the tiger swallowtail, which feeds on species such as red maple and elm trees as a caterpillar (Wagner, et al. 1997). The cerulean warbler, also found within the watershed, is an Audubon Watch List bird that depends on large, mature forest tracts for its survival (Rosenberg, et al. 2000). Many species of butterflies, dragonflies, amphibians, mussels, birds, and even mammals are found in proximity to streams and depend on high water quality. Because of their special requirements, the health of many of these species is a reflection of the health of local environments for humans. Table 4-1 shows exemplary communities found within the Shenango River watershed according to the Pennsylvania Natural Heritage Program (PNHP) and Ohio Division of Natural Areas and Preserves. Though the community types listed may be present in more than one subwatershed, only exemplary or “good examples” that have been identified in each of the subwatersheds are listed.



The tiger swallowtail is a common butterfly within the watershed

Table 4-1. Exemplary Communities

Upper Shenango River Subwatershed
sugar maple-American beech-yellow birch
speckled alder-silky dogwood
broadleaf-conifer swamp
white pine-American larch forest
white pine-larch-mixed shrub community
white pine-eastern hemlock
skunk cabbage-sensitive fern colonies
narrow-leaved cattail colony
hemlock hardwood swamp**

Middle Shenango River Subwatershed
glacial bog
mollusk bed**
mixed emergent marsh**

Lower Shenango River Subwatershed
sycamore (river birch) floodplain forest

Neshannock Creek/Big Run Subwatershed
sedge colony
hillside graminoid-forb fen*
northern hardwood forest*
robust emergent marsh*
allegheeny stonecrop*
weakly minerotrophic lakeside bog*

*These communities are listed for PA portion

** These communities are listed for the OH portion

Intact riparian (streamside) forest and wetland communities are the most important habitats within the Shenango River watershed for maintaining biodiversity; yet these habitats are threatened as a result of the small amount of land dedicated to their conservation. Conservation lands are either public or private lands that have a written management plan which takes into account the needs of plants and animals. Because there are few conservation lands (Figure 4-1), it is up to local municipalities and landowners to make wise choices to protect natural resources. In the following section, some of the important conservation priorities are described, and protection recommendations are presented.

Wetlands

There are various shrub and tree communities associated with wetlands within the watershed, including tree species such as pin oak and red maple, and shrubs such as arrow-wood viburnum, winterberry, and highbush blueberry. Fens, marshes, swamps, and wetlands are important communities within the watershed that are most abundant in glaciated regions, such as northwestern Pennsylvania and northeastern Ohio (Coxe 2002). The following definitions describe these communities of the Shenango River watershed (Warner, et al. 1997):

Fens are nutrient-rich, high alkalinity wetlands composed of peat (decaying matter). Though hydrology can vary, the primary input of water is through groundwater and there are no major outputs of water from the wetland system. Vegetation is primarily sedges, grasses, and shrubs. The water table is usually just above the surface.

Bogs are also peatlands, but have virtually no contact with groundwater. They are low in acidity and nutrients, and are usually covered in sphagnum, because they do not receive minerals from groundwater. Water inputs are from precipitation and the water table is near the surface.

Swamps are wetlands with standing or gently flowing water, seasonally inundated from an adjoining stream or lake. The vegetation commonly includes trees and shrubs.

Marshes are wetlands, like swamps, that are seasonally inundated with water. They are characterized by grasses and sedges and are found at the margins of streams or lakes.

Plants

Mixed oaks dominate the forested areas within the watershed. Dry, upland areas contain communities of mainly white and red oak, which are more suited to acidic soils. Lower slopes on more mesic, or moister, areas also contain varied tree species such as sugar maple, beech, black birch, basswood, and tulip tree. The sparse understory often includes species such as mountain laurel and maple-leaved viburnum (Coxe 2002; Coxe 2003).

Northern slopes take on more of a northern hardwood forest structure, consisting of species such as American beech, red maple, sugar maple, black cherry, and hemlock. Understory species in these northern hardwood or hemlock mixed-hardwood forests often include witch hazel, elderberry, and spice bush. Herbaceous species may include mayapple, Jacob's ladder, blue cohosh, Canada mayflower, New York fern, and intermediate log fern (Coxe 2002; Fike 1999).

Forested riparian zones along larger to mid-size streams within the watershed may include sycamore-box elder (river birch) floodplain forest, characterized by sycamore, box elder, red maple, and American elm. Common understory and herbaceous species include dogwoods, jewelweed, great nettle, jumpseed, and invasive species, such as multiflora rose and Japanese knotweed.

As noted in the previous section, there are various shrub and tree communities associated with wetlands within the watershed, including tree species such as pin oak and red maple, and shrubs such as arrow-wood viburnum, winterberry, and highbush blueberry.

Animals

The diversity of animals in an area is influenced mainly by habitat availability, which is affected by factors such as climate, geologic history, vegetation, and soil type. Generally, the most diversity within the Shenango River watershed occurs in the bird, plant, and fish taxonomic groups. This diversity is related to the presence of wetlands and grasslands within the Shenango River watershed and its place in the Ohio River drainage. The watershed is considered to have fairly low mammal diversity because of the limited forest remaining (Meyers, et al. 2000). However, because limited information is available about small mammals, the true diversity of mammals within the watershed is highly speculative (J. Hart, personal communication 2004).

Amphibians and Reptiles

There are possibly 52 species of reptiles and amphibians inhabiting the Shenango River watershed, according to the Pennsylvania Herpetological Atlas and Amphibians and Reptiles of Pennsylvania (Hulse, et al. 2001). This includes the endangered eastern massasauga rattlesnake, a candidate for federal listing, which lives in wet fields or fields near wetland areas. However, no sightings of eastern massasaugas have been reported within the watershed for at least a decade. Since amphibians, in particular, do not have the capacity for long-distance dispersal, localized conservation efforts are important for their survival (Meyers, et al. 2000). Snakes and turtles are also extremely vulnerable to the destruction of their habitat, which largely consists of wetlands and intact forest areas.

At-risk amphibians found within the Shenango River watershed include species such as the northern leopard frog, the eastern hellbender, the western chorus frog, and the gray tree frog. Less than 20 percent of lands containing these species in Pennsylvania have any kind of special protection (Meyers, et al. 2000), and the Shenango River watershed is no exception.



The eastern massasauga rattlesnake is an endangered species that may still be in the Shenango River watershed

Protecting amphibians often requires localized conservation efforts, since they do not easily re-colonize new areas. The riparian wetlands within the watershed are among the leading landscapes in Pennsylvania for snakes and turtles, containing a significant number of declining or at-risk species (Meyers, et al. 2000). However, there have been no sightings of species such as the endangered bog turtle and Blanding's turtle for over 50 years in the Shenango watershed; these species are thought to have been extirpated (eliminated) due to development pressures (Hulse, et al. 2001). A list of amphibians and reptile species with ranges in the Shenango River watershed can be found in Appendix I.

Birds

The Glaciated Pittsburgh Plateau physiographic province, which primarily includes the Shenango River watershed, is a leading landscape for birds in Pennsylvania (Meyers, et al. 2000). For many birds, the watershed is one of the only locations in Pennsylvania where appropriate habitat can be found. Because most of the land within the Shenango River watershed is currently not being managed for conservation, it is a high priority (or leading landscape) in terms of future conservation. The significance of the watershed for bird life can be attributed to the high percentage of wetlands and grasslands.

Birding groups and local Audubon societies can provide helpful information about birds within a watershed or Important Bird Area (IBA) (<http://www.csonline.net/russs/bas>). The Bartramian Audubon Society maintains a list of birds identified within the Shenango River Lake IBA and surrounding area. Other groups, such as the Three Rivers Birding Club (<http://3riversbirdingclub.org>), regularly travel to the Pymatuning Reservoir and Shenango River Lake. Bird lists developed during the establishment of IBAs within the watershed can be found on Pennsylvania Audubon's website (<http://pa.audubon.org>). IBAs within the Shenango River watershed are discussed in more detail later in this chapter.

There are three Breeding Bird Survey routes passing within the Shenango River watershed, including Espyville, Pennsylvania (route 2), Beaver, Pennsylvania (route 46), and Clover, Pennsylvania (route 3). In a collaborative effort between the United States Geological Survey (USGS) and the Canadian Wildlife Service to document the status and trends of North American birds (Patuxent Wildlife Research Center 2004), volunteers document breeding birds observed on preset routes throughout the country on a day in early summer during these surveys. Additionally, the Pennsylvania Breeding Bird Atlas is a largely volunteer effort to document all of the breeding bird species throughout Pennsylvania by assigning volunteers a "block" to survey based on sections of USGS quadrangles (Gross 2002). The 2nd Pennsylvania Breeding Bird Atlas is under way and will extend from 2003 through 2009.

A list of bird species of concern is provided in Table 4-2. The list does not distinguish whether the bird uses habitat within the Shenango River watershed for breeding or migration purposes, which may affect its significance within the watershed. The table was developed from state or federally threatened or endangered species, species on the Audubon Watch List, and species of high concern according to the conservation organization Partners in Flight (tier I). Audubon Watch List "red" species are those facing major conservation threats that are of global conservation concern. "Yellow" listed species are facing declines, though less than those on the red list, and are of national conservation concern. A full list of breeding and non-breeding bird species found within the watershed can be found in Appendix I.

Fish and Mussels

The Ohio River basin is considered the most aquatically diverse river basin in Pennsylvania and among the most diverse in the world. Within the Ohio River basin, the Shenango River is of particular importance. The aquatic diversity in parts of the Shenango River watershed was once considered more diverse than the nearby French Creek watershed, but, due to industrial and nutrient pollution, it faces notable impairments. There are 11 fish species within the Shenango River watershed that are considered threatened, endangered, or candidates for threatened or endangered status in Pennsylvania.

Table 4-2. Bird Species of Highest Conservation Concern

Species	Pennsylvania Status	Audubon	PIF tier I?
American golden-plover		yellow	
bald eagle	threatened, proposed delisting		
bay-breasted warbler		yellow	
black tern	PA endangered		
black-billed cuckoo			yes
black-crowned night heron	candidate-at risk		
blue-winged warbler		yellow	
buff-breasted sandpiper		red	
Canada warbler		yellow	yes
cerulean warbler		red	yes
common tern	PA endangered		
dickissel	PA threatened		
field sparrow			yes
great egret	PA endangered (breeding)		
Henslow's sparrow		red	yes
Louisiana waterthrush			yes
marsh wren	candidate rare		
northern harrier	candidate-at risk		
olive-sided flycatcher		yellow	
pie billed grebe	PA candidate rare		
prothonotary warbler	candidate rare	yellow	yes
red knot		yellow	
red-headed woodpecker		yellow	
rusty blackbird		yellow	
short-billed dowitcher		yellow	
Swainson's thrush	candidate rare		
trumpeter swan		yellow	
whimbrel		yellow	
willow flycatcher		yellow	
Wilson's phalarope		yellow	
wood thrush		yellow	yes
yellow-bellied flycatcher	PA threatened		

These species include the warmouth, spotted sucker, southern redbelly dace, horneyhead chub, mountain brook lamprey, redbfin shiner, brindled madtom, central mudminnow, brook stickleback, brook silverside, and river redhorse. A recent survey by Western Pennsylvania Conservancy (WPC) identified the southern redbelly dace within Lawrence and Mercer counties (Smith 2003). Previously, this threatened species was considered to be a possible extirpated species in Pennsylvania and this is currently the only known location for the species in Pennsylvania.

The most common fish species within tributaries of the Shenango River are the creek chub, mottled sculpin, blacknose dace, central stoneroller, and longnose dace. The Shenango River watershed is also home to a number of darters, including fantail darter, banded darter, Johnny darter, greenside darter, and rainbow darter.

The most significant threats to fish species within the watershed include low water in summer months, high water temperatures due to canopy removal, and sewage and agricultural pollution. Mine drainage has not had a significant impact within the watershed as a whole. It has, however, had a negative impact on Yellow Creek, which has reduced the ability of Yellow Creek and Cool Spring Creek to maintain brown trout populations. Pine Creek and Cool Spring Creek are the only streams within the watershed with naturally reproducing trout populations and would be excellent candidates for stream restoration projects. In addition to riverine species, the watershed hosts a number of lake species in Shenango River Lake and Pymatuning Reservoir. Popular sport fishes include walleye, large and smallmouth bass, catfish, and white and black crappie.

The Ohio River basin has the most diverse population of freshwater mussels in the world, including 42 percent of the species that can be found in North America (Helfrich, et al. 2003). Mussels obtain their food and oxygen by filtering water and are extremely susceptible to pollution that can clog their siphons and gills. There are at least 25 species of mussels recorded within the Shenango River watershed, 15 of which are of special concern (PA DCNR 2004c). Of these, the northern riffleshell and clubshell are federally endangered species and evidence suggests that the watershed may contain the only remaining populations of round hickorynut and pistolgrip.

There are many threats to mussels within the Shenango River system. The damming of Pymatuning Reservoir and Shenango River Lake severely impacted the flow of water in the Shenango River. Impoundments create more high flows and low flows than would typically occur, as large amounts of water are released or retained for flood control or other purposes. Periods of low water do not create enough energy to transport sediment downstream, and silt is deposited on the river bottom, smothering many mussel species. Species that are not smothered may be affected by the extremely high flows released, which can cause quick shifting of sediment that uplifts mussels and changes their habitat. The damming has also created more backwater areas (R. Evans, personal communication 2004). The result is the increase or introduction of more stillwater mussel species and a reduction of species more characteristic of naturally flowing rivers.

Further effects on the mussel population include increased sediment and nutrient pollution from agricultural operations and faulty sewage treatment systems within the watershed. There have been reports of several sewage treatment plants discharging effluent high in nutrients and organics (USACE 2004). Additionally, the removal of riparian zones along the Shenango River and its tributaries has increased water temperatures, erosion, and sedimentation to streams. Even if these sources do not affect the mussels directly, they certainly impact the fish hosts used by glochidia (larval mussels) to survive, as evidenced by the many declining fish species within the Shenango River watershed.

Recent surveys of mussels within the Shenango River watershed conducted by WPC (2001-2002) found significant changes in the mussel composition since surveys taken in 1919 (Ortmann) and 1987 (Bursey) (Table 4-3). A total of 24 species were identified in 1919, 14 in 1987, and 19 in 2001-2002 by WPC (Evans and Zimmerman, unpublished manuscript). Generally, there has been a shift from species more characteristic of a river system to more standing water species and species less sensitive to sedimentation. The ray-beaned, rainbow, northern riffleshell (also a federally endangered species), and cylindrical papershell may have disappeared from the Shenango River system, since they were only identified in 1919 and not in 1987 or 2001-2002. The clubshell, a federally endangered species, has drastically decreased in abundance. The eastern pondmussel, which thrives under ponded conditions, was not present in either the 1919 or 1987 surveys. It has now become a dominant species that is utilizing backwaters created by damming and the old Erie Canal. Species such as the fat mucket and three ridge have increased in numbers because they thrive under silted conditions.

Table 4-3. Mussel Species of the Shenango River System

		Ortmann (1919)	Burse (1987)	Evans (2001)
mucket	<i>Actinonaias ligumentina</i>	X		X
elk toe	<i>Alasmodonta marginata</i>	X		X
three ridge**	<i>Amblema plicata</i>	X	X	X
cylindrical papershell**	<i>Anodontoides ferrussacianus</i>	X		
spike	<i>Elliptio dilatata</i>	X	X	X
northern riffleshell*	<i>Epioblasma torulosa rangiana</i>	X		
snuffbox**	<i>Epioblasma triquetra</i>	X	X	X
long-solid**	<i>Fusconaia subrotunda</i>	X	X	X
plain pocketbook	<i>Lampsilis cardium</i>	X		X
wavy-rayed lampmussel	<i>Lampsilis fasciola</i>	X	X	X
pocketbook	<i>Lampsilis ovata</i>	X		X
fatmucket	<i>lampsilis siliquoidea</i>	X	X	X
creek heelsplitter **	<i>Lasmigona compressa</i>	X	X	X
fluted-shell	<i>lasmigona costata</i>	X	X	
eastern pondmussel	<i>Ligumia nasuta</i>			X
round hickorynut**	<i>Obovaria subrotunda</i>	X	X	X
clubshell*	<i>Pleurobema clava</i>	X		X
round pigtoe**	<i>Pleurobema sintoxia</i>	X	X	X
kidneyshell	<i>ptychobranhus fasciolaris</i>	X	X	X
giant floater	<i>Pyganodon grandis</i>	X	X	X
rabbitsfoot**	<i>Quadrula cylindrica cylindrica</i>	X	X	
creeper**	<i>Strophitus undulatus</i>	X		X
pistolgrip**	<i>Trigonia verrucosa</i>	X	X	X
ray-beaned**	<i>Vilosa fabalis</i>	X		
rainbow**	<i>Vilosa iris</i>	X		

*federally endangered

**state threatened or endangered or candidate

Efforts to maintain the flows of the Shenango River to more closely mimic natural conditions could improve conditions for mussels. This would include raising the minimum flows that are allowable from Pymatuning and Shenango Dams and avoiding extremely high releases unless absolutely necessary. Additionally, upgrades to sewer systems and increases in agricultural best management practices (BMPs), such as streambank fencing, would improve conditions. Many of the more riverine mussels in the Shenango River could probably never recover to their historic populations, even with significant changes. However, conditions could be improved so these species and stillwater species do not disappear entirely. If conditions improve in Neshannock Creek, it may be possible to relocate some of the more riverine species to this unimpounded system within the Shenango River watershed.

Other Wildlife

There are many other plants and animals that have not been discussed in this chapter which are valuable components of the Shenango River watershed. The Carnegie Museum of Natural History hosts a Mammals of Pennsylvania online resource at <http://www.carnegiemuseum.org/cmnh/mammals>, including descriptions and distribution maps of mammals in Pennsylvania. General descriptions of dragonflies and butterflies within counties of Pennsylvania can be found at the website of the USGS Northern Prairie Wildlife Research Center. Links to this information are at <http://www.npwrc.usgs.gov/resource/geograph.htm>.

Invasive Species

Invasive species are nuisance plant or animal species that spread quickly and easily crowd out native, or resident, species. Invasive plant species thrive on disturbance, such as removal of native communities, exposure to sunlight and nutrient-enriched conditions, and altered water regimes. Purple loosestrife (*Lythrum salicaria* or *virgatum*) and common reed grass (*Phragmites australis*) are common plant invaders of wetland areas in northwest Pennsylvania, while floodplain invasive species most commonly include Japanese knotweed (*Polygonum cuspidatum*) and multiflora rose (*Rosa multiflora*) (PA DCNR 2004b).



Purple loosestrife in the marshy fringes of the Pymatuning Reservoir

Table 4-4. Common Invasive Plants of Northwestern Pennsylvania (PA DCNR)

Serious Threats	Moderate Threats
garlic mustard (<i>Alliaria petiolata</i>)	goutweed (<i>Aegopodium podagraria</i>)
musk thistle (<i>Carduus nutans</i>)	cheatgrass (<i>Bromus tectorum</i>)
Canada thistle (<i>Cirsium arvense</i>)	dame's rocket (<i>Hesperis matronalis</i>)
bull thistle (<i>Cirsium culgare</i>)	wild parsnip (<i>Pastinaca sativa</i>)
giant hogweed (<i>Heracleium mantegazzianum</i>)	reed canary grass (<i>Phalaris arundinacea</i>)
purple loosestrife (<i>Lythrum salicaria, virgatum</i>)	Japanese barberry (<i>Berberis thunbergii</i>)
common reed (<i>Phragmites australis</i>)	European barberry (<i>B. vulgaris</i>)
Japanese knotweed (<i>Polygonum cuspidatum</i>)	border privet (<i>Ligustrum obtusifolium</i>)
Johnson grass (<i>Sorghum halepense</i>)	Bell's honeysuckle (<i>Lonicera morrowii x tatarica</i>)
autumn olive (<i>Elaeagnus umbellata</i>)	glossy buckthorn (<i>Rhamnus frangula</i>)
amur honeysuckle (<i>Lonicera maackii</i>)	
Morrow's honeysuckle (<i>L. morrowii</i>)	
tartarian honeysuckle (<i>L. tartarica</i>)	
multiflora rose (<i>Rosa multiflora</i>)	
Oriental bittersweet (<i>Celastrus orbiculatus</i>)	

Invasive species, such as those described above, are most commonly exotic species that have been imported to the United States accidentally or intentionally for ornamental purposes. However, they can also include native species that become a nuisance when the natural landscape is altered. American lotus (*Nelumbo lutea*), considered an endangered species in Pennsylvania, was introduced to the Pymatuning Reservoir and has since taken on the characteristics of an invasive species there, overwhelming sections of the reservoir and destroying habitat.

Invasive species can include animal species such as the gypsy moth and the zebra mussel. The zebra mussel does not appear to be a problem in the Shenango River but has invaded nearby Sandy Creek. The gypsy moth is widespread throughout Pennsylvania, feeding on a variety of tree species, causing defoliation and often death.

The best way to control invasive plant species is to keep natural landscapes intact by employing methods such as forestry BMPs, using fertilizers properly, and maintaining natural stream flows. Once invasive plant species are found, it is best to remove them manually by cutting or pulling before they get out of control and to replace them with native plants. If they become overly abundant, they may need to be removed by experts with chemical and/or mechanical removal. Control of invasive animal species is often even more difficult and usually involves the introduction of natural predators. The invasive species information found in Table 4-4 was developed by PA DCNR and can be accessed at <http://www.dcnr.state.pa.us/forestry/wildplant/invasive.aspx>.

Subwatershed Characteristics

Upper Shenango River Subwatershed

Description

The Upper Shenango River subwatershed includes the portion of the Shenango River upstream of the outlet to Pymatuning Reservoir (Figure 1-3). As of this report's publication, a Natural Heritage Inventory (inventory of areas of high biological diversity within the watershed) of Crawford County has not been completed. However, much is already known about the high diversity of this subwatershed, which is unique in the state for its abundance of rare plants and wading birds, especially during spring and fall migrations. The subwatershed has a higher percentage of forest remaining than the Lower and Middle Shenango River and Neshannock Creek/Big Run subwatersheds, though it is also heavily fragmented. These forested areas contain mixed oak uplands, mixed hardwood lowlands, and several tracks of hemlock-mixed hardwood forests.

The soil underlying Pymatuning Reservoir of the Upper Shenango River subwatershed was formed by the deposition of glacial outwash during the Wisconsin Glaciation (Sevon, et al.1999). Deposits of glacial outwash also contributed to the formation of glacial lakes in the subwatershed, such as Dollar Lake and Crystal Lake, two of the eight glacial lakes in Pennsylvania. These high quality areas contain plant species of special concern and fish such as bass and panfish. Water flow from Pymatuning Reservoir, and invasive species such as Eurasian milfoil, threaten the biodiversity and health of these lakes. WPC is currently conducting surveys of the glacial lakes as part of the Glacial Lakes Flora Project. A final report on the biodiversity and health of the lakes is to be completed by summer 2005.



An aerial view of Dollar and Crystal glacial lakes

Pymatuning Reservoir is a highly productive warm-water impoundment, both in terms of nutrient loads and fish populations, and it comprises a large portion of the subwatershed. The reservoir supports approximately 48 species of fish (F. Johns, personal communication 2004), including large and small mouth bass, black crappie, muskellunge, walleye, and yellow perch. The reservoir provides fishing and recreational opportunities, as well as drinking water for Ohio and Pennsylvania residents. Organizations such as the Pymatuning Lake Association have worked to install habitat structures in the reservoir.



Inland pond at Clark Island

Habitat quality has decreased over the years as many of the original trees and snags that were present during the reservoir's construction have decomposed.

Black Jack Swamp Natural Area and the Hartstown/Blair Road Swamp are the remaining high quality swamp areas surrounding Pymatuning Reservoir. They are a reminder that, before the creation of the reservoir, the entire Pymatuning Reservoir area was once swampland. Black Jack Swamp, a 725-acre palustrine scrub/shrub wetland, is located in the northern corner of Pymatuning State Park. This swamp area contains both plant and animal species of special concern. Blair Road/Hartstown Swamp, located within PA State Game Lands #214, extends south from the upper Pymatuning Reservoir as a line of marsh and forested swamp areas. Much of this area is owned or leased by the Pennsylvania Game Commission (PGC). Migratory waterfowl are concentrated in

this area, which is essential to Pymatuning Reservoir's designation as an Important Bird Area. The state's largest populations of bald eagles and prothonotary warblers are found in this area, along with the state's only nesting location for black tern (Pennsylvania Audubon Society 2004). Most of the upper section is closed to hunting, while the lower Hartstown section is a PGC-controlled hunting area. In addition, the Hartstown area is one of the most important locations for rare plants in Pennsylvania (S. Grund, personal communication 2004).

The Upper Shenango River subwatershed has a history of rich aquatic biodiversity, with records of four endangered or threatened fish and two mussel species of concern, of which one is globally rare (PA DCNR 2004b; S. Grund, personal communication 2004). A large percentage of streams in the area are ephemeral (flow only seasonally). The riparian zones of many of the streams are surrounded by a palustrine forest floodplain, which provides important breeding habitat for frogs, many migratory bird species, and other wildlife.

Conservation Priorities

Agricultural pressures and future development threaten both wetlands and intact riparian areas. Protecting this subwatershed will involve maintaining a delicate balance between its many uses for farmers, hunters, eco-tourists, anglers, and wildlife. The future economy and well-being of this subwatershed depend on partnerships between its stakeholders.

Pymatuning Reservoir and its surrounding area is an enormous asset, providing recreational opportunities and fueling the local economy. Though active streambank fencing work is being done, there are still many farms that are not participating. Sewage pollution and the highly agricultural area surrounding the lake are the primary sources of nutrient enrichment, which, like the Shenango River Lake, has had the effect of producing algal blooms and odor problems. Reducing nutrient loads could be done through more intensive streambank fencing efforts and improvements in on-lot septic systems and sewage treatment plant effectiveness.

Invasive species also threaten to reduce habitat within the watershed. Pymatuning Reservoir has been invaded by purple loosestrife and American lotus (Billingsley and Johns, personal communication 2002). Though American lotus is considered endangered in Pennsylvania, it is an introduced species in Pymatuning Reservoir and has impaired spawning areas for fish. Eurasian milfoil has also invaded and could potentially affect habitat quality of the glacial lakes.

Additionally, there are numerous areas of conservation concern in this subwatershed, such as the glacial lakes, that are not receiving adequate protection through municipal planning, easements, and other conservation tools.

Middle Shenango River Subwatershed

Description

This highly agricultural subwatershed is located from the outlet of Pymatuning Reservoir downstream to the outlet of Shenango River Lake (Figure 1-4). Its high biodiversity can be attributed to the Shenango River and adjacent riparian wetlands, and to the aquatic resources of Shenango River Lake. This subwatershed lacks much of the municipal point source pollution characteristic of the Lower Shenango River subwatershed. However, a lack of riparian zones along many of its tributaries has reduced habitat for fish, birds, and other wildlife. Improvements in the water quality of Shenango River Lake and its tributaries could benefit wildlife, as well as maintain the reservoir, which has experienced nutrient and odor problems, as a safe recreational area and drinking water supply.



Spring beauties are one of the first wildflowers of spring found within the Shenango River watershed

Pastureland and cropland dominate the subwatershed, with much of the remaining forest concentrated along Shenango River Lake. Pasturelands and abandoned agricultural fields support grassland birds such as the bobolink and eastern meadowlark (Patuxent Wildlife Research Center 2004), and possibly the endangered least shrew, which are declining in Pennsylvania. However, these species are threatened by tilling practices and succession.

The Shenango River upstream of Shenango River Lake (from Greenville to Big Bend) is likely the biggest wildlife resource in this subwatershed, containing a forested riparian zone and good stream habitat. Common fish species include central stoneroller, bluntnose minnow, riverchub, spotfin shiner, and white sucker (Coxe 2002). In addition, the river supports a number of threatened or endangered mussel and fish species (R. Evans, personal communication 2004). The section from New Hamburg to Big Bend is still predominately forested and supports migratory birds such as the cerulean warbler (anonymous resident, personal communication 2004).

Threats to the Shenango River include nutrient enrichment and hydrological alterations resulting from Pymatuning Dam. A large part of the nutrient enrichment problem enters Shenango River Lake from Ohio via Pymatuning Creek and the Shenango River (USACE 2004). This nutrient enrichment causes algal blooms that can lead to fish suffocation and increased drinking water treatment costs downstream (discussed further in the Water Resources chapter). Despite these problems, Shenango River Lake remains an important resource for bird life, with birders coming from all over the state to view the sandpipers, eagles, ospreys, egrets, and others (Pennsylvania Audubon Society 2004).

The southern portion of Shenango River Lake contains a noticeable concentration of ephemeral wetlands, small wetland areas that only hold water during the spring and early summer (Coxe 2002). Likely existing in other portions of the Shenango River watershed (but particularly noticeable here), vernal pools support spotted, Jefferson, and four-toed salamanders, as well as a diversity of snails, whose life cycle depends on the existence of these wetlands. These wetlands are often filled in or altered because their importance or location is not realized.

Conservation Priorities

Since the Shenango River, and surrounding area, is the biggest source of biodiversity within this section of the watershed, conservation efforts should focus on protecting the health of this resource. Though the USACE owns a portion of the western riparian zone of the section from New Hamburg to Big Bend, a large portion is still privately controlled and is threatened by poor forestry management practices. The purchase of this land by a public agency, and/or obtainment of conservation easements would help protect the high biodiversity of this subwatershed and provide additional access to the river. WPC, United States Department of Agriculture Natural Resource Conservation Service (NRCS), and other organizations can work with landowners who wish to harvest timber in order to identify forestry BMPs that are more compatible with protecting the river.

Loss of habitat is an important concern in this subwatershed. Residents should be educated about the characteristics and importance of seasonal wetlands and advised on how to protect them with buffer zones. WPC, The Nature Conservancy, or other conservation organizations in the area can be contacted for further information about protecting seasonal wetlands. Protecting and restoring riparian zones along the Middle Shenango River and its tributaries could also help improve biodiversity and water quality. Keeping riparian zones intact can help decrease the amount of nutrients and sediment entering streams as runoff, as well as help prevent flooding. The Shenango Conservancy, WPC, and other local conservation groups can assist private landowners in protecting their properties through easements, enrollment of individuals in programs such as the Conservation Reserve Enhancement Program (CREP), and by working with the Shenango Conservancy and other organizations to obtain funding for conservation projects. CREP and other similar programs can help farmers take riparian zones out of production, allowing them to revegetate, while protecting streams and providing corridors for terrestrial animals. The local conservation districts, NRCS office, and other local conservation organizations may also provide guidance on agricultural practices that are compatible with the requirements of the declining grassland species in northwest Pennsylvania, such as mowing late in the season and maintaining an area of warm season grasses.

The USACE should continue to make all efforts to release dammed waters in such a way that best mimics natural flow conditions for mussels, birds, and other wildlife. Many species of mussels in the Shenango River, including the federally endangered clubshell and northern riffleshell, are found within the Middle Shenango River subwatershed. The river is changing from a system that accommodates more riverine species (including the two endangered species) to a system that supports standing water species. In addition, the hydrologic alterations have affected the populations of many fish species that the mussel species use as hosts.

Lower Shenango River Subwatershed

Description

The Lower Shenango River subwatershed includes the portion of the Shenango River and its tributaries from the outlet of Shenango River Lake downstream to the mouth of the Shenango River (Figure 1-5). This subwatershed contains forest communities that can be found throughout the entire watershed. The uplands contain drier areas of mixed oak hardwood forests, including white oak and red oak. The lower slopes contain more acidic (soils of higher pH) mesic (wetter) forest communities that additionally contain sugar maple, beech, black birch, slippery elm, basswood, white ash, tulip tree, and cucumber tree (Coxe 2003). The majority of forested areas of the subwatershed are largely confined to the central portion of the subwatershed, while the upper portion is dominated by pastureland and hayfields, and the lower portion is dominated largely by cropland. The cities of Sharon and Hermitage threaten to expand into some of the remaining natural areas in the Pennsylvania side of the watershed, and Youngstown is expanding in the Ohio portion (National Land Cover Data (NLCD) 2001).

Wetlands in the Lower Shenango River subwatershed are associated with such areas as the bottomland hardwood floodplains of the Shenango River below Sharon, and riparian areas such as those of Yankee Creek in Ohio (NLCD 2001). The widths of riparian zones along the Shenango River vary in size and quality. Serving as a corridor for migratory birds and other wildlife, these riparian areas could be considered one of the most significant natural features in this subwatershed (Coxe 2002).

The water quality of the Shenango River below Sharon is considered impaired by the Pennsylvania Department of Environmental Protection (PA DEP) (Coxe 2002). This section of the Shenango River is on the Integrated Waterbody List of Impaired Streams (formerly known as the 303 (d) list) due to nutrient enrichment and hydro-modification. In general, aquatic or semi-aquatic species that might exist in this stream segment (species such as the eastern hellbender salamander, queen snake, and largemouth bass) are negatively impacted by poor water quality. Even a surprising number of terrestrial animals depend on good water quality for their survival, including riparian birds, such as the Louisiana waterthrush and Acadian flycatcher, and mammals, such as shrews and weasels. One of the few remaining high quality areas of the subwatershed is the portion of the river above Sharon, which currently contains several aquatic species of special concern (Coxe 2002). However, even these species depend on good water quality and stable hydrology downstream to increase their reproduction.

Several tributaries of the Shenango River are threatened by the expanding development of Youngstown and Sharon, and appropriate land-use controls will be necessary to maintain their riparian zones as corridors for wildlife. A portion of the large eastern tributary of Deer Creek is on the Integrated Waterbody List. This tributary is being threatened by nutrient enrichment and low dissolved oxygen. However, a significant portion of the tributary passes through PA State Game Lands #150, and some of its smaller tributaries are healthy. For instance, bio-monitoring data for Little Deer Creek, as reported in the Interstate Pymatuning Shenango Watershed Plan, shows a good quality macroinvertebrate population. Further assessment is needed to determine how aquatic life is being impacted in Deer Creek and its tributaries and to determine appropriate BMPs to restore the creek. Likewise, other tributaries, such as Yankee Creek in Ohio, are in need of further investigation to determine impacts from point and non-point discharges.

Conservation Priorities

Ultimately, improvement of the biodiversity and recreational opportunities in this subwatershed will have to include a decrease in nutrients and other harmful pollutants being received from the expanding Sharon and Youngstown areas. More intensive monitoring efforts are needed to determine the causes and possible solutions to pollution problems. This may involve partnerships between local businesses, municipalities, non-profit organizations, and PA DEP, which are fairly uncommon in the subwatershed. Continued development may increase pressures on municipal sewage systems and other services, which could result in further degradation of the river and its tributaries. Smart Growth planning, including better stormwater management and projection of future needs, could help alleviate some of these problems. This may include working together and developing joint-municipal plans that allow for the sharing of infrastructure and ideas.

Besides addressing development pressures, the more rural areas in this subwatershed are also in need of agricultural BMPs, such as streambank fencing and cattle crossings, which would help reduce sediment and nutrients to streams. As with the other subwatersheds, the conservation districts and NRCS may be contacted by farmers wishing to participate in available programs.

Neshannock Creek/Big Run Subwatershed

Description

The Neshannock Creek/Big Run subwatershed has a unique assemblage of small wetlands, including bogs and swamps that were formed by the deposition of glacial till during the recession of the glaciers. These areas contain numerous threatened and endangered species. Most are located on private lands that are highly susceptible to changes in hydrology caused by devegetation of the surrounding area or other disturbance.

The forest communities are largely comprised of species such as red maple, tulip tree, sugar maple, shagbark hickory, and black cherry. Sycamore-river birch-box elder floodplain forest communities can be found along some of the stream courses. The area abounds in cattail marshes and swamps, containing species such as swamp white oak, silver maple, and mature hardwoods (Coxe 2002). Many of these wetland areas are associated with plants of special concern and provide important habitat for animals of special concern, such as the marsh wren and least bittern.



Schollard Marsh, an important natural area in Neshannock Creek/Big Run subwatershed

This subwatershed once contained important breeding grounds for the state-endangered eastern massasauga rattlesnake. However, recent surveys suggest populations may no longer be found anywhere within the Shenango River watershed because of loss of habitat. The snakes are found in open fields with tall grass, in or close to wetland areas. They are susceptible to disking or heavy machinery, which can destroy their burrows. Nicknamed “swamp-rattler,” these snakes also hide out in cracks of old foundations. Removal of woody debris and prescribed burning are good management options to protect habitat for this non-aggressive rattlesnake (B. Jellen, personal communication 2004).

Despite the intensive land use occurring in this subwatershed, most streams are still meeting their water quality standards, containing fish species such as mottled sculpin, rainbow darter, central stoneroller, and four fish species of special concern. However, Yellow Creek is degraded due to abandoned mine drainage and several smaller streams are high in nutrients and siltation.

A look at the land-use map for this subwatershed reveals that there are few large forested areas left, and that a small or absent buffer surrounds many of the areas of high biodiversity that have been identified by the Pennsylvania Natural Diversity Inventories (see Natural Heritage Areas section for more information). Several high quality wetland areas are under public control by the PGC, Westminster College, WPC, and other public entities. However, much of the remaining land in this subwatershed is privately owned. Protecting the remaining resources of this watershed will involve educating landowners about the location and importance of these areas. Maintaining vegetated buffers around these areas aids in groundwater recharge and retention, contributes to an elevated water table, and reduces invasive species by keeping light levels low (as light openings often promote invasive species).

Conservation Priorities

During recent visits to the Neshannock Creek subwatershed, WPC staff noted that this subwatershed has the potential to benefit greatly from restoration efforts. The southern redbelly dace and several other species of concern were found in smaller tributaries. Neshannock Creek itself contains adequate habitat for aquatic organisms and does not have the hydrological alterations present in the Shenango River.

Recently, streambank fencing and other efforts have increased within the watershed due to programs offered in conjunction with the local NRCS, conservation district offices, Shenango Conservancy, and other organizations. Expansion of this streambank fencing program would greatly benefit this subwatershed, with its high aquatic diversity. Future improvements in the creek could reduce sedimentation and allow for the introduction of mussels from the Shenango River, where their survival has decreased as a result of impounded conditions.



A dragonfly within a scrub/shrub wetland

Further landowner awareness efforts are also needed to inform people of species of concern or important habitats on their lands. A land steward program would be ideal for this subwatershed. Land stewards could be responsible for monitoring natural heritage areas (see following section) on a regular basis, working with landowners, and reporting back to the Shenango Conservancy, WPC, or another organization to follow up on management recommendations.

Areas of Conservation Concern

Natural Heritage Areas

WPC, with funds provided by PA DCNR and other sources, is working to complete County Natural Heritage Inventories (CNHIs) in western Pennsylvania. These inventories identify and map the most significant natural places in a county based on species accounts and natural communities (Coxe 2003). Areas important for wildlife habitat and scientific study are also included. The final product of these investigations is a report highlighting specific areas and providing detailed management recommendations for their protection. These areas are termed Biological Diversity Areas, Landscape Conservation Areas, and Dedicated Areas.

A **BDA** (or **biological diversity area**) is an area of land recognized as supporting populations of state, nationally, or globally significant species or natural communities, high quality examples of natural communities or ecosystems, or natural exceptional native diversity. These areas are typically small and contain a buffer that takes into account the natural community or habitat that is the focus of the site.

An **LCA** (or **landscape conservation area**) is a larger area of land that contains minimal human disturbance and allows ecosystems to function on a landscape level. These areas often contain multiple BDAs.

A **DA** (or **dedicated area**) is an area of land recognized because of an owner's specific intention to protect it, which could result in the site improving to either become a BDA in the future or to become an even better high quality area within an already designated BDA. Numerous areas within the watershed could be DAs in the future through landowner agreements, special programs, or other methods.

The CNHIs for Mercer and Lawrence counties in Pennsylvania were completed in 2002 and 2003, respectively. The Crawford CNHI is scheduled for completion in mid-2005. Included in inventories completed thus far for the Shenango River watershed in Pennsylvania were a total of 24 BDAs, one LCA, and two DAs. For each subwatershed, the locations and descriptions of these ecological areas are listed in the following sections, as well as recommendations for their protection. BDAs are listed according to significance as explained in Table 4-5.

In the Ohio portion of the Shenango River watershed, natural areas are protected through the Division of Natural Areas and Preserves under the Ohio Department of Natural Resources (ODNR). The preserve system was created to protect rare plants and animals and unique geologic features. In addition, the ODNR recognizes conservation sites, which are high quality natural areas harboring one or more rare plant or animal communities that have some type of protection. One preserve (Pymatuning Wetlands Area) and one conservation area (Conrail Conservation Pond) are located within the Shenango River watershed. Neither area is available for general public use (ODNR). ODNR does not have the equivalent of Pennsylvania's BDAs, yet it does record locations of exemplary communities and species of concern. These areas, which are unnamed, are located with BDAs in Figure 4-2.

Generally, it is recommended that a buffer zone be established around BDAs and that certain activities be eliminated or reduced within the buffer zone. Depending on the characteristics of the BDA, these may include camping, intensive logging, and development. The type of activities that can occur in a buffer zone are dictated by the needs of the particular plant, animal, or community that is in need of protection and often can be incorporated into a management plan for the BDA. Suggested buffers are already incorporated into the BDA areas in Figure 4-2. Buffers are particularly important for wetland communities whose existence depends directly on a high water table. Removal or alteration of vegetation can cause the water table to be lowered, drying up or altering these communities. These hydrologic changes can lead to an increase in invasive species and a decrease in native plants of special concern.

Table 4-5. Significance Rankings for BDAs

Significance Rank	Explanation
Exceptional	Sites are of exceptional importance for the biological diversity and ecological integrity of the county or region, containing one or more occurrences of state or national species of special concern or a rare natural community of good size, condition, and extent. These areas deserve complete and strong protection.
High	Sites are highly important for biological diversity of county or region and, just like exceptional sites, contain species of special concern or natural communities that are highly ranked; these sites are also of relatively large extent and are primarily undisturbed, but are of slightly less importance in terms of rare species or condition than exceptional sites. These sites deserve strong protection.
Notable	Sites in this category contain occurrences of species of special concern or natural communities that are either more common or of smaller size and extent than exceptional or high rank areas, or have activity and disturbance. These sites deserve special protection within the context of their characteristics, degree of disturbance, and place in the community.
County	These sites have great potential for protecting biodiversity but have not yet been found to contain species of special concern or state-significant natural communities. Because of their size, undisturbed character, or proximity to other significant areas, these sites deserve further study and investigation as possible future high or exceptional sites.

Regular monitoring by landowners or concerned citizens can help to determine the health of BDAs. Just noting the types of activity occurring within the buffer zone can provide valuable insight into steps that could be taken for a BDA's protection. This is a potential role that local organizations, including the Shenango Conservancy, could play in helping to maintain these sites. If a property is identified as being threatened or as having special significance to the community, there is the possibility of working with the landowner to obtain a conservation easement for the property (private land), to develop a management plan for the property (public or private land), or to donate or sell the property for public use (private land). In the case of a conservation easement, the landowner gives up the right to perform certain

activities on the property but still retains the use of the land, in exchange for a deduction on their property tax. PA DCNR offers Parks and Recreation Grants for non-profit organizations that wish to purchase a property for public use. PA DCNR, WPC, and other organizations can be contacted for more information about these opportunities.

Upper Shenango River Subwatershed

Because the CNHI has not been completed for Crawford County, there are currently no Natural Heritage Areas identified. The exception is part of the Crooked Creek BDA, which extends northward from the Middle Shenango River subwatershed. This BDA contains a hemlock mixed-hardwood palustrine forest, two animals of special concern, and an endangered plant, yellow lady's slipper. Upon completion of the CNHI, it is likely that all or a portion of Pymatuning Reservoir will be considered a BDA, with a focus on the portion called Sanctuary Lake. Black Jack Swamp and Hartstown Area swamp, which have both been found to contain species of special concern, will also likely be included. Clark Island, a PA DCNR natural area, contains a mature hardwood forest and possible plants of special concern. This natural area may also be considered for BDA status.

In the Ohio portion, the Pymatuning Creek Wetlands Nature Preserve is granted special protection through the Ohio nature preserve system. Limited activity is permitted on the site, and visitation is by permit only (ODNR).

Middle Shenango River Subwatershed

1. Shenango River BDA

Municipality: Delaware Township, Greene Township, Greenville, Hempfield Township, City of Hermitage, Jamestown (Mercer County), Jefferson Township, Pymatuning Township, West Salem Township

Significance: Exceptional

Description: This BDA includes the Shenango River and immediately surrounding land from Jamestown Borough to the flood pool of Shenango River Lake above Big Bend, containing some of the best remaining riparian forest habitat in the subwatershed

Rare Occurrences: Thirteen aquatic animal species of special concern and one rare plant, fog fruit, which is found on the rocky islands of the Shenango River; the animals of special concern live in the occasional riffles, deep pools, and backwater channels and include nine Pennsylvania endangered species and one Pennsylvania threatened species; notable areas include riffles at Kidd's Mills Bridge and backwaters created by the old Lake Erie Canal at Hamburg

Threats: Absence of riparian forest buffers; sewage discharges at Greenville and Jamestown; invasive species such as multiflora rose

Recommendations: Increase streambank fencing efforts; improve sewage treatment systems at Greenville and Jamestown; monitor and remove invasive species

2. Shenango Lake BDA

Municipality: Pymatuning Township, South Pymatuning Township, Clarksburg, Delaware Township, Jefferson Township, City of Hermitage (Mercer County)

Significance: Exceptional

Description: A 3,560-acre impoundment of the Shenango River and Pymatuning Creek managed by the USACE for flood control, recreation, wildlife enhancement, low-flow augmentation, and water quality. Current management of the lake involves raising water levels in the spring and a gradual drawdown in the summer and fall.

Rare Occurrences: great blue heron (breeding), osprey (Pennsylvania threatened), and three other special animals of concern, two of which are endangered in Pennsylvania; cat-tail sedge (Pennsylvania threatened); a bottomland oak-hardwood palustrine community

Threats: Disruption in flood regime; human visitation and trampling of areas of concern (including trash dumping); deer browsing; exotic species

Recommendations: Maintain and improve current flood regime (raising levels in spring and drawing them down in summer and fall); invasive species monitoring and control (in some places Japanese knotweed and purple loosestrife are still at a minimum and could be removed by volunteers); develop a management plan and designated-use areas

3. Crooked Creek BDA

Municipality: Sugar Grove

Significance: High

Description: Originating in the Hartstown swamp area, Crooked Creek flows south into the Little Shenango River

Rare Occurrences: Stream habitat and floodplain pools provide habitat for two animals of special concern, one plant of special concern, and one community of special concern; communities include a northern mixed-hardwood palustrine forest and a black ash-red maple palustrine swamp; the western end of the site contains a highly disturbed marsh that harbors the animal of special concern

Threats: Heavy siltation and nutrient runoff from upstream and massive infestations of multiflora rose in the upper section

Recommendations: Sediment control upstream strategies, depending on the source of the sedimentation; invasive species monitoring and control; an assessment of the impact of impoundments on the creek on native flora and fauna

4. Salem BDA

Municipality: Sugar Grove (Mercer)

Significance: Notable

Description: Salem BDA (or Barrows Heronry) contains mature forest riparian areas along Little Shenango River, providing breeding habitat for great blue herons in large sycamore and black cherry trees; the Barrows Heronry is the largest of its kind in Pennsylvania, with about 500 nests

Rare Occurrences: great blue heron (breeding)

Threats: Herons are sensitive to disturbance within a few meters of their nesting areas; even small visitation can disturb these animals, as well as the removal of dead or alive trees on which they depend

Recommendations: Current levels of activity are compatible with their needs; continuing to inform landowners in the area of these needs will be essential to maintaining this population

5. Conrail Pond Conservation Area

This area, located in the Ohio portion of the Middle Shenango River subwatershed, contains one or more rare plants and animals or exemplary natural communities. It is located on private land and is not open to the public.

6. Shenango River LCA

Municipality: Clark Borough, Delaware Township, Greene Township, Greenville Borough, Hempfield Township, City of Hermitage, Jamestown Borough, Jefferson Township, Otter Creek Township, Pymatuning Township, South Pymatuning Township, Sugar Grove Township, West Salem Township

Significance: Not Applicable

Description: This LCA includes the Shenango River BDA and the Shenango Lake BDA and immediate watershed; most of the upper sections of the river between Jamestown and Greenville are highly fragmented by non-forest land uses; the riparian areas of the lower sections are primarily forested

Rare Occurrences: Includes those found in the Shenango River BDA and Shenango Lake BDA

Threats: Substantial nutrient and silt loads from upstream, including sewage outflows at Jamestown, Greenville, and Reynolds Heights; development pressures

Recommendations: Careful planning and partnerships between private landowners, local municipalities, and the USACE, including a management plan for the area immediately surrounding Shenango Lake BDA and Shenango River BDA; improve the sewer system discharges from Jamestown; maintain and restore riparian zones.

Lower Shenango River Subwatershed

1. Beaver River Islands BDA

Municipality: North Beaver Township, City of New Castle, Taylor Township (Lawrence County)

Significance: High

Description: Forested islands and riparian areas of the Beaver and Shenango Rivers containing exemplary riverine habitat, a sycamore (river birch) box elder floodplain forest, and the northernmost extent of the yellow buckeye in Pennsylvania

Threats: Disturbance by industrial activities and logging dominate the east side, while a railroad dominates the west side; invasive species and loss of canopy are significant concerns

Rare Occurrences: Sycamore (river birch) box elder floodplain forest

Recommendations: Invasive species monitoring and prevention; maintenance of mature forest and decrease in forestry activities; reduction in deer populations; possible easement opportunity

2. Sharpsville BDA

Municipality: Sharpsville, City of Hermitage, South Pymatuning Township (Mercer County)

Significance: High

Description: Forested riverine habitat within the Shenango River watershed, just below the dam, that is the furthest downstream location of three animal species of special concern on the Shenango River, before it is impacted by pollution of the Sharon Metropolitan Area

Rare occurrences: Three aquatic species of special concern, which are all considered endangered in Pennsylvania

Threats: Changes in flow regimes and pollution (these animals are very sensitive to pollution)

Recommendations: Maintain flood releases at the dam to support species of concern; monitor and restore polluted areas upstream and downstream so that rare species may someday re-colonize this area

3. Deer Creek Confluence BDA

Municipality: Pulaski (Lawrence County)

Significance: Notable

Description: Wetland at the confluence of tributaries to Deer Creek, which is the location of a high quality natural community (skunk cabbage golden saxifrage seep)

Rare Occurrences: Skunk cabbage golden saxifrage seep

Threats: Multiflora rose; damage to recharge zone (deforestation, development, ditching)

Recommendations: Monitoring and landowner awareness

4. Shenango Oxbow BDA

Municipality: Shenango (Mercer County)

Significance: County

Description: Located downstream of Sharon, this BDA includes an oxbow of the Shenango River, a graminoid wetland, and a beaver impoundment

Rare Occurrences: None

Threats: Heavy disturbance from agriculture and other land use; invasive species

Recommendations: Landowner awareness; maintenance of beaver populations; buffering and limited disturbance of the area

Neshannock Creek/Big Run Subwatershed

1. Pine Swamp BDA

Municipality: Worth Township, Jackson Township, Lake Township, Sandy Lake Township (Mercer County)

Significance: Exceptional

Description: This BDA is part of PA State Game Lands # 130 and marks the beginning of Wolf Creek and Fox Run; it includes a swamp forest dominated by a northern hardwood forest community, a marsh, and the only raised bog in Pennsylvania

Rare Occurrences: Bog: short awn meadow foxtail, broad-leaved water plantain, soft-leaf sedge, and bog bluegrass; Swamp/marsh: autumn willow

Threats: Mining of adjacent property; treated sewage application to nearby field (proposed) that would alter nutrient balance required by swamp; invasive species (common reed grass and multiflora rose)

Recommendations: Occasional, managed disturbance in non-forest areas to avert succession; management agreement between WPC and PGC; invasive species monitoring and removal

2. Fringed Gentian Fen BDA

Municipality: Shenango Township (Lawrence)

Significance: Exceptional

Description: Fringed Gentian Fen BDA includes an alkaline wet meadow, shrub swamp, and riparian area, located along a portion of Big Run; the Fen itself contains 11 plant species of special concern in Pennsylvania; the adjacent wooded area contains an uncommon plant for Lawrence County, wild coffee

Species/Communities of Concern: Broad-winged sedge—PA threatened; slender sedge—PA rare; prairie sedge—PA threatened; Sterile sedge —PA endangered; Rigid sedge—PA threatened; Slender Spike Rush —PA endangered; beaked spike rush—PA endangered; vanilla sweet-grass—PA endangered; stiff cowbane—PA threatened; grass-of-parnassas—PA endangered; swamp lousewort—PA endangered; Special Animal 1; open sedge fen community (considered imperiled in PA)

Threats: Lack of buffer (agricultural and residential land use surround it); succession (WPC owns only a small portion of this BDA)

Recommendations: Control woody vegetation; work with landowners to develop a management plan

3. Otter Creek Swamp BDA

Municipality: Coolspring Township (Mercer County)

Significance: High

Description: Otter Creek Swamp BDA is characterized by a complex of swamps and marshes that intersperse with wet meadow and forested areas; it is the location of two animal species of special concern and an exemplary wet meadow community; Otter Creek is filled with dense patches of yellow pond lily. Immediately downstream is a wooded area dominated by silver maple, swamp white oak, red maple, and green ash.

Rare Occurrences: PA endangered animal; marsh wren, considered vulnerable and its status is under review

Threats: Disturbance to adjacent uplands; heavy silt loads; land use that alters hydrology

Recommendations: Inform the landowner of requirements of animals of concern; additional surveys for special concern animals; BMPs along Otter Creek and upstream

4. Mercer Bog

Municipality: East Lackawannock Township (Mercer County)

Significance: High

Description: Kettle-hole depression bog with a floating peat mat on one side and surrounded by an extensive shrub swamp

Rare Occurrences: Few seeded sedge, a threatened species in Pennsylvania

Threats: Frequent visitation or other disturbance, which will affect the health of this fragile mat community; the landowner currently has expressed an interest in protecting the bog and surrounding habitat

Recommendations: Maintain the bog in its current state, with some possible invasive species monitoring of the site

5. Brandy Springs BDA

Municipality: East Lackawannock Township, Mercer Borough (Mercer County)

Significance: High

Description: A forest community comprised of pignut hickory, American basswood, red oak, and red maple as the primary overstory species and an understory including black cherry and sugar maple

Rare Occurrences: American columbo, a PA endangered plant that only flowers every few years when internal and environmental cues are right

Threats: Intensive use or expansion of picnic area; removal of vegetation; future timbering; deer browsing

Recommendations: Inform park manager and maintenance crew of plant requirements (high sensitivity to disturbance); monitor invasive species; construct deer exclosures

6. Sunset Valley Floodplain BDA

Municipality: Neshannock Township, Hickory Township (Lawrence County)

Significance: High

Description: Sunset Valley Floodplain BDA, within PA State Game Lands #178, is located on a slight bend to the southeast of Neshannock Creek; a sycamore (river birch) box elder floodplain forest occupies the floodplain and an island; a red-oak mixed hardwood forest can be found on the slopes to the west of the floodplain

Rare Occurrences: Wild hyacinth, a PA endangered plant

Threats: Invasive species, such as multiflora rose, which opening of the canopy would encourage

Recommendations: Work with PGC to develop a management plan for endangered plants; discourage canopy removal

7. Little Neshannock Creek BDA

Municipality: Wilmington Township (Lawrence County); Wilmington Township (Mercer County)

Significance: High

Description: Little Neshannock Creek at the Mercer-Lawrence county line contains a PA threatened aquatic animal of special concern; the creek flows through a landscape of fields and shrub swamps; in its upstream section, nutrients from agriculture are a problem; downstream section has a better buffer

Rare Occurrences: PA threatened aquatic animal

Threats: Sedimentation from upper reach activities; salt and runoff from roads

Recommendations: Streambank fencing; assessment of other impacts

8. Westminster College BDA

Municipality: New Wilmington Borough, Wilmington Township (Mercer and Lawrence counties)

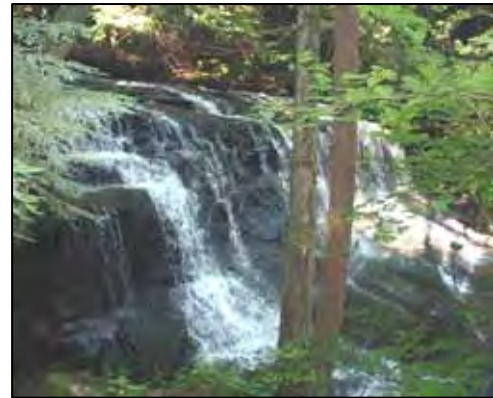
Significance: High

Description: This BDA includes wetlands along Neshannock Creek and one of its tributaries that provide habitat for an animal of special concern potentially existing in the area; the species depends on the stream for winter habitat and the upland for foraging; this BDA includes a DA that is an outdoor teaching facility for Westminster College, containing old growth forest

Rare Occurrences: Potentially home to a PA endangered animal, which is a candidate for federal status

Threats: Activities that alter the perennial wetland hydrology; disturbance to adjacent uplands; use of herbicides and mowing of fields (foraging habitat for rare animals)

Recommendations: Engage landowners in management of area and investigate potential easement opportunities; conduct additional surveys for the rare species (possibly in conjunction with Westminster College)



Falls at Schollard Run BDA

9. Schollard Run BDA

Municipality: Springfield Township (Mercer County)

Significance: High

Description: Schollard Run BDA includes a large cattail wetland (Schollard Marsh, Pennsy Swamp) and Springfield (Leesburg) Falls. The Springfield Falls section contains an exemplary hemlock (white pine)-northern hardwood forest in a steep gorge before flowing to Neshannock Creek; to the east of Springfield Falls is a higher elevation shrub swamp

Threats: Much development pressure (close to Grove City Outlet mall); stormwater runoff

Rare Occurrences: Elliptic spike rush—PA endangered; prairie sedge—PA threatened; autumn willow—PA threatened; least bittern—PA endangered; three animals of special concern; hemlock (white pine)—northern hardwood forest

Recommendations: Infrastructure development should consider these natural communities and corridors of natural habitat should be maintained; a stormwater management plan is badly needed

10. Leesburg Station BDA

Municipality: Springfield Township (Mercer County)

Significance: Notable

Description: Neshannock Creek, at Leesburg, is a clear, flowing stream surrounded by a narrow, mature forested floodplain consisting of red maple, black cherry, tulip-tree, and others; fish species in the creek include rainbow darter and mottled sculpin, as well as central stoneroller and white sucker

Rare Occurrences: Endangered aquatic animal

Threats: Nutrients from upstream activities (Otter Creek drains into Neshannock Creek); multiflora rose and other exotics; removal of canopy (which could also introduce invasive species)

Recommendations: Maintain and expand current forest cover; implement BMPs upstream

11. Kashner Corners Swamp BDA

Municipality: Otter Creek Township (Mercer County)

Significance: Notable

Description: Kashner Corners Swamp BDA sits along a headwater tributary of Otter Creek; this swamp contains a wet meadow, a bottomland-hardwood palustrine forest, a swamp comprised primarily of swamp white oak and silver maple, and a mature hardwood forest

Rare Occurrences: Two communities deserving of special protection; an exemplary wet meadow; a bottomland-hardwood palustrine forest community

Threats: Addition of nutrients and herbicides/pesticides from nearby agricultural fields; changes in hydrology due to logging or other altering activities in the buffer zone; exotic species introduction as a result of these alterations

Recommendations: Inform landowner of significance of these communities; investigate impacts of upstream land uses on rare communities; maintain buffer zone by reducing or eliminating high impact activities (agriculture, logging) in this buffer area

12. Hawk Marsh BDA

Municipality: Perry Township, Hickory Township (Lawrence)

Significance: Notable

Description: Hawk Marsh BDA, located next to Hottenbaugh Run, is an area of low relief constricted by adjacent uplands to form a tussock sedge marsh wetland

Rare Occurrences: tussock sedge marsh, a vulnerable community in Pennsylvania

Threats: Changes in groundwater quality and quantity; nutrient additions which could alter the community and introduce invasive species

Recommendations: Inform the landowner of significance of wetland; carefully evaluate any draining and ditching activities for potential impacts; monitor invasive species

13. Harlansburg Swamp BDA

Municipality: Scott Township (Lawrence County)

Significance: County

Description: This shrub swamp, located at the headwaters of Hottenbaugh Run, is the historic location of a plant species of special concern; a tulip tree-beech-maple forest community dominates the uplands, while the swamp contains shrub species such as silky dogwood and buttonbush

Rare Occurrences: None

Threats: Lack of woodland buffer, as a result of mining and timbering on the north and west side; hydrologic changes due to impoundment and ditching

Recommendations: Work with landowner, who is aware of significance of site; avoid removal of canopy trees and allow adjacent area to revert to woodland; avoid hydrologic changes, such as damming and ditching; monitor for possible invasion of exotic species (which are currently not an issue)



Buttonbush is a common wetland plant in the Shenango River watershed named for its button-like flowers

14. Shenango Township Marsh BDA/Gardner Swamp BDA

Municipality: Shenango Township (Lawrence County)

Significance: Notable

Description: Part of Shenango Township Park, this BDA is a primarily wooded area containing sassafras, black cherry, red maple, sugar maple, and shagbark hickory; near the wooded area is a beaver-impounded woodland probably containing Torrey's rush, a PA endangered plant; the wetland is isolated by numerous intensive land uses, including a strip mine, residential area, and strip mall

Rare Occurrences: Torrey's rush (*Juncus torreyi*), a PA endangered plant

Threats: Runoff; filling from strip mines; invasive species such as multiflora rose

Recommendations: Study impacts of beaver activity on wetland; monitor invasive species

15. Briar Hill BDA

Municipality: Hickory Township (Lawrence County)

Significance: County

Description: A buttonbush wetland that is a possible location of grass-of-parnassus, a PA endangered species, recorded by O. E. Jennings in 1929; the wetland is surrounded by woodland and pasture, with a recently cut area to the west and an uncut area to the south, which has increased water inputs; the wooded area contains species such as red maple, sugar maple, and sycamore and herbaceous species such as false Solomon's seal and Christmas fern

Rare Occurrences: A buttonbush wetland, considered vulnerable in Pennsylvania

Threats: Increased runoff from unforested surrounding areas; invasive species, such as purple loosestrife and common reed

Recommendations: Activities further altering hydrology are not recommended; more research is needed to determine best course of management, which might include maintaining a more open habitat through removal of shrubs

16. Westminster College DA

Municipality: New Wilmington Borough (Lawrence County)

Description: Part of the outdoor teaching facilities at Westminster College, this area contains old-growth forest and a potentially important wetland; this area has the potential to be an exemplary portion of Westminster College BDA

17. Fringed Gentian Fen DA

Municipality: Shenango Township (Lawrence County)



Three Rivers Birding Club members look for eagles at an outing in Pymatuning IBA

Description: Owned by WPC, this is a small portion of Fringed Gentian Fen BDA in Shenango Township; greater landscape planning could insure that this fen reflects the potential of the BDA

Important Bird Areas

Pennsylvania was the first state to develop an Important Bird Area (IBA) program in the United States. Based on strict scientific criteria, a group of scientific advisors first selected 73 IBA sites, including migratory staging areas, winter-feeding and roost sites, and prime breeding areas. They also include critical habitats, such as grasslands, bogs, marshes, and bottomland hardwood swamps. Additional IBA sites are selected on an ongoing basis by a group of scientific advisers known as the Ornithological Technical Committee (Pennsylvania Audubon Society 2004).

The Shenango River watershed hosts, entirely or part, four of the 81 current IBAs, including the 3rd (Pymatuning, Hartstown Complex), 8th (Barron Heronry and Edward Brucker Sanctuary), 9th (Shenango Reservoir), and 10th (Penny, Black, and Celery Swamps) IBAs in Pennsylvania. In addition, Ohio Audubon has named the Pymatuning Corridor in Ohio as an Important Bird Area. IBAs are a natural focus of volunteer monitoring, stewardship, and advocacy (Hoffman, personal communication 2002). Outdoor and birding groups travel to two of the publicly owned IBAs on a regular basis (Pymatuning and Shenango in Pennsylvania) and have developed bird lists of the areas. IBA designations can also be used to assist private landowners and public land managers by providing a scientific basis for habitat conservation decisions (Pennsylvania Audubon Society 2004). Bird species are unique to specific habitats and their presence or absence often reflects the extent and health of that habitat. The four IBAs are located in three of the subwatersheds: Upper Shenango River (Pymatuning and Barrows Heronry), Middle Shenango River (Shenango), and Neshannock Creek/Big Run (Penny, Black, and Celery Swamps).

The large concentration of IBAs within the Shenango River watershed can be attributed to its many wetland areas. Numerous other important wetlands exist and support wetland birds, including those of conservation concern. The Shenango River watershed is arguably the most important watershed in Pennsylvania for wading birds during breeding season and yearly migrations. However, it is important to note that the watershed is important in terms of conservation for other types of bird life as well. Forest-interior birds, which are declining in many parts of their range (including the worm-eating warbler, Acadian flycatcher, and cerulean warbler), depend on large, intact forest tracts and a forest matrix that has a large percentage of forest. These birds still have a significant presence throughout the watershed, especially along the forested riparian zones of the Shenango River. However, they are in danger due to the decline of forestland in the region. Grassland birds, such as the short-eared owl and eastern meadowlark, have also been reported within the watershed.

Upper Shenango River Subwatershed

The **Pymatuning/Hartstown Complex**, comprised of the Pymatuning Reservoir and surrounding wetlands, is the 3rd IBA designated in Pennsylvania. The actual components of the IBA include Pymatuning Reservoir, Pymatuning Wildlife Management Area, Pymatuning Wildlife Refuge (Sanctuary Lake), and PA State Game Lands #214-Hartstown Swamp (Pennsylvania Audubon Society 2004). The site meets a number of IBA criteria (Table 4-6).

Table 4-6. Criteria Met by the Pymatuning/Hartstown IBA

Category	Explanation of Criteria	How Criteria is Met
1a & b	The site regularly supports at least 2,000 waterfowl (at one time) during some part of the year	common goldeneye (FM, W-18,000 max), Canada goose (W, FM-10,000+), hooded merganser (W, FM-4,000 max), tundra swan (SM-500-2000), shorebirds (SM-400+)
2	The site supports a significant population of a species that is endangered or threatened	bald eagle (B-4+pair, W-10+), black tern (B-1+), American bittern (B-2+), least bittern (B-2+), king rail (poss. B)
3	A site of major importance, supporting a significant population of a species on the Pennsylvania "special concern" list, but not currently endangered or threatened	black-crowned night-heron (B), pied-billed grebe (B-2+pair), marsh wren (B-2+pair), prothonotary warbler (B-2+pair)
4a	The site contains a habitat type that is rare, threatened, or unusual within the state or region	very large, intact wetland complex supporting breeding species of Virginia rail, sora, common snipe, American wigeon, common moorhen, and others

Limited hunting is allowed in the Sanctuary Lake area, located near Linesville, Pennsylvania, as it is largely protected for shorebird and waterfowl habitat. Thousands of geese, ducks, and swans are found in fall and winter in Sanctuary Lake. Swampy areas near Hartstown support the state's largest population of prothonotary warblers, while open marshes contain the state's only nesting area for the black tern. Additionally, the IBA supports the state's largest concentration of nesting bald eagles (Pennsylvania Audubon Society 2004).

Threats to the site include the introduction of non-native species, the reduction of biotic diversity due to alteration of vegetation by carp populations, and flow regimes that are not consistent with habitat requirements for birds (such as lack of water drawdowns). Recommendations include conducting an engineering feasibility study to determine changes in water level that are most appropriate, and developing a management plan based on those findings (Pennsylvania Audubon Society 2004).

Middle Shenango River Subwatershed

The **Shenango Reservoir IBA** is a 3,500-acre area including PA State Game Lands #294, the Shenango River Lake and its 100-meter boundary, and adjacent wetlands and mudflat habitat. The lake is fed by Pymatuning Creek, which originates in Ohio, and Big Run. It empties into the Shenango River. Due to water drawdowns in late summer and autumn, mudflats are exposed to provide habitat for as many as 30 shorebird species. This IBA is regionally important for waterfowl during migration and in winter, with more than 30 species of shorebirds from July through October and American pipit flocks over 200 (PA Audubon Society 2004). It met several criteria to achieve its IBA designation (Table 4-7).

Threats to the IBA include the lack of water drawdowns to maintain suitable mudflat habitat in late summer and fall, and human disturbance. Continued education of the public and enforcement of regulations governing this area will help ensure the protection of bird life.

The **Barrows Heronry & Edward Brucker Sanctuary**, the 8th IBA in Pennsylvania, consists of two sites in Mercer County. The Barrows Heronry includes a 10-acre riparian woodland and swampy second-growth forest, including black cherry and sycamore. The Edward Brucker Great Blue Heron

Table 4-7. IBA Criteria Met by Shenango Reservoir IBA

Category	Explanation of Criteria	How Criteria is Met
1a & b	Supports at least 2,000 waterfowl (at one time) during part of the year (1a) and supports at least 100 shore birds (at one time) during part of the year (1b)	2,000+ waterfowl, 2,000+ shorebirds, including 250+ killdeer, 75+ lesser yellowlegs, 75+ semipalmated sandpipers, 50+ least sandpipers, 25+ semipalmated plover
2	Supports a significant population of endangered or threatened species	great egret(15+), bald eagle (6+), osprey

Sanctuary is a floodplain of Big Run Creek, containing a deciduous forest comprised largely of black oak, shagbark hickory, and sycamore. The 45-acre area is owned by Thiel College. Together, these two sites have historically housed the largest great blue heron colony in Pennsylvania, with an estimated 500 nests in the Barrows Sanctuary in 1998. However, the Brucker Sanctuary is currently abandoned due to suspected disturbance of nesting sites and current plans are to discontinue it as an IBA. Most of the herons have moved to the nearby Barrows site (Pennsylvania Audubon Society 2004). Nevertheless, the Brucker's site will continue to be protected by Thiel College and used as a research area for its Center for Watershed Studies.

Both of these sites are privately owned. Access is permitted in the Brucker Sanctuary, but only between September and January. The private landowners involved intend to protect the habitat.

Neshannock Creek/Big Run Subwatershed

The **Pennsy, Celery and Black Swamps IBA**, located partially within the watershed, is part of PA State Game Lands #284 (located within the watershed) and PA State Game Lands #151 (outside of the watershed). The portion inside the watershed includes a section known as Pennsy Swamp in Mercer County and Black Swamp in Lawrence County. This area includes high quality emergent wetlands supporting significant numbers of characteristic breeding species, such as pied-billed grebes, American coots, moorhen, sora, and marsh wren (Table 4-8). American bittern and least bitterns are also likely breeders in this IBA.

Threats to the IBA include development pressures from Grove City outlet mall, which is less than three miles from the swamp, and a theme park proposed on the north side. There is also water pollution potential from a nearby landfill, farmlands, and gravel strip mines adjacent to the property. Recommendations include the development of a stormwater management plan that considers the protection of the IBA, and regular monitoring of the site.

Species of Special Concern

PNHP is a partnership between WPC, PA DCNR, and The Nature Conservancy, to conduct inventories and collect data regarding Pennsylvania's native biological diversity. Plant and animal records and associated information are gathered from specimens in museums, universities, and other sources. Field surveys are then conducted to verify and search for these records. PNHP works in conjunction with the Pennsylvania Biological Survey (PABS), which determines the state rank of a particular species or community and makes recommendations regarding its protected status (endangered, threatened, etc.). PA DCNR, PGC, PA Fish and Boat Commission (PFBC), U.S. Fish and Wildlife Service (USFWS), and PABS then determine official status. In Ohio, the Division of Natural Areas and Preserves employs a similar process. The PNHP is part of a larger Natural Heritage Network, which uses

Table 4-8. Criteria Met by Pennsy, Celery, and Black Swamps IBA

Category	Explanation of Criteria	How Criteria is Met
2	The site supports a significant number of threatened or endangered species	king rail (poss. B-1+pair), American bittern (poss. B), least bittern (poss. B)
3	A site of major importance, supporting a significant population of a species on the PA "special concern" list, but not currently endangered or threatened	pied-billed grebe, American coot, marsh wren (B-6+pair)
4a & b	A habitat that is rare, threatened, or unusual within the state (4a), and an exceptional representation of a characteristic natural habitat within its physical province (4b)	Virginia rail (B), dora (B), moorhen (B), Virginia rail, dora (B), sandhill crane
5	A natural area where long-term avian research or monitoring is in progress	Pennsylvania Society for Ornithology-Special Areas Project (Bartramian Audubon Society)

state information to determine global status and, ultimately, national status under the Endangered Species Act. For each subwatershed, the biota of statewide and national concern that have been documented in that subwatershed are listed along with their current and recommended state status and global status (DCNR 2004c).

The Endangered Species Act of 1973, and subsequent amendments, provides broad protection for species of fish, wildlife, and plants that are listed as threatened or endangered in the United States or elsewhere. Provisions are made for listing species, as well as for recovery plans and the designation of critical habitat for listed species. As part of both federal and state acts, environmental assessments of properties for endangered species are often required before large-scale building and development projects are begun. However, rather than stopping development altogether, changes in design or timing of construction can often help protect habitat for these species.

Subsequent sections list state and federal threatened and endangered species in each subwatershed. It is possible that a species may be considered endangered in Ohio and not in Pennsylvania, and vice versa, because of the range of habitats available in that state. Pennsylvania and Ohio share similar habitats within the Shenango River watershed; however, outside of the watershed, the geologic topographic conditions vary between the states. For instance, the yellow-bellied sapsucker is found in both Ohio and Pennsylvania but is only considered endangered in Ohio. A species that has a federal ranking is one that is considered threatened or endangered on a national level, with only a small number of occurrences in the entire country. Additionally, there are species considered to be in decline or rare in either Ohio or Pennsylvania that are not yet considered endangered or threatened. These additional species may be found in Appendix H. In Pennsylvania and Ohio, a plant may be considered "rare" and not have achieved threatened or endangered status, due to its limit of range, restricted range, or special habitat. These species are also in Appendix H.



The showy lady's slipper is a Pennsylvania threatened orchid found in the Upper Shenango River subwatershed

An “endangered” species is one that is in danger of becoming extinct throughout its range. A “threatened” species is a species at risk of becoming endangered in the near future, unless action is taken to protect its habitat. A “candidate” species is one that, often through careful consideration and study by state or federal agencies, is a proposed endangered or threatened species at the state or local level.

Upper Shenango River Subwatershed

This subwatershed, characterized by the wetland areas surrounding the Pymatuning Reservoir, has an abundance of threatened and endangered species of concern (Table 4-9). These include species such as the eastern massasauga rattlesnake, a candidate for federal status that has been previously identified in the subwatershed. An example of a Pennsylvania endangered plant found within this watershed is swamp fly honeysuckle, found in wet woods and thicket areas and a victim of deer over-browsing and loss of habitat. Additional species may still be of concern because of recent declines or loss of habitat. These include the prothonotary warbler, a Pennsylvania watch list species experiencing decline because of alteration of the mangrove swamps where they winter (Pennsylvania Audubon Society 2004). In Pennsylvania, it nests in very few areas, mainly flooded bottomland forests of the Pymatuning area.

Table 4-9. Threatened and Endangered Species of the Upper Shenango Subwatershed

Scientific Name	Common Name	Federal Status	State Status
Fish and Mussels			
<i>Lepomis gulosus</i>	warmouth	not ranked	endangered-PA
<i>Minytrema melanops</i>	spotted sucker	not ranked	threatened-PA
<i>Phoxinus erythrogaster</i>	southern redbelly dace	not ranked	threatened-PA
Amphibians and Reptiles			
<i>Sistrurus catenatus catenatus</i>	eastern massasauga rattlesnake	candidate	endangered-PA
Birds			
<i>Chlidonias niger</i>	black tern	not ranked	endangered-PA
<i>Haliaeetus leucocephalus</i>	bald eagle	threatened, proposed delisting	endangered-PA
<i>Sphyrapicus varius</i>	yellow-bellied sapsucker	not ranked	endangered-OH
Plants			
<i>Botrychium multifidum</i>	leathery grape fern	not ranked	threatened-OH
<i>Carex alata</i>	broad-winged sedge	not ranked	threatened-PA
<i>Carex bebbii</i>	Bebb's sedge	not ranked	threatened-PA
<i>Carex diandra</i>	lesser panicled sedge	not ranked	threatened-PA
<i>Carex louisianica</i>	Louisiana sedge	not ranked	endangered-OH
<i>Carex mitchelliana</i>	Mitchell's sedge	not ranked	endangered-PA
<i>Carex prairea</i>	prairie sedge	not ranked	threatened-PA
<i>Carex projecta</i>	necklace sedge	not ranked	threatened-OH

Table 4-9 . Threatened and Endangered Species in the Upper Shenango Watershed (Continued)

Scientific Name	Common Name	Federal Status	State Status
Plants			
<i>Carex pseudocyperus</i>	cyperus-like sedge	not ranked	endangered-PA
<i>Cornus canadensis</i>	bunchberry	not ranked	threatened-OH
<i>Cypripedium calceolus</i> var. <i>parviflorum</i>	small yellow lady's slipper	not ranked	endangered-PA
<i>Cypripedium reginae</i>	showy lady's slipper	not ranked	threatened-PA
<i>Dryopteris clintoniana</i>	Clinton's wood fern	not ranked	endangered-OH
<i>Epilobium strictum</i>	downy willow-herb	not ranked	endangered-PA
<i>Equisetum sylvaticum</i>	woodland horsetail	not ranked	threatened-OH
<i>Hypericum majus</i>	tall St. John's wort	not ranked	pot. threatened-OH
<i>Lonicera oblongifolia</i>	swamp fly honeysuckle	not ranked	endangered-PA
<i>Myriophyllum sibiricum</i>	American water-milfoil	not ranked	threatened-OH
<i>Myriophyllum verticillatum</i>	whorled water-milfoil	not ranked	endangered-PA
<i>Nelumbo lutea</i>	American lotus	not ranked	endangered-PA
<i>Oxalis montana</i>	white wood-sorrel	not ranked	extirpated-OH
<i>Poa paludigena</i>	bog bluegrass	not ranked	threatened-PA
<i>Polygonum setaceum</i> var. <i>interjectum</i>	a swamp smartweed	not ranked	endangered-PA
<i>Ribes triste</i>	red currant	not ranked	threatened-PA
<i>Salix serissima</i>	autumn willow	not ranked	threatened-PA
<i>Streptopus roseus</i>	rose-twisted stalk	not ranked	endangered-OH
<i>Trillium undulatum</i>	painted trillium	not ranked	endangered-OH

Middle Shenango River Subwatershed

The Middle Shenango River subwatershed is home to many listed plants and animals, including seven Pennsylvania endangered or recommended endangered species of mussels (Table 4-10). Mussels feed on organic particles and minute plants and animals. The clubshell and northern riffleshell, once widely distributed in the United States, are federally endangered species. Impoundments, channelization, non-point source pollution, municipal discharges, and destruction of riparian habitat have been attributed to its decline (USFWS 2004).

Endangered plants in Ohio include species such as Hill's pondweed and small purple-fringed orchid. Hill's pondweed, a submerged flowering plant, is notorious for its susceptibility to pollution, and within the state has only been found in Ashtabula County (ODNR). Small purple-fringed orchid is a beautiful wildflower found in wet, boggy areas and possibly no longer exists in Ohio due to loss of habitat (ODNR). A number of additional species of concern and candidates for endangered status from the Middle Shenango River subwatershed are listed in Appendix H. This list includes species such as the horny-head chub, named for the horn-like protrusions of breeding males. It is found in smaller streams and is less tolerant to pollution than the more common creek chub.

Table 4-10. Threatened and Endangered Species in the Middle Shenango Subwatershed

Scientific Name	Common Name	Federal Status	State Status
Birds			
<i>Haliaeetus leucocephalus</i>	bald eagle	threatened in some of its range; proposed delisting	endangered-PA; threatened-OH
Odonates			
<i>Somatochlora walshii</i>	brush-tipped emerald	not ranked	endangered-OH
Fish and Mussels			
<i>Amblema plicata</i>	three-ridge	not ranked	recommended -PA
<i>Epioblasma torulosa rangiana</i>	northern riffleshell	endangered	endangered-PA
<i>Epioblasma triquetra</i>	snuffbox	pot. candidate	recommended -PA
<i>Fusconaia subrotunda</i>	long-solid	not ranked	recommended -PA
<i>Lasmigona compressa</i>	creek heelsplitter	not ranked	recommended -PA
<i>Lepomis gulosus</i>	warmouth	not ranked	endangered-PA
<i>Noturus miurus</i>	brindled madtom	not ranked	threatened-PA
<i>Obovaria subrotunda</i>	round hickorynut	not ranked	recommended -PA
<i>Pleurobema clava</i>	clubshell	not ranked	endangered-PA
<i>Pleurobema sintoxia</i>	round pigtoe	not ranked	recommended -PA
<i>Quadrula cylindrica</i>	rabbitsfoot	not ranked	recommended -PA
<i>Strophitus undulatus</i>	creeper	not ranked	recommended -PA
<i>Tritogonia verrucosa</i>	pistolgrip	not ranked	recommended -PA
Plants			
<i>Callitriche verna</i>	vernal water-starwort	not ranked	threatened-OH
<i>Carex oligosperma</i>	few-seeded sedge	not ranked	threatened-PA
<i>Clintonia borealis</i>	bluebead-lily	not ranked	endangered-OH
<i>Elymus trachycaulus</i>	bearded wheat grass	not ranked	threatened-OH
<i>Epilobium strictum</i>	simple willow-herb	not ranked	threatened-OH
<i>Equisetum sylvaticum</i>	woodland horsetail	not ranked	threatened-OH
<i>Platanthera psychodes</i>	small purple fringed orchid	not ranked	endangered-OH
<i>Polygonum staceum var. interjectum</i>	bristly smartweed	not ranked	endangered-OH
<i>Potamogeton hillii</i>	Hill's pondweed	not ranked	endangered-OH
<i>Spiranthes romanzoffiana</i>	hooded ladies' tresses	not ranked	threatened-OH
<i>Trollius laxus</i>	spreading globeflower	not ranked	endangered-OH
<i>Viburnum opulus var. americana</i>	highbush cranberry	not ranked	endangered-OH
<i>Viola primulifolia</i>	primrose-leaved violet	not ranked	endangered-OH

Lower Shenango River Subwatershed

The Ohio portion of the Lower Shenango River subwatershed supports two species of state threatened plants (ODNR), including the speckled wood-lily. The speckled wood-lily is most commonly found in wetter, lowland woodlands and slightly acidic soils and only remains in several Ohio counties.

The speckled wood-lily was an Ohio endangered species in the 1980s and has since been lowered to threatened status. It prefers sandy wetlands and is relatively tolerant of disturbed areas.

Though not yet ranked, four listed mussel species are recommended for inclusion on the Pennsylvania endangered list by PABS. All four are considered extremely rare in Pennsylvania and vulnerable to habitat changes, with five or fewer occurrences or very few individuals remaining in the commonwealth (PNHP). All four of the species prefer medium- to large-sized rivers. Research has shown that mussels are one of the most vulnerable aquatic taxa to pollution, particularly nutrients, metals, and sedimentation. The snuffbox is one of the most susceptible of the four species found in the subwatershed, preferring clear, gravel riffles (Cummings, et al. 1992). Table 4-11 describes threatened and endangered species in the Lower Shenango River subwatershed.

Table 4-11. Threatened and Endangered Species in the Lower Shenango River Subwatershed

Scientific Name	Common Name	Federal Status	State Status
Plants			
<i>Carex abolutescens</i>	pale straw sedge	not ranked	threatened-OH
<i>Clintonia umbellulata</i>	speckled wood-lily	not ranked	threatened-OH
Mussels			
<i>Epioblasma triquetra</i>	snuffbox	not ranked	recommended endangered-PA
<i>Fusconaia subrotunda</i>	long-solid	not ranked	recommended endangered-PA
<i>Obovaria subrotunda</i>	round hickorynut	not ranked	recommended endangered-PA
<i>Tritogonia verrucosa</i>	pistolgrip mussel	not ranked	recommended endangered-PA

Neshannock Creek/Big Run Subwatershed

The majority of threatened and endangered species in this subwatershed are wetland plants, such as sedges and rushes, which are grass-like emergent plants that grow at the edges of marshes and fens (Table 4-12). They also include wild hyacinth, a beautiful blue flowering plant of the lily family that is currently recommended for Pennsylvania endangered status. Other species of concern that have not yet reached threatened or endangered status (Appendix H) include duckweeds, which are tiny green flowering plants that do not have roots but float at the surface in slow-moving waters. The marsh wren, recommended for Pennsylvania threatened status, nests in very few places in the state, preferring wetland areas with dense emergent vegetation and nesting in cattails and rushes such as some of those in the Neshannock Creek/Big Run subwatershed (Zimmerman, et al. 2002).

Table 4-12. Threatened and Endangered Species of the Neshannock Creek/Big Run Subwatershed

Scientific Name	Common Name	Federal Status	State Status
Birds			
<i>Ixobrychus exilis</i>	least bittern	not ranked	endangered-PA
<i>Rallus elegans</i>	king rail	not ranked	endangered-PA
<i>Cistothorus palustris</i>	marsh wren	not ranked	recommended-PA
Bats			
<i>Myotis septentrionalis</i>	northern myotis	not ranked	recommended-PA

**Table 4-12. Threatened and Endangered Species of the Neshannock Creek/Big Run Subwatershed
(continued)**

Scientific Name	Common Name	Federal Status	State Status
Fish			
<i>Ichthyomyzon greeleyi</i>	mountain brook lamprey	not ranked	threatened-PA
<i>Lepomis gulosus</i>	warmouth	not ranked	endangered-PA
<i>Lythrurus umbratilis</i>	redfin shiner	not ranked	endangered-PA
Plants			
<i>Alisma triviale</i>	broad-leaved water plantain	not ranked	endangered-PA
<i>Camassia scilloides</i>	wild hyacinth	not ranked	threatened-PA
<i>Carex alata</i>	broad-winged sedge	not ranked	threatened-PA
<i>Carex prairea</i>	prairie sedge	not ranked	threatened-PA
<i>Carex sterilis</i>	sterile sedge	not ranked	threatened-PA
<i>Carex tetanica</i>	a sedge	not ranked	threatened-PA
<i>Eleocharis elliptica</i>	slender spike-rush	not ranked	endangered-PA
<i>Eleocharis intermedia</i>	matted spike rush	not ranked	threatened-PA
<i>Eleocharis rostellata</i>	beaked spike rush	not ranked	endangered-PA
<i>Hierochloa hirta ssp. Arctica</i>	common northern sweet grass	not ranked	recommended-PA
<i>Oxyopolis rigidior</i>	stiff cowbane	not ranked	recommended-PA
<i>Parnassia glauca</i>	Carolina grass-of-parnassus	not ranked	endangered-PA
<i>Pedicularis lanceolata</i>	swamp lousewort	not ranked	recommended-PA
<i>Poa paludigena</i>	bog bluegrass	not ranked	threatened-PA
<i>Salix serissima</i>	autumn willow	not ranked	threatened-PA
<i>Swertia caroliniensis</i>	American columbo	not ranked	threatened-PA
<i>Symphyotrichum firmum</i>	firm aster	not ranked	recommended-PA
<i>Viburnum trilobum</i>	hibusbush-cranberry	not ranked	recommended-PA
Other			
<i>Sistrurus catenatus catenatus</i>	eastern massasauga rattlesnake	candidate	endangered-PA

Management Recommendations

Wildlife and Biodiversity

- Develop areas for wildlife viewing and education to raise awareness about the high biodiversity within the watershed.
- Develop stronger partnerships between organizations to discuss the threats to natural resources and develop protection strategies; this may include regular meetings with numerous conservation groups.
- Educate citizens about biological diversity and the vital importance of habitats in protecting species.
- Improve aquatic life habitat for fish, mussels, and other organisms by implementing BMPs and other restoration activities.
- Monitor aquatic and terrestrial trends in biodiversity.

Important Habitat Areas

- Continue to make the Shenango River upstream and downstream of Kidd's Mills Bridge a priority for restoration and protection through BMP programs, reduction of road runoff, and establishment of better flow regimes.
- Develop a program or means through which landowners can obtain conservation easements for biologically diverse areas on their properties.
- Develop an incentive program to encourage and reward landowners who develop management plans, decrease development, and employ other conservation practices in and around riparian corridors and biologically diverse areas.
- Establish more private backyard conservation areas to serve as wildlife habitat and travel corridors by providing activities and programs for landowners.
- Identify and protect additional environmentally sensitive areas and areas of high biodiversity.
- Increase habitat and passage for fish, mussels, and other aquatic organisms by removing dams on small tributaries and maintaining stable flow regimes downstream from Pymatuning and Shenango Reservoirs.
- Maintain old fields in state, county, and public parks for grassland species through practices such as controlled burns and limited mowing activity.
- Modify municipal ordinances to protect wetland areas of biological importance, such as Pennsy, Celery, and Black Swamp Important Bird Areas.
- Preserve natural habitats using smart land-use planning strategies that set aside open space for wildlife corridors.
- Protect wetland habitats for birds and wildlife by limiting development, storm runoff, and other disturbances in wetland areas and buffers surrounding them.

Deer Management

- Promote and support deer management strategies such as special hunting tags and deer enclosures in natural areas.
- Sponsor outreach programs about deer management strategies and practices for private landowners.

Riparian Areas

- Encourage streamside property owners to leave a minimum 15-foot buffer from the edge of the stream when mowing their lawn.
- Increase habitat by planting riparian buffers or allowing them to grow back through streambank fencing programs.
- Promote the preservation of riparian areas through education about their benefits for wildlife, flood prevention, and groundwater supplies.

County Natural Heritage Inventories

- Develop a land steward program for Biological Diversity Areas through which volunteers would be responsible for regular monitoring of these areas and educating landowners.
- Develop more detailed management plans by working with landowners of biologically diverse areas, including inventories of natural features and invasive or exotic species monitoring plans for the properties.
- Educate the public about the use and purpose of County Natural Heritage Inventories in planning, with an additional focus on understanding the importance of the natural resources that exist.
- Incorporate County Natural Heritage Inventories into municipal plans.
- Study and expand areas to be included in natural heritage inventories as Biological Diversity Areas.

Rare, Threatened, or Endangered Species

- Develop monitoring strategies and management plans for species of concern that are particularly vulnerable to habitat destruction by working with the Pennsylvania Natural Heritage Program.
- Protect habitats that support threatened and endangered species and species of concern through acquisition, easements, and/or landowner education.

Invasive Species

- Compile an Internet database of exotic and invasive species sightings within the watershed that can be accessed and added to by the public.
- Conduct a watershed-wide invasive species plant survey by subwatershed to develop a list of areas where invasive species pose the greatest threats to biodiversity.
- Develop an eradication strategy for removing invasive species, especially from high-quality areas or areas where an invasive species is expanding its territory.
- Develop monitoring plans for invasive species on private properties by working with landowners, especially those whose properties contain high-quality natural communities.

Native and Sensitive Plants

- Encourage the use of native plants in landscaping and wildlife habitat plantings.
- Promote native tree plantings in streambank fencing projects.

Other

- Provide educational programs for municipal officials about land-use planning that incorporates conservation goals to make communities more attractive and protects biodiversity.

CHAPTER 5. CULTURAL RESOURCES

Recreation

The Shenango River watershed is fortunate to have numerous recreational amenities. Several State Game Lands and one State Park exist in the watershed. Hiking, bicycling, boating, fishing, camping, golfing, bird watching, hunting, and off-road vehicle (ORV) riding are common recreational activities.

Recreational Facilities

Parks

Various municipal and community parks exist within the watershed, and some are included in Figures 5-1, 5-2, 5-3, and 5-4, and Appendix J. The watershed contains two large parks: Pymatuning State Park and Shenango River Lake Park.

Pymatuning State Park, the largest operational park in the Pennsylvania State Park system, is located in Crawford County, Pennsylvania and Ashtabula County, Ohio and encompasses 21,122 acres. The reservoir is 17,088 acres and approximately 17 miles long. A large number of recreational activities are available at the park, including camping, boating, swimming, fishing, picnicking, hiking, hunting, and sightseeing. A wide variety of winter activities are also available.

One of the top tourist attractions in Pennsylvania is the spillway at the park. The outflow of a secondary impoundment at the reservoir, the spillway serves as fish propagation waters and a wildlife sanctuary comprising 2,500 acres. The spillway is home to numerous carp and waterfowl, giving the park its notable reputation as “the place where the ducks walk on the backs of fish.”



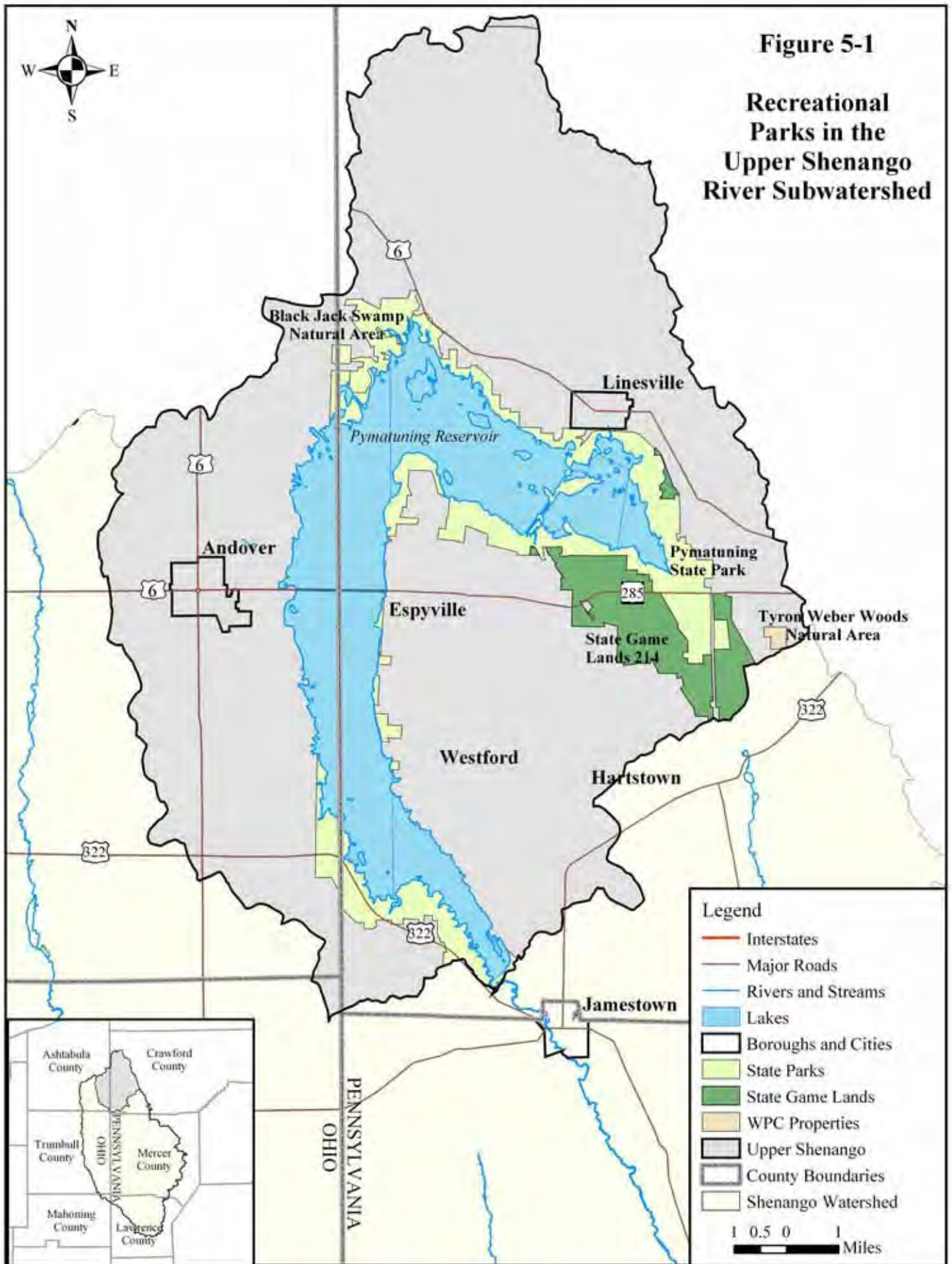
Gatehouse at Pymatuning Lake

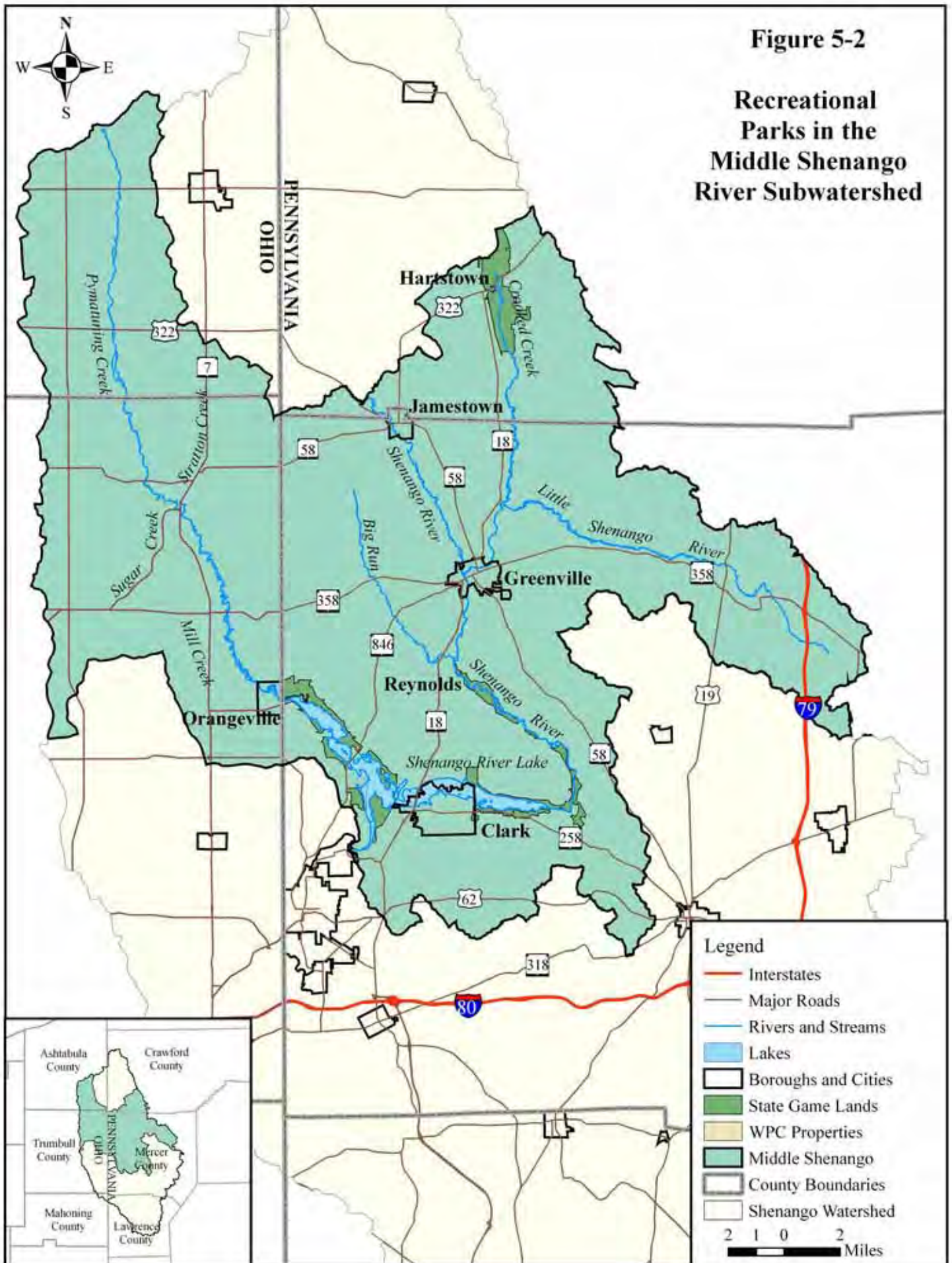
The gatehouse, the only historic structure at the park, was constructed in the early 1930s. Located a short distance north of the dam, the gatehouse rises above the lake surface. It was designed to house the drainage gates in the Pymatuning Reservoir. The tower is connected to the dam by an arched stone bridge ending in a small entrance known as the guardhouse.

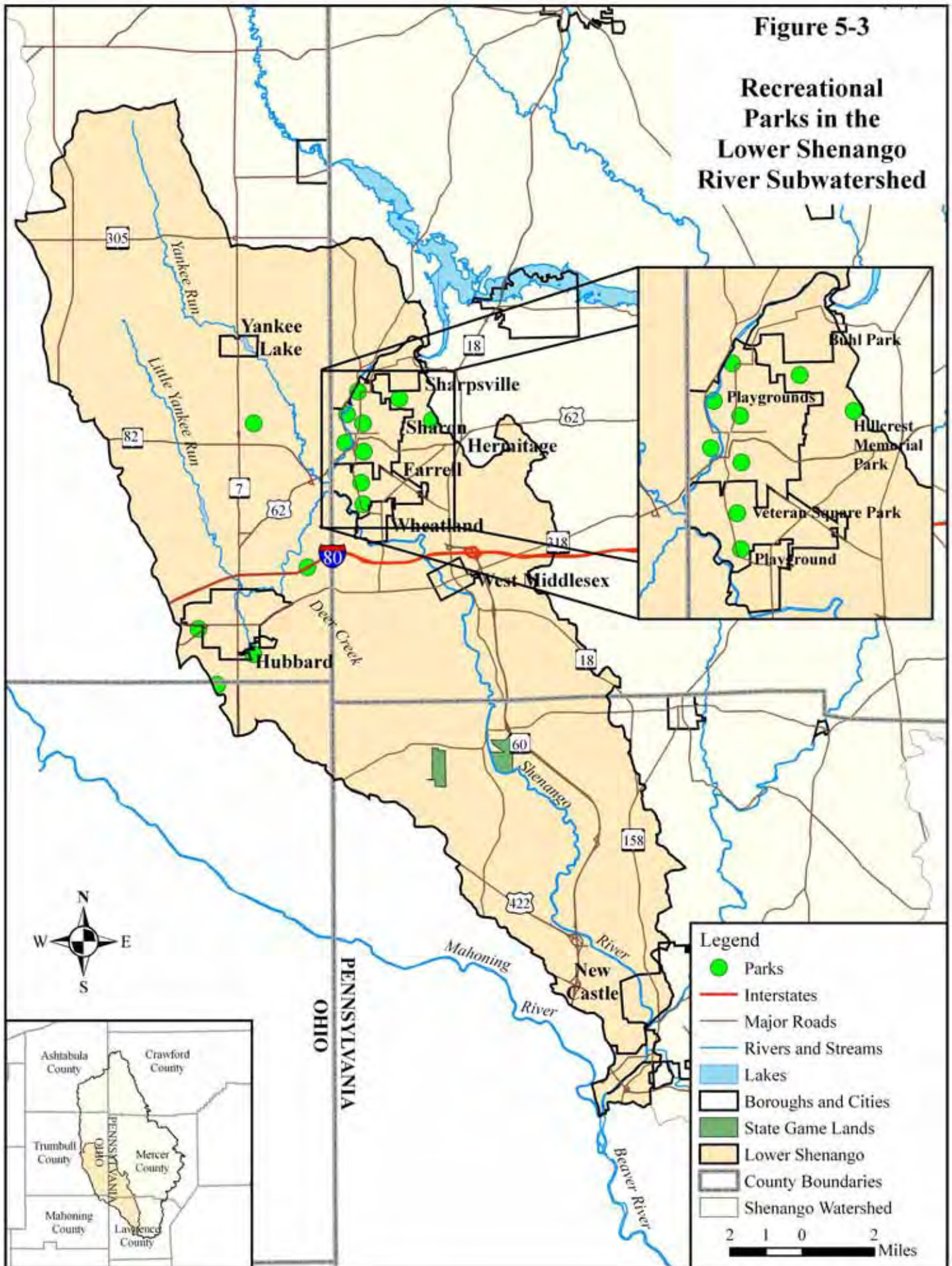
Shenango River Lake encompasses 15,071 acres located in Mercer County, Pennsylvania and Trumbull County, Ohio. It is owned by the federal government and operated by the United States Army Corps of Engineers (USACE). Five recreation areas offer a variety of opportunities (Table 5-1). Three sites offer access to the 3,560-acre reservoir, with no horsepower restrictions. A dam, hunting area (handicapped accessible), wildlife area, hiking trail, and an ORV area are incorporated into the park. The park also offers the historic remnants of Kidd’s Mills Covered Bridge and the old Erie Canal stone lock.

Trails

A link between communities, trails provide alternative transportation, recreation, and educational opportunities. Trails are used for a variety of activities including hiking, bicycling, cultural and historic cultivation, and environmental education.







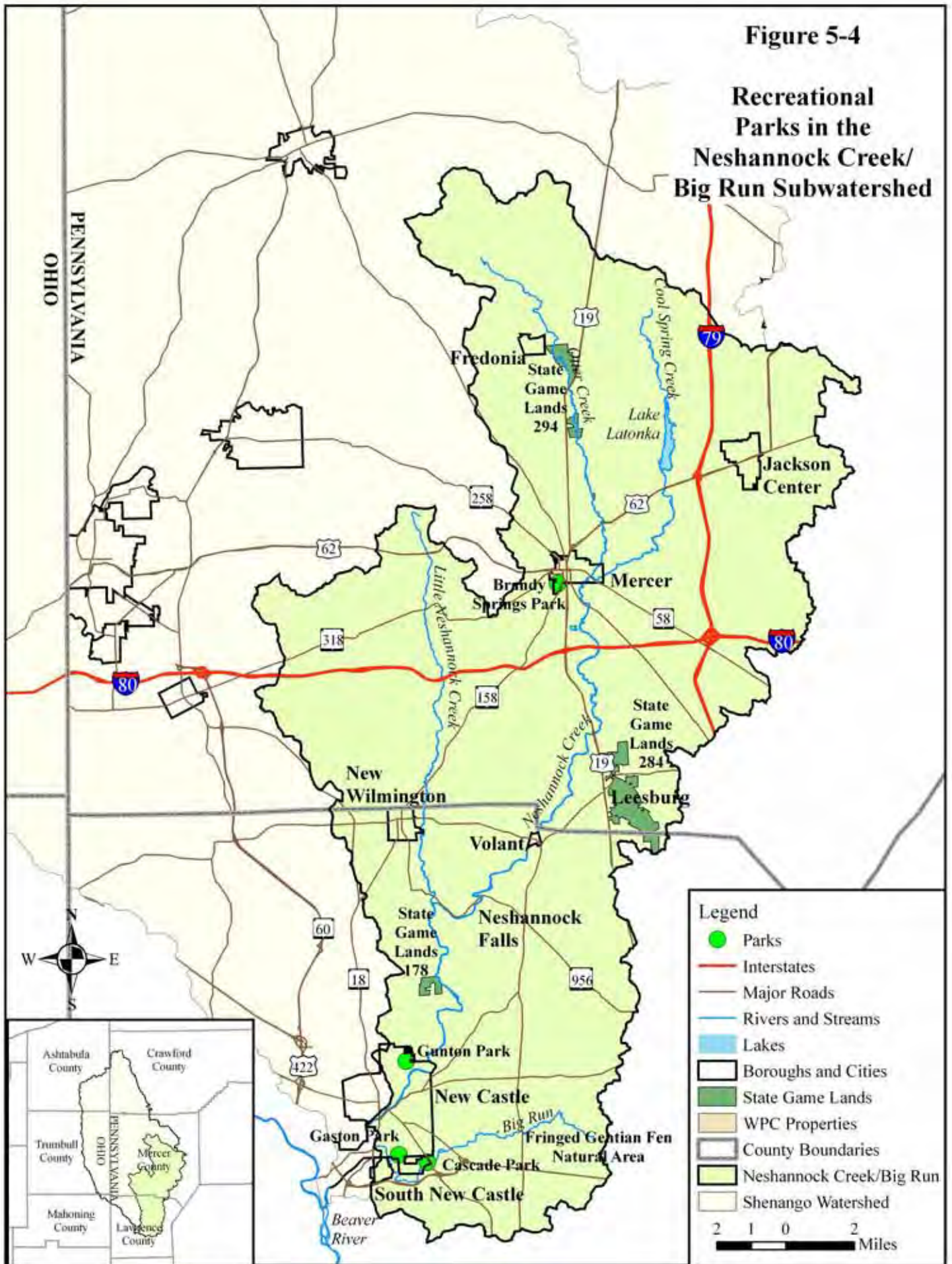


Table 5-1. Shenango River Lake Recreational Opportunities Operated by USACE

Shenango River Lake	Amenities
Shenango Dam Area	Drinking water, fishing, grills, visitor center, parking, pets, picnic area, picnic shelters, playgrounds, restrooms, trails, water safety programs
Mahoney Recreation Area	Drinking water, fishing, grills, boat launch, pets, picnic area, picnic shelters, playgrounds, restrooms, trails, parking
Hartford Road Access Area	Fishing, boat launch, parking
Parkers Landing Access Area	Fishing, boat launch, parking
Route 846 Access Area	Fishing, parking
Shenango Recreation Area	Amphitheater, campground, educational programs, drinking water, fishing, grills, boat launch, parking, pets, picnic areas, picnic shelters, playgrounds, restrooms, store, and trail (there is a fee for some amenities)
Mercer Recreation Area	Camping, drinking water, parking, pets, playgrounds, restrooms, swimming (there is a fee for some amenities)
Golden Run Wildlife Area	Fishing, hunting, boat launch, parking
Clark Recreation Area	Drinking water, fishing, grills, visitor center, boat launch, parking, pets, picnic areas, restrooms
Bayview ORV Area	Parking
Route 846 Hunting Area	Handicapped accessible hunting, parking
Chestnut Run Swim Beach	Drinking water, grills, parking, picnic areas, picnic shelters, playground, restrooms, trails, swimming (there is a fee for some amenities)
Commercial Marina	Boat rentals, drinking water, boat launch, parking area, pets, picnic areas, picnic shelters, restrooms, snack bar, store (there is a fee for some amenities)
YMCA Camp Shenango	Campground, educational programs, drinking water, parking, pets, picnic areas, restrooms, swimming (there is a fee for some amenities)
Old Erie Canal Stone Lock	Fishing, parking, picnic areas
Kidd's Mills Covered Bridge	Fishing, grills, canoe launch, parking, picnic areas, restrooms, trails

Converting abandoned and unused rail corridors into public trails began in the 1960s. Once rail lines were removed, people began utilizing the corridors to walk, socialize, and explore. In 1965, a movement promoting conservation ethics and healthy lifestyles led to the development of the Rails-to-Trails program.

The Shenango River watershed has a variety of trails and trail types (Table 5-2). Located at the Shenango River Lake, one trail is designated for the use of ORVs. The Bayview ORV area offers nine miles of trails for ORV enthusiasts. Other trails for hiking, mountain biking, and snowmobiling are located at Pymatuning State Park.

The Shenango Trail travels seven and a half miles along the former Erie Extension Canal route parallel to the Shenango River. It is possible to see remnants of the canal and view scenic vistas of the Shenango River from the trail.

Existing trails could be expanded and new trails developed to connect additional communities. There are approximately 232 miles of abandoned rail line corridors not being utilized within the

Shenango River watershed. Converting some of these abandoned rail lines into multi-use trails could provide additional recreational opportunities.

Table 5-2. Recreational Trails

	Trail	Miles	Location
Pymatuning State Park	Tamarack Trail	1	This hiking trail is a boardwalk path connecting the Jamestown cabin area within the Pymatuning State Park. Parking and access are located along West Lake Road.
	Spillway Trail	2	Pymatuning Reservoir and the Linesville fish hatchery are visible along this trail. Located on an abandoned railway, from Fries Road to Linesville Road, the Spillway Trail is ideal for hiking and mountain biking. Parking and access are available at either end.
Others	Visitors Center Nature Trail	0.25	The trail follows the shoreline with scattered viewing stations along the way. Parking and access are available at the Wildlife Learning Center. The trail is paved, making it ideal for ADA accessibility.
	Bike Route Y	41.7	The route travels through Crawford County and the Shenango River watershed in Hartstown, Linesville, and Espyville.
	Erie Extension Canal Towpath Trail	4	Graced by many scenic vistas, this grass-surfaced hiking trail travels along wetlands, meadows, and even beaver dams. Access and parking are available along Route 285.
	Pennsylvania Route 6 Trail		A scenic trip traveling Route 6 crossing Pennsylvania from Pike County in eastern Pennsylvania to Erie and Crawford counties in western Pennsylvania. Pymatuning State Park is along the way.
	Shenango Trail	7.5	This trail follows the Shenango River from the Kidd's Mills Covered Bridge to the Big Bend Access Area before the Shenango Reservoir.
Shenango River Lake	Bayview ORV Area	9	The only public ORV trail in the watershed.
	Seth Myers Trail	0.5	A self-guided interpretive natural trail located at the Mahoney Recreation Area.
	Coonie Trail	0.5	A self-guided interpretive natural trail located at the Shenango Recreation Area.

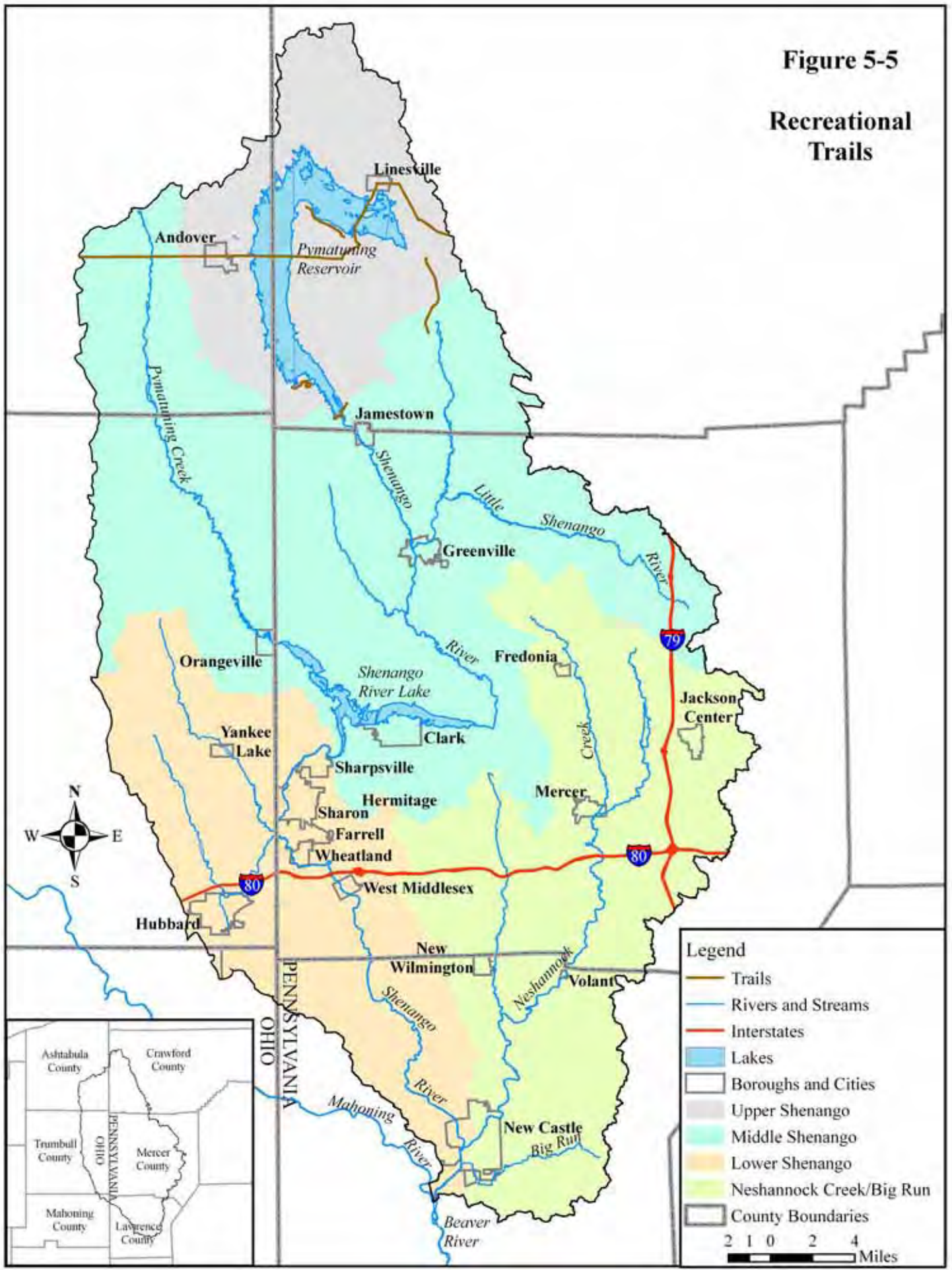
Recreational Opportunities

Hunting

Five State Game Lands, and one Wildlife Area (Table 5-3) exist within the watershed, but no State Forests. In addition, there are 235,276 acres of farmland open to hunting through cooperative farmland and safety zone programs in Mercer, Lawrence, and Crawford counties. Hunting is also permitted on private land, with landowner permission.

In 1936, the Cooperative Farmland Program was established to protect farmland property from acts of vandalism and to increase hunting opportunities. It provides landowners with advice and incentives to conserve soil, increase wildlife habitats, and incorporate other profitable practices. There are two programs: the safety zone program and the farmland program. The safety zone program involves individual landowners, with a minimum of 50 acres, opening their land for public hunting. The farmland program is several safety zone locations blocked together. Having property in the farmland program

Figure 5-5
Recreational Trails



provides better incentives for the landowners. In Mercer, Lawrence, and Crawford counties, there are 404 safety zones. There are also 13 areas, involving 2,006 landowners, enrolled in the farmland program.

Table 5-3. State Game Lands and Wildlife Areas

Hunting Lands	Acres	Location	Subwatershed
State Game Land #214	5,399	Hartstown, Crawford County	Upper Shenango River
State Game Land #150	505	Deer Creek, Lawrence County	Lower Shenango River
State Game Land #178	164	Neshannock Creek, Lawrence County	Neshannock Creek /Big Run
State Game Land #284	1,373	Leesburg, Mercer County	Neshannock Creek /Big Run
State Game Land #294	417	Otter Creek, Mercer County	Neshannock Creek /Big Run
Shenango Wildlife Area	4,845	Trumbull County	Middle Shenango River

Fishing

The Shenango River watershed provides ample fishing opportunities for a variety of species. The Shenango River is designated as a Warm Water Fishery in Pennsylvania, except for a one-mile section below the dam at the Shenango Reservoir, which is designated as a Trout-Stocked Fishery.



Trout caught at the Sharpsville Area Recreation Park along the Shenango River

Little Shenango River, Lackawannock Creek, and Neshannock Creek--tributaries to the Shenango River--are designated as Trout-Stocked Fisheries. Unnamed tributaries entering Shenango below the Shenango Reservoir Dam to river mile one are designated as Cold Water Fisheries.

Within the Shenango River watershed, the two reservoirs provide excellent fishing opportunities for anglers. Common species caught at the Shenango River Lake include bass, walleye, muskellunge, and pan fish. The outfall area from the dam is an excellent place for catching trout and warm-water sport fish. Fishing at the Pymatuning Reservoir by boat can be done with a valid Pennsylvania or Ohio license and proper boat registration. Fishing from shore requires the appropriate state fishing license. Common species found at the Pymatuning Reservoir include crappie, carp, muskellunge, walleye, bass, perch, and bluegill.

Several trout-approved waters exist in the watershed. In the Neshannock Creek/Big Run subwatershed, Big Run, Neshannock Creek, West Branch of Neshannock Creek, and Cool Spring Creek, including its tributaries of Yellow Creek and Mill Creek, are trout-approved waters. The Little Shenango River and the Shenango River, from the tailrace of the dam to the Walnut Street Bridge, are trout-approved waterways in the Middle Shenango watershed. The only trout-approved water in the Lower Shenango subwatershed is Deer Creek.

There are two areas open for delayed harvest using artificial lures: Neshannock Creek, 2.7 miles from the base of the Mill Dam in Volant downstream to the covered bridge; and Cool Spring Creek, 1.25 miles from State Route 2014 bridge upstream to the abandoned railroad grade.

Boating

There are ample opportunities for boating within the watershed. Marinas, mooring locations, and launches throughout the watershed provide access to streams and reservoirs.

In the Upper Shenango subwatershed, the Pymatuning Reservoir is open to motorized and non-motorized watercraft. The reservoir has two marinas, nine boat launches, and 20 mooring locations. Motorized watercraft are limited to a maximum of 10 horsepower in the reservoir. Discussions are being held to potentially increase the horsepower limit in the lake. Cooperation between Ohio Department of Natural Resources and Pennsylvania Department of Conservation and Natural Resources (PA DCNR) would be needed before a change could occur.

The Shenango River Lake, located in the Middle Shenango River subwatershed, is open to non-motorized and motorized watercraft. Seven boat launches, one canoe launch site, and one marina provide access to the lake with areas designated for unlimited horsepower, as well as areas designated for 10 horsepower motors and minimum wake zones.

Lake Latonka, located in the Neshannock Creek/Big Run subwatershed, is a private community. The lake is privately owned and is only open to community residents.

Several stream miles are accessible by small watercraft on the Shenango River and some of its tributaries. Navigable sections include portions of the Shenango River, Little Shenango River, Crooked Creek, and Neshannock Creek.

Camping

Fourteen campgrounds exist within the watershed in Mercer, Crawford, and Ashtabula counties. Within the Upper Shenango subwatershed there are seven campgrounds: three in Linesville, Pennsylvania, three at Pymatuning State Park, and one near Andover, Ohio. Three campgrounds are located in the Middle Shenango subwatershed in Greenville, Jamestown, and at the Shenango River Lake near Clark. There are no public camping facilities in the Lower Shenango River subwatershed, and four campgrounds in the Neshannock Creek/Big Run subwatershed in Mercer.



Camping at Pymatuning State Park

Table 5-4. Camping Facilities

Campground	Location	County	Subwatershed
Pymatuning Lake's Holiday Camplands	Andover	Ashtabula	Upper Shenango River
Jamestown Campground	Pymatuning State Park	Crawford	Upper Shenango River
Linesville Campground	Pymatuning State Park	Crawford	Upper Shenango River
Tuttle Campground	Pymatuning State Park	Crawford	Upper Shenango River
End of the Road Campground	Linesville	Crawford	Upper Shenango River
Mallards Landing Family Campground	Linesville	Crawford	Upper Shenango River
Pine View Camplands	Linesville	Crawford	Upper Shenango River
Shenango River Lake	Clark	Mercer	Middle Shenango River
Farma Travel Trailer Park	Greenville	Mercer	Middle Shenango River
Shangri-La by the Lake Campground	Jamestown	Mercer	Middle Shenango River
Junction 19-80 Campground	Mercer	Mercer	Lower Shenango River
Mercer/Grove City KOA	Mercer	Mercer	Lower Shenango River
Plantation Park Campers Association	Mercer	Mercer	Lower Shenango River
Rocky Springs Campground	Mercer	Mercer	Lower Shenango River

Off-Road Vehicles

The use of ORVs is a popular recreation activity for many residents and visitors to the watershed. The improper and illegal use by some riders has given ORVs a bad reputation. One designated public ORV facility, the Bayview ORV Area, is located at the Shenango River Lake. Nine miles of trails are available for riders here.

PA DCNR, along with the commonwealth of Pennsylvania, is working to regulate the use of ORVs. In 1985, Chapter 77 of the Pennsylvania Vehicle Law was established to regulate ORVs (PA DCNR 2002). In 2001, Act 68 modified the law requiring owners and operators to register their vehicles (PA DCNR 2002). Fees collected for the registration of ORVs are being used to develop and maintain trails on public lands, encourage trail development on private lands, teach safety, and enforce the law.

Efforts need to be taken to educate riders to recreate in an environmentally sound manner. The establishment of additional environmentally sound public trails or parks for ORVs is needed. Establishing additional locations would continue to reduce the liability and damage occurring on private property.

Golfing

There are 22 golf courses within the Shenango River watershed (Table 5-5). The Buhl Farm Golf Course and Driving Range is believed to be the world's only free golf course. This nine-hole course is located at the Buhl Farm Park in Hermitage. Golf courses in the watershed are located in Crawford, Mercer, Lawrence, Trumbull, and Mahoning counties.

Table 5-5. Golf Courses

Golf Course	Location	Description
Greenville Country Club	Greenville, PA	18-hole private course
Birchwood Golf Course	Transfer, PA	18-hole public course
Borland Golf Center	New Wilmington, PA	18-hole public course
Bronzewood Golf Course	Andover, OH	18-hole public course
Buhl Farm Driving Range and Golf Course	Hermitage, PA	9-hole public course
Castle Hills Golf Course	New Castle, PA	18-hole public course
Tanglewood Golf Course	Pulaski, PA	18-hole public course
Deer Creek	Hubbard, OH	18-hole public course
Donnybrook	Hubbard, OH	9-hole public course
Green Meadows Golf Course	Volant, PA	18-hole public course
Hartstown Golf Course	Hartstown, PA	9-hole public course
Hickory VFW Public Golf Course	Hermitage, PA	18-hole public course
Mercer Public Golf Course	Mercer, PA	18-hole public course
Oak Tree Country Club	West Middlesex, PA	18-hole private course
Pine Hill	Greenville, PA	18-hole public course
Pine Lakes	Hubbard, OH	18-hole public course
Pleasant Acre	Jamestown, PA	18-hole public course
Rolling Hills	Pulaski, PA	18-hole public course
Sharon Country Club	Hermitage, PA	18-hole private course
Spring Valley Golf Club	Mercer, PA	18-hole public course
Tam O'Shanter of PA	Hermitage, PA	18-hole public course
Walnut Creek Golf Course	Jamestown, PA	9-hole public course
Yankee Run	Brookfield, OH	18-hole public course

Other Recreational Opportunities

The **Linesville Fish Hatchery**, operated by the Pennsylvania Fish and Boat Commission (PFBC), is responsible for stocking about five million adult trout and salmon, and 90 million walleye fry and fingerlings each year. Northern pike, walleye, muskellunge, steelhead, paddlefish, brown trout, Coho salmon, largemouth bass, and minnows are some of the species raised at the hatchery.

The visitor center houses a multi-story aquarium and exhibits throughout the year. An observation deck overlooks the Pymatuning Reservoir. Tours of the hatchery are conducted from March to September with many activities to witness in the fish culture cycle, from egg collection and fertilization, to incubation, to fry growth.



Paddlefish displayed in the aquarium at the Linesville Fish Hatchery

The Pennsylvania Game Commission (PGC) manages the **Wildlife Learning Center** at Pymatuning State Park. Located on Ford Island near the Linesville Fish Hatchery, the museum displays over 300 mounted specimens and artifacts. The center features learning-based exhibits, programs, and activities to inform and educate the public.

Environmental Education

Environmental education was born when the agricultural community began teaching conservation. The movement broadened to include land-use issues, preservation of natural resources, water quality improvements, and protection of native plants and animal species. Educating the public about important environmental challenges and developing knowledgeable citizens actively participating in addressing these challenges is critical to sustaining the balance between environmental and human activities.

Environmental education, as defined by the National Environmental Education Advisory Council (NEEAC), is a learning process that increases knowledge and awareness of the environment and associated challenges, develops skills and expertise to address these challenges, and fosters attitudes, motivation, and commitment to make informed decisions and take responsible actions (NEEAC 1996).

Environmental education is relevant to ensuring the health and welfare of the watershed, protecting human health, advancing quality education, expanding employment opportunities, promoting sustainable development, and protecting our natural heritage (NEEAC 1996).



Cub Scout observing macroinvertebrates at the annual Pymatuning Waterfowl Expo

In January 2002, the Pennsylvania Department of Education (PDE) added environment and ecology academic standards to the educational standards required for high school graduation. Following these standards, students will become active participants in, and problem solvers for, real issues that affect their communities, families, and schools. These standards will establish essential elements that students will need to know to help them understand decision-making processes, problem-solving skills, and the art of compromise.

With the rapid changes in our environment, the education of stakeholders is an ongoing process. There are several organizations and agencies that provide environmental education to landowners, students, and other stakeholders within the Shenango River watershed.

The **PGC** provides a variety of education programs. Project Wild is training for educators about the environment, the outdoors, and their interactions. This program is designed to assist educators of grades K-12. It evaluates the activities and cross-references them with the PDE environmental standards. Wildlife Conservation Officers provide education programs in the schools. The programs are designed to be appropriate for each grade level. PA Song Birds is a program that is co-sponsored by PGC, PA DCNR, and the Audubon Society. Similar to Project Wild, the PA Song Birds program provides teacher workshops and lesson plans for educators. In addition to the educator workshops and education presentations, PGC has reference materials available to all educators.

The **PFBC** provides several workshops for educators, including the Keystone Aquatic Resource Education (KARE) Teacher Workshop, and the Pennsylvania Amphibian and Reptile Educator workshop. These workshops provide educators with curricula to meet the environmental standards required by PDE. PFBC has numerous educational videos, brochures, and fact sheets available for students and instructors/educators about a variety of topics.

The **Audubon Society** provides environmental education programs for school students and workshops for teachers. Student programs can be presented at the local school or the Audubon's center at the Beechwood Farms Nature Reserve in Allegheny County. The Audubon Society provides teachers with resources and workshops to fulfill the environmental and ecology standards, as well as the science and technology standards. They provide year-round environmental education programs for children, adults, and groups.

PA DCNR provides a variety of education programs through its different divisions. The Bureau of Forestry is a leader in educating people about forestry and native wild plant conservation and management. Audiences include school-aged children, educators, organizations, local governments, private landowners, consulting foresters, industry, and the general public. The office of Wild Resource Conservation produces a variety of education materials including posters, activity books, and videos for the state's conservation agencies, PDE, and conservation groups. More information about the resources available through the Wild Resource Conservation office can be found in Appendix N).



*Environmental education program
being conducted by DCNR
(photo courtesy of PA DCNR, 2001)*

Watershed education programs are offered through Pymatuning State Park, a part of PA DCNR. Programs provide school-aged children field learning experiences through hands-on activities (Table 5-6). Pymatuning State Park also provides teacher workshops. More information is available by contacting Pymatuning State Park or from the Internet (Appendix N).

County conservation districts are active in educating citizens about the environment. They work with local landowners, the agricultural community, industries, local governments, and other agencies to implement best management practices. Conservation districts provide educational programs to school-aged children through school programs, community events, and Envirothon competitions.

The **Pennsylvania State University Cooperative Extension** offers numerous environmental education opportunities. They host educational workshops for landowners, educators, and youth and assist in 4-H natural resource projects. In 2004, the Mercer County Cooperative Extension coordinated the establishment of an American Chestnut Research Orchard near Mercer.

Table 5-6. Watershed Education Programs Offered by PA DCNR

Program	Program Description
Watershed Tour	Students explore their own watershed by traveling on a bus, taking a hike, or through an audiovisual program. They identify clues relating to the culture and history of the area, uses of local streams and rivers, and impacts on the watershed.
Adopt-A-Stream	Students discover the fascinating world of stream ecology and monitor the impacts of natural and human activities taking place within their watershed. Students learn to measure physical, chemical, and biological parameters in their local stream.
Network with Other Schools	Students use the Internet to share data, discoveries, experiences, and ideas with other participating schools.
Interacting with the Community	Through research, networking, and stewardship projects, students become active community members.

Shenango Conservancy, Penn Ohio Watershed Association, and Shenango River Watchers are local groups constantly working to engage local community members in efforts to improve the quality of life in the watershed. Through various trash cleanups, recreational events, and projects, the groups educate landowners and citizens about how they can make a difference in their watersheds.

Another local organization, the **Mercer County Woodland Owner's Association (MCWOA)**, has provided educational opportunities since 1998 and provides annual scholarships for youth conservation camps and college scholarships for juniors and seniors in forestry and wildlife majors at accredited institutions.

Boy Scouts and Girl Scouts have been participating in conservation projects since their beginnings in 1910 and 1912, respectively. The Boy Scouts of America offer 23 different ecology and conservation merit badges. The Cub Scout program has environmental components required to advance their rank. The Girl Scouts of America work on educating girls about the environment with numerous conservation projects and badges that can be earned.

Archaeological and Historical Resources

Historical Overview

Glacial movements across northwestern Pennsylvania changed the landscape of the Shenango River watershed. Ice movements gouged out hills, filled in valleys, and left the contours of the land level. Pymatuning, a lake prior to the glacial movements, was reduced to a swamp with the leveling of the land.

Early Settlers

The first inhabitants of the area were Native Americans called Monongahelas or Mound Builders. They lived in the area from about 500 B.C. to 1650 A.D. Although the reason for their departure is unknown, there is speculation that war, disease, encroachment, or the gradual breakdown of their society could be the reason.

For many years it seems there may have been no permanent settlement in Pennsylvania, but instead the area was utilized as hunting grounds for numerous tribes. In 1681, the Lenne Lenape, or Delaware Indians, inhabited the land when Europeans arrived in the area. In 1742, after losing their land to white settlers, they relocated to western Pennsylvania and Ohio.

As early as the 1720s, Delaware Indians began moving into the region from eastern Pennsylvania. According to a journal entry of Christian Fredrick Post in 1748, Kuskuskies, an important Indian center, was located at the delta of the Mahoning and Shenango Rivers. Inhabited first by the Senecas and preceding the arrival of the Delawares, Kuskuskies was abandoned during the revolutionary war.

Agriculture

The early white settlers were primarily agriculturalists, providing for the needs of their families. Early farmlands were covered with trees and brush that required removal before farming could take place. The ground was crudely plowed among dead trees and harrowed by dragging a tree with projecting branches over it. Grain was cut by a sickle and threshed with a flail. Corn was shelled by hand.

With many streams to provide waterpower, gristmills for grinding grain were in operation as early as the 1800s. Farming gradually changed from subsistence to commercial agriculture. Inventions such as mechanical planters, thresh machines, and steam engines enabled agricultural production to develop with growing domestic markets.

In the northern portion of the watershed, dangerous bogs, floating islands, and the inability to determine where the land ended and the water started made farming difficult. Part of the swamp at Pymatuning Lake was drained and reclaimed as farmland. Farmers found that this reclaimed land was perfect for the cultivation of onions.

In 1868, a geological survey determined that the entire swamp could be drained and reclaimed into farmland. That determination was changed shortly after because of the effects it would have had on the industrial needs of the Shenango Valley.

After World War II, farming was further revolutionized with the development of modern farming machinery, increased acreage of farmlands, specialization, and scientific advances. Most farmers specialized in one type of operation: dairying; beef, poultry, or hog production; or fruit or crop production. Scientific advances improved the quality and quantity of production or yield.

Industrial

The first industries established within the watershed were along streams and within close proximity to raw materials and other natural resources. A key factor inhibiting the expansion of early industries was the limitations of transportation. Transportation was slow and expensive.

After the establishment of gristmills, sawmills were developed throughout the region. Sawmills were used to reduce logs to boards for easier construction and better furniture. As the population grew, forests were cut down and some wildlife species were eliminated.

The iron and steel industry had a major impact on the growth of the central and southern portions of the watershed. Forges and iron furnaces developed throughout, bringing prosperity and economic development to the local villages in which they were located. As transportation evolved, smaller facilities were abandoned and large consolidated operations were established.

In October 1893, a large tin plate manufacturing company was opened after the McKinley Tariff Act of 1892 placed a tax on importing tin plates. New Castle became known as the “Tin Plate Capital of the World.”



Industrial plant along the Shenango River

Two china companies were founded in 1901: New Castle China Company and Shenango China Company. They were founded in New Castle because of the availability of soft coal. In 1909, the two companies merged together to form Shenango China Company. From 1909 through 1935, production at the plant was devoted to commercial china. In 1936, the company began making fine dinnerware under the name of Castleton China. Castleton China became famous throughout America. They made china for Presidents Dwight D. Eisenhower, Lyndon B. Johnson, and Ronald Reagan. The local company went out of business in 1993, when its operation was transferred to Syracuse, New York.

Amish farmers in Mercer and Lawrence counties had trouble marketing their milk after a new Pennsylvania law regulating temperature control required the utilization of electricity. Standards for cheese making were not regulated as strictly. In 1955, Jabobo Marti, a young Swiss-cheese maker, cooperated with Amish farmers to build a cheese plant as an outlet for their milk. The Farmers Cheese Co-op was founded. He found markets for his Swiss cheese and, by 1974, he had created the largest and most modern Swiss-cheese plant in the United States. In 1979, he gave up Swiss-cheese making and turned to Italian types, which had become popular and more profitable. In 1985, he sold the business to a farmer's cooperative, based in Strongsville, Ohio. By 1993, it had become the largest Italian-cheese plant under one roof in the country, with a work force of 160, processing up to three million pounds of milk in a 24-hour day.

Transportation

As settlers moved into new lands and established new communities, transportation was needed. One of the early methods of transportation used 12-foot canoes. Settlers were able to transport merchandise as they paddled up and down the rivers.

Another method of early transportation was the use of primitive trails developed by Native Americans. These trails were often narrow, worn, and usually followed streams. Settlers traveled these trails by foot and horseback. They also used these trails for the transportation of merchandise on packhorses.

Simple roads stretched between early settlements. Before the invention of the automobile, roads and streets were primarily dirt. The roads became well-packed from usage, but were dusty or muddy, depending on weather conditions. Once the automobile was invented, roads in towns were often paved using bricks. Outside of towns, the roads were unpaved and farmers were the primary users of those roads.

It was not until 1805 that a state system of roads was developed. Existing local roads were used before any new roads were constructed. In 1802, Congress authorized a national highway, which by 1818 ran from Baltimore, Maryland to Wheeling, West Virginia. Shortly after, lateral roads were developed, connecting rural areas. Before the Erie Canal was built, the Mercer-Meadville Turnpike was the only improved road in the area. After the canal was built, Route 258 was constructed for the sole purpose of providing access to the canal.

In 1825, the Erie Canal was completed. It was the first transportation revolution that changed this region. Materials were now sent to villages through the use of the canals. Once the Erie Canal was completed it set off a wave of canal building.

In 1834, the Pennsylvania Canal connected Philadelphia with Pittsburgh and the Ohio River. The Beaver Division, a portion of the Erie Extension of the Pennsylvania Canal, also opened in 1834. This section traversed over 30 miles from Beaver to the Western Reserve Harbor, a point six miles north of New Castle on the Shenango River. In 1848, the Erie Extension was completed from New Castle to Erie.

In 1833, after the Beaver Division Canal reached New Castle, work began on the Pennsylvania and Ohio Canal, known locally as the “Cross Cut.” A canal bridge was used to carry canal traffic across the Shenango River between the Beaver Division and Cross Cut Canals.

Canals were the major method of transportation until the introduction of the railroad in the 1860s. The railroad again changed the way people did business. They connected an increasing number of communities, providing transportation for materials and passengers.

New Castle became a railway center, eventually being serviced by all the major carriers. Approximately 70 to 80 passenger and freight carriers arrived and departed daily.

After World War II, freight hauling by train decreased. Larger and more powerful tractor-trailers and improved roadways drew much of the freight business. The new highway system, more comfortable automobiles, and air travel decreased the need for passenger rail service.



Train display at the Greenville Railroad Museum

Postal Delivery

As early as 1801, horsemen delivered mail weekly, stopping at county seats between Pittsburgh and Erie. Post offices were established quickly in the region, with Harlansburg being the first in 1811. With the coming of mail coaches, Harlansburg became a key spot along the Pittsburgh-Erie route.

Flood Control

In 1913, after a flood, the Pennsylvania legislature authorized the building of the Pymatuning Dam, creating the present reservoir. The dam was built from 1931 to 1934, and the park was dedicated in 1937. In 1971, Pymatuning Reservoir was placed under the authority of the Bureau of State Parks, becoming the largest State Park in Pennsylvania.

The Flood Control Act of 1938 authorized the Shenango River Lake. Completed in 1965, the dam was built for flood control, seasonal discharge regulation for water quality improvement, and recreation. The dam was tested in 1972 when Tropical Storm Agnes came through the area.

Important People

William Bigler, Governor of Pennsylvania from 1852 to 1855, was from Mercer County, southeast of Greenville. On the same day he was elected, his brother John was elected the Governor of California.

John Gilky, along with a couple of his brothers, developed a variety of potato that was resistant to the blight causing the Irish Potato Famine. During the famine, they sent a few thousand potatoes and seeds to Ireland. The potato variety has changed again, and the Gilky potato no longer exists. John operated the Mercer County farm from 1798 to 1826.

John Armax Bingum was a Mercer County native. He was a major in the Civil War, a lawyer, and a friend of President Abraham Lincoln. He served as the Judge Advocate General during the trials of Lincoln’s assassin and Andrew Jackson’s impeachment, which failed by one vote. Bingum became the first United States Minister to Japan.

Leading industrialists in the late 19th and early 20th centuries, **Frank and Julia Buhl** were involved in the manufacturing of iron and steel. They managed Sharon Iron Works, which, by 1888, was the single

largest industry in Mercer County. As owner of the BH Buhl Club, a 300-acre area including the Buhl Farm, they gave the club and library to trustees for the citizens of Sharon. This is the site of Buhl Park today.

Chuck Tanner, native to the Shenango River valley, was a major league baseball player. In his first at bat in the major leagues he hit a home run. In addition to being a player, Tanner was the manager of the 1979 World Series Champion Pittsburgh Pirates.

Origin of Names

The name Shenango could have originated from one of two sources: the Iroquoian word Shaningo, meaning “beautiful one,” or the Onondagas word Chenango, meaning “big bull thistle.” It is thought that the name Pymatuning came from a Delaware chief meaning, “Crooked-mouth man’s dwelling place.”

Historical Notes, Sites, Structures, and Districts

In 1966, the National Historic Preservation Act established the National Register of Historic Places. The Pennsylvania Historical and Museum Commission (PHMC) manages the register for Pennsylvania, as does the Ohio Historical Society for Ohio. Listed properties include districts, sites, buildings, structures, and other objects significant to American history, architecture, archeology, engineering, and culture. A listing in the register contributes to the preservation of properties but does not interfere with the property owner’s rights.



Kidd's Mills Covered Bridge

Properties are nominated by each state’s preservation office for inclusion in the registry. If the property owner, or the majority of the owners if the property is owned by more than one person, objects to the nomination, it is then sent to the National Parks Service for a determination of eligibility, without formally listing the property in the National Register (National Parks Service 2001).

Within the Shenango River watershed there are 54 sites on the national register (Appendix K). Of those sites, 37 are eligible properties and the other 17 sites are listed. Listed sites are described in Table 5-7.

Pennsylvania, the Covered Bridge Capital of the World, had 1,500 covered bridges at one time. Two hundred and nineteen covered bridges still exist today, of which 119 are utilized by vehicular traffic. Within the Shenango River watershed there are two covered bridges: Kidd’s Mills Bridge, located in Mercer County, and Bank’s Covered Bridge, located in Lawrence County.

Kidd’s Mills Bridge crosses the Shenango River at Kidd’s Mills Park, two and half miles from Route 58, just south of Hempfield Township. This 120-foot bridge was built in 1868 and remodeled in 1990. The bridge is no longer utilized by vehicular traffic. It is located on property owned and operated by USACE.

Bank’s Covered Bridge, located off Route 68 in Volant, Pennsylvania, crosses Neshannock Creek. The 121-foot bridge, built in 1889, is still open to vehicular traffic and has been heavily reinforced with steel beams under the deck of the truss system.



Bank's Covered Bridge in Lawrence County

David Crawford donated property for the **Lawrence County Courthouse**, which was completed in 1852. The original cost was \$12,004, but additions to the project increased the total cost to \$32,000. James Craig and William Hamilton were contractors for the project, while P. Ross Berry was responsible for the brick work and Robin Trimble, stonemason, created the columns on the courthouse.

Table 5-7. National Register of Listed Properties
(Source: Pennsylvania Historical Museum Commission and National Parks Service)

Historic Site	Municipality	Date Listed
<i>Mercer County</i>		
New Hamburg Historical Areas	Delaware Township	12/2/1974
Greenville Commercial Historic District	Greenville Borough	8/10/2000
Alexander P. & James S. Waugh House	Greenville Borough	4/23/1998
Quaker Bridge	Hempfield Township	6/22/1998
Gibson House	Jamestown Borough	12/1/1978
Big Bend Historical Areas	Jefferson Township	4/21/1975
Christiana Lindsey House	Mercer Borough	1/15/1998
Mercer County Courthouse	Mercer Borough	11/12/1998
Kidd's Mills Historical Area	Pymatuning Township	12/2/1974
Frank H. Buhl Mansion	Sharon City	12/2/1977
Jonas J. Pierce House	Sharpsville Borough	10/24/1996
Johnston's Tavern	Springfield Township	3/24/1972
<i>Lawrence County</i>		
Lawrence County Courthouse	New Castle City	12/15/1978
North Hill Historic District	New Castle City	2/18/2000
S.R. Thompson House	New Wilmington Borough	3/7/1985
New Castle Armory	Union Township	5/9/1991
Bank's Covered Bridge	Wilmington Township	6/27/1980
<i>Trumbull County</i>		
Dr. Peter Allen House	Kinsman	9/3/1971
Brookfield Center Historic District	Brookfield	10/10/1985
Congregational-Presbyterian Church	Kinsman	9/3/1971
Clarence Darrow Octagon House	Kinsman	9/10/1971
Elam Jones Public House	Hartford	1/8/2003

Management Recommendations

Environmental Education

- Educate developers, planners, and municipal officials about environmentally friendly development.
- Promote environmental education campaigns such as "Everybody lives downstream" and storm drain stenciling.
- Secure local, state, federal, and private funding to provide environmental education programs for municipal officials, watershed residents, businesses, and school-aged children about the importance of watershed protection, watershed issues, and the value of natural resources.
- Utilize and develop West Park Nature Center for environmental education opportunities.
- Continue development of Munnell Run Farm as an ecological and agricultural education center.

Historic Preservation

- Establish driving, walking, and/or biking tours highlighting historical sites and structures to increase awareness of local historical sites, structures, and history.
- Increase local, state, federal, and private funding for historic preservation.
- Partner with county and local historical societies to preserve existing historical sites and structures such as the canal lock in Pulaski.
- Work with Pennsylvania Historic Museum Commission, individuals, and agencies to determine if local historical sites and structures could be added to the National Register.

Marketing Recreation

- Identify local, state, federal, and private funding to promote ecotourism.
- Promote tourism utilizing available natural and recreational resources.
- Utilize river resources for recreation opportunities.

Recreational Opportunities

- Develop additional public access sites to the Shenango River and some of its tributaries, including adequate parking and amenities.
- Enhance existing community parks with updated equipment.
- Enhance recreational facilities to be multi-use facilities providing a variety of activities and amenities.
- Establish community parks in municipalities that currently do not have recreational facilities.
- Establish year-round recreational opportunities.
- Identify and protect areas open to hunting.
- Increase local, state, federal, and private funding for establishing and maintaining multi-use parks, providing access to waterways, maintaining open space, and maintaining area fisheries.
- Encourage landowners to allow hunting on their properties and educate hunters about the importance of land etiquette.
- Protect and improve area waterways to maintain fisheries.
- Work with private landowners to provide access to waterways for anglers and small non-powered watercraft.
- Remove some low head dams to increase canoeing and kayaking opportunities and natural fish passage.

Trails

- Conduct feasibility studies for the development of recreational areas and trails for off-road vehicles.
- Convert abandoned rail lines into multi-use trails.
- Develop additional trailheads on existing trails.

- Educate off-road vehicle riders to recreate in an environmentally sound manner.
- Establish a network of multi-use trails by connecting existing and new trails together.
- Establish environmentally sound public trails or parks for off-road vehicles.
- Establish water trails on Neshannock Creek and the Shenango River.
- Increase local, state, federal, and private funding for trail maintenance and development.
- Increase safety for trails along roadways by erecting signs alerting motorists to trails and trail crossings, and offering trail safety seminars to trail users.
- Maintain trail paths, whether water or land, and keep free of debris for the safety of those utilizing the resources available.
- Establish a bike trail and loop around Linesville using abandoned rail lines and Pymatuning State Park.

CHAPTER 6. ISSUES AND CONCERNS

Several methods were used to identify issues and concerns of watershed stakeholders. Western Pennsylvania Conservancy (WPC) and the steering committee hosted public meetings, attended community events, and met with groups and individuals. Public meeting workshops, public and municipal surveys, and stakeholder interviews were used to gather information from watershed residents. The information gathered was used to identify these issues and concerns and are not the opinions of WPC or the steering committee.

The surveys were anonymous and the results identified how stakeholders use and perceive the watershed. Key stakeholders, identified by the steering committee, were interviewed for their opinions about watershed matters. This information was used to help determine the management recommendations, which can be found in Chapter 7.

Meeting Summaries

Initial Meetings

In July 2003, a series of five public meetings was held throughout the watershed. During these meetings, the process used to develop the Shenango River Watershed Conservation Plan was introduced to the community. Background information about watershed conservation planning and the Pennsylvania Department of Conservation and Natural Resources (PA DCNR) planning process was presented. Attendees identified issues in the watershed, including boat engine horsepower limitations on lakes, inefficient sewage and septic systems, unplanned development, streambank restoration, and funding.



Attendees of the initial public meeting held at Neshannock High School

Draft Presentation

In April 2005, a series of three public meetings was held to announce the draft of the plan. Stakeholders were given the opportunity to review the plan and provide comments (Appendix O). Public comments were collected for 30 days and incorporated into the final plan.

Issues and Concerns

Many issues and concerns addressed by the watershed community were interconnected and cannot be addressed separately. Projects should be designed to address the issues collectively whenever possible. The issues identified by watershed stakeholders are summarized in the following sections.

Water Quality

A goal of stakeholders is having clean and vibrant waterways. Addressing drinking water taste and odor issues, sanitary sewage overflows, sewage entering the streams, and stormwater are priorities in the watershed. Working with the agricultural community to implement best management practices to help control sedimentation, erosion, and excess nutrient runoff is important to watershed stakeholders.

Taste and Odor Issues

Watershed residents in portions of the watershed complain of odors and poor taste in their drinking water. The high organic content in the water drawn out of the river, by drinking water suppliers, creates

difficult and expensive challenges. During certain times of the year the extremely high biological activity results in the production of chemical compounds known as Geosmin and MIB. Depending on seasonal weather conditions, the problem can be severe and persist for several months. Public water suppliers cannot adequately address the problem. Although the water is safe to drink and meets drinking water regulations, consumers find the water objectionable. The only treatment removal technique effectively used by suppliers is activated carbon, which still does not adequately address the problem and is extremely expensive. Collaboration with the public water suppliers to identify the source of the problem and methods to correct it is needed.

Abandoned Mine Drainage

Abandoned mine drainage (AMD) entering a stream adversely affects aquatic life and water use. AMD is formed through a series of complex chemical reactions, which usually pollute the water with high levels of dissolved metals and acid. Acidic waters can appear clean and clear while being severely toxic to aquatic organisms and plant life. Often, impaired streams are stained orange from high levels of iron. Upon entering a stream, metals deposit on the stream bottom and severely degrade the habitat of aquatic organisms. Installing treatment systems for major abandoned mine discharges allows the water to be treated before entering the streams.

Only one AMD site is located within the Shenango River watershed. It is located along Fox Run, a tributary to Yellow Creek. Remediation efforts are already being conducted. For more information about AMD or the Fox Run discharge and treatment system, refer to the Water Resources chapter.

Septic and sewage

The development of adequate wastewater treatment is needed throughout the watershed. Malfunctioning and absent septic systems allow nutrients and bacteria to enter the water causing contamination of streams and groundwater. This contamination can lead to potential health hazards. Within the watershed, there are numerous private camps that lack any type of septic system. Working with landowners to repair or install properly designed and functioning on-lot septic systems, or community sewage systems, is needed. Educating property owners is the first step.

In residential areas, homes are connected to wastewater treatment plants that treat sewage waste. Sewage is pumped into these plants where it goes through a three-step process to remove sewage waste and treat the water. Once the treatment is complete, the water is released back into a nearby waterway. Older wastewater treatment systems were designed to collect wastewater and stormwater. When large storm events occur and cause these systems to exceed capacity, combined sewage overflows allow nutrients and bacteria to contaminate waterways. Designing wastewater treatment systems to adequately serve the communities is needed. Separating stormwater from wastewater systems can ease the amount of combined sewage overflows occurring within the watershed.

Stormwater Management

Stormwater management involves planning for surface runoff into stream and river systems during rain or snowmelt events. Problems with stormwater occur when there is a large amount of impervious surface, such as driveways, roads, and parking lots. Surface runoff during storm events can cause excess sediment and pollutants to enter the streams. Flooding can also occur during storm events due to old stormwater systems that cannot handle large amounts of runoff. The development of a stormwater management plan is needed for the watershed, especially in urbanized areas such as Hermitage, Sharon, and New Castle.

Water Quantity

Water withdrawal is an important issue for watershed stakeholders. Water is withdrawn from the Shenango River for drinking and industrial purposes. Water companies withdraw and treat water from

the river to provide drinking water to area residents. Industries withdraw water from nearby bodies of surface water, pass it through the plant, and then return it to the same body of water. Water quantity can become a concern during low-flow or drought conditions.

Erosion and Sedimentation

Erosion and sedimentation are important issues within the watershed. Erosion can result from a number of land-use practices, including construction activities, poor agricultural practices, and poor logging techniques. Soils lacking vegetation are susceptible to extensive erosion, allowing large amounts of silt to enter the stream, especially during storm events. Erosion occurs on streambanks where little or no vegetation is present because there are no roots to hold the soil in place. On streambanks lacking vegetation, native species of plants could be grown to limit the amount of erosion and sedimentation in the streams and protect streambanks.



Erosion along a streambank in Lawrence County

Agricultural Runoff

Agriculture is one of the primary land uses within the watershed. Working with the agricultural community to control runoff and stabilize streambanks would be beneficial to the watershed. Educating the agricultural community to understand that the implementation of best management practices is not only beneficial to the environment, but also to farmers, is critical. Streambank fencing, for example, removes cows from the stream, resulting in re-established vegetation, stabilized streambanks, a reduction in soil erosion and sedimentation, and improved water quality. This also increases the health of the herd, resulting in a financial gain for farmers.

Off-Road Vehicles (ORVs)

One of the most controversial issues within the watershed is the use of ORVs. ORVs are one of the causes of soil erosion within the watershed. Drivers typically ride on areas of steep slopes, or streambeds, ripping up vegetation and allowing additional sediment to enter the streams. Enforcement of current regulations and the strengthening of these regulations are needed within the watershed. Keeping ORVs off private lands and unauthorized trails is difficult with the increased interest in ORVs. Establishing more designated areas for ORVs like the off-road vehicle area at Shenango River Lake could potentially eliminate some of the problems. Proper design of ORV trails helps control erosion and sedimentation.

Waste Cleanup

Illegal dumping

A number of illegal dumps presently impact the watershed. In addition to being unsightly, they also pose direct threats to the watershed and have a high potential to contaminate the water. Waste containing hazardous materials soaked by rainfall may cause contaminants to leach through the soil or run off the land surface, contaminating ground or surface water. Trash and debris can directly enter the stream by way of floods or heavy rainstorms, affecting the water quality and stream aesthetics. Debris can collect in the stream, having a clogging effect, raising water levels, and causing flooding.

Locating and cleaning up these unsightly dumps is an important issue for the watershed community. A reduction of the number of illegal dumpsites can occur through cleanups, education, and alternate disposal methods. Active participation by watershed residents and local government officials is needed to address illegal dumping issues. In addition, educating the public about the threats of illegal dumping is an important step in battling the epidemic. PA CleanWays chapters and volunteers work to clean up illegal

dumps across the state by adopting roadways where dumping occurs. Establishing chapters of PA CleanWays in Mercer and Crawford counties could help decrease the amount of illegal dumping.

Old Industrial Sites

Old industrial sites are areas that could be marketed for redevelopment. Some of the old industrial sites can be classified as brownfield sites. These are sites that were contaminated from past industrial uses, and often left vacant. This is an important planning issue because the amount of remediation needed at a particular site is examined when the redevelopment of a brownfield site is considered. In most cases, incentives and cleanups are required before industries consider redeveloping old sites. In order to clean up these sites, funding is needed. Placement on the Superfund list is one possible way to acquire financial resources to make the cleanup feasible. Once the areas are cleaned up, new industries may be attracted to the area, bringing jobs. Brownfield redevelopment is an important concept, because it also helps to reduce sprawl development through the reuse of industrial sites. Funding to restore brownfield sites is available from the U.S. Department of Interior's Office of Surface Mining (OSM), the Environmental Protection Agency (US EPA), and the Pennsylvania Department of Environmental Protection (PA DEP).

Even though refuse piles and abandoned mines fit the popular definition of brownfields, they do not fall under the state's policy. Refuse piles and abandoned mines lack the infrastructure needed for redevelopment. US EPA and OSM have begun to consider them as "greyfields." The benefits of greyfield redevelopment closely parallel those associated with brownfields.

Public Awareness and Education

Education is the key to actively involved citizens and an improved quality of life for watershed residents. Within the watershed there seems to be a lack of concern for the environment. This lack of concern leads to poor environmental planning, minimal environmental awareness, and missed funding opportunities. Educating residents and officials to understand the economic benefits and importance of watershed protection is essential to watershed improvements.

Environmental education is generally targeted to school-aged children. Adult environmental



An environmental education program being conducted at Mercer County Cooperative Extension Office

educational programs are limited. Implementing programs to help landowners understand the importance of watersheds could be a first step to getting them more involved. Stakeholders have identified a need to make the public more aware of environmental issues affecting the watershed community, such as illegal dumping, water conservation, and environmentally friendly development.

The Pennsylvania Department of Education (PDE) established environment and ecology standards requiring educators and students to become more involved in watersheds. Educators often look to local organizations, such as watershed groups, to assist them in educating the youth. Reaching out to help the local school districts teach students about watersheds may inspire kids to become more involved in their local communities.

Recreation

Watershed residents expressed an interest in capitalizing on the recreation opportunities that exist. Marketing of current recreational facilities is limited. Hunting, fishing, boating, hiking, and horseback riding have been identified as popular recreation activities and can be enhanced through additional planning and protection. The watershed has a variety of recreational facilities. Working to connect these facilities to one another and enhancing the amenities of these facilities would be beneficial.

Extending and linking existing trails, along with the development of new trails, is something that residents would like to see. Watershed stakeholders also identified the desire for more access to trails, better maintenance, and the creation of water trails. Parking facilities and access points for boating were also suggested.

Historic Preservation

Watershed residents expressed the importance of preserving remaining historic sites. Preserving historic sites for future generations is key to protecting the culture of the region. To help preserve these historic areas, municipal officials must get involved with local citizens and preservation groups. Establishing self-guided auto tours that highlight the history of the area could also make local citizens and visitors more aware of the local culture and increase tourism.

Smart Growth and Planning

Development is going to occur. It can be done attentively and wisely through the implementation of cooperative land-use strategies. Smart growth principles promote the use of sound land-use planning, including mixing land uses; making development decisions predictable, fair, and cost effective; strengthening and directing development toward existing communities; fostering distinct, attractive communities with a strong sense of place; and preserving open space, farmland, natural beauty, and critical environmental areas. By employing smart growth principles, businesses and industries could be attracted to the area, bringing in needed jobs while maintaining the natural settings prized by residents and tourists. Smart growth also involves educating landowners about the process and its benefits.

The establishment of zoning ordinances would help the watershed community protect itself from unwanted land uses. Each municipality should consider zoning ordinances and a comprehensive municipal plan and/or joint plan with neighboring municipalities. Many watershed residents are interested in working with municipal officials to establish ordinances to protect their community from sprawl and other unwanted land uses.

Horsepower Limitations

There are plenty of opportunities for boating within the watershed. Boating on Shenango River Lake and Pymatuning Reservoir is a favorite activity of residents and tourists in the area. Currently, the Pymatuning Reservoir limits watercraft to a maximum engine size of 10 horsepower. Residents have a variety of opinions about the horsepower limit, ranging from increasing the horsepower limit, to keeping it the same, to lowering the limit.

There is also debate about limiting the engine size allowed on Shenango River Lake. There is currently no horsepower limitation for the Shenango River Lake. Some residents would like to see a horsepower limitation enforced in the area, while others would like it to remain without limitations.

Survey Results

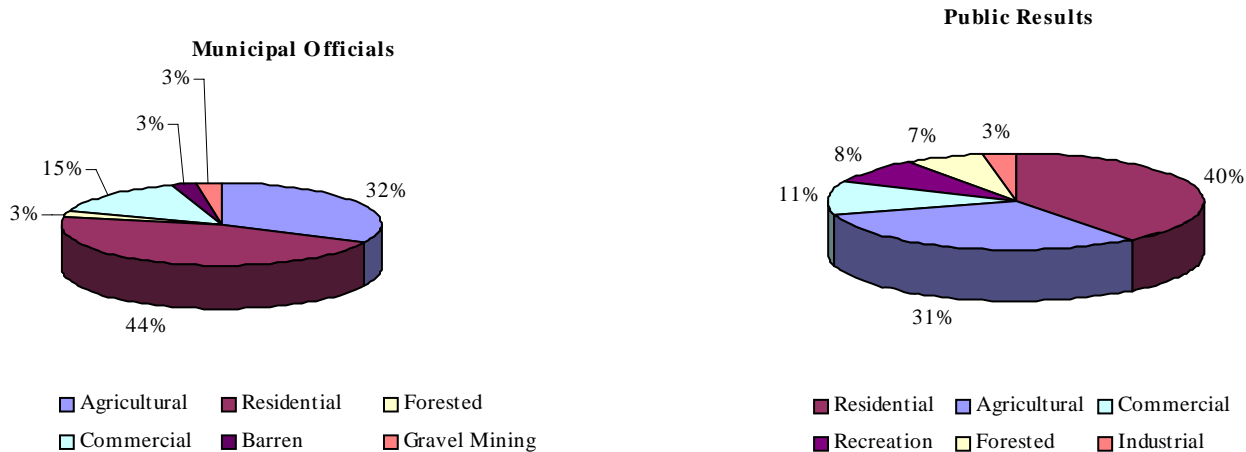
Watershed residents and municipal officials were asked to complete surveys to determine how stakeholders perceived the watershed and how they use the watershed. A copy of the survey is located in Appendix L. The results of the surveys are listed in the next section. Twenty-two surveys from municipal officials were received, and the results are summarized below.

Land Use

When asked what they thought were the most common land uses within the watershed, residents and municipal officials thought that residential and agricultural were the top two uses. Land-use data

identified agriculture and forest as the two major land uses within the watershed. More information about land uses within the watershed is identified in the Land Resources chapter.

Figure 6-1. Common Land Uses as Viewed by Municipal Officials (left) and Watershed Stakeholders (right).



Forty-four percent of municipal officials who responded thought that residential uses are the most common land use, while 32 percent felt it was agricultural uses, and 15 percent felt it was commercial uses.

Watershed residents view the watershed about the same as the municipal officials. Forty percent feel the most common land use is residential uses, while 31 percent think agricultural uses, and 11 percent think commercial uses.

Water Quality

Those surveyed thought that stormwater management, flooding, agricultural runoff, and failing, improperly maintained, or non-existent sewage and septic systems were the most prevalent water quality issues. Urban and road runoff, land development, and industrial discharges were also identified as areas of concern.

Watershed Attributes

Participants were asked to rank a list of watershed attributes according to their priority, with one being the most important and nine being the least important (Table 6-1). Water quality improvements, attractive natural settings, and recreational opportunities were the top three priorities. Other concerns identified but not listed in Table 6-1 included travel corridors, greenways, public water systems, preserving agriculture, sustainable forest management on private woodlands, and keeping large acreages intact.

Table 6-1. Watershed Attributes Importance Ranking

Attribute	Public		Municipal	
	Score	Rank	Score	Rank
Water Quality Improvements	284	1	124	3
Attractive Natural Settings	278	2	84	5
Recreational Opportunities	213	3	87	4

New Business/Jobs	199	4	128	1
Preserving Historic Sites	176	5	68	7
Community Activities	162	6	73	6
Educational Opportunities	139	7	59	8
Residential Development	138	8	125	2

Recreational Opportunities

Participants were asked to list how they use or view the watershed for recreation, rating them from one to 14, with one being the most important item (Table 6-2). Boating, canoeing, hiking trails, fishing, and public parks were among the top recreational opportunities within the watershed. Other activities identified but not listed in Table 6-2 include wildflower walks, snowmobile trails, furbearers trapping, and historic preservation.

Table 6-2. Recreational Opportunities Importance Rankings

Attribute	Public		Municipal	
	Score	Rank	Score	Rank
Public Parks	362	1	122	2
Boating/Canoeing	362	1	109	6
Hiking Trails	329	3	115	5
Fishing	319	4	119	3
Scenic Vistas	310	5	119	3
Picnic Areas	271	6	89	8
Bike Trails	245	7	82	11
Hunting	238	8	126	1
Bird Watching	235	9	50	13
Swimming	208	10	89	8
Photography	175	11	52	12
Athletic Fields	148	12	92	7
Horseback Riding	128	13	88	10

Positive Attributes

Participants were asked to provide three positive attributes of the Shenango River watershed. The results are listed in the bulleted sections below.

Socio-economics

- Cost of living
- Climate and rainfall
- Township supervisors

Socio-economics (continued)

- Sense of community
- Active and interested public
- Low development pressure
- Peaceful, safe, quiet settings
- Nice place to raise a family
- Variation between urban and rural settings
- Low population
- Clean air
- Easy access via interstates

- Commercial and industrial jobs
- Variety of businesses
- Friendly people
- Scenic area
- Safe environment
- School system and school sport activities

Land Resources

- Attractive land
- Forest and scenery
- Open space
- Agricultural opportunities
- Natural resources
- State Game Lands
- Good geographic location
- Abandoned railroad beds
- Barren ground

Water Resources

- Plentiful water resources
- Clean water
- Lakes
- Abundant rivers and streams
- Less industrial pollution

Biological Resources

- Diverse wildlife and vegetation

Cultural Resources

- Amount of recreational resources
- Cultural diversity and opportunities
- Easy access to recreational facilities
- Almost any activity you choose can be found locally
- Outdoor open areas for hunting, fishing, hiking, etc.
- Tourist attractions
- Community, state, and federal parks

Negative Attributes

Participants were asked to provide three negative attributes of the Shenango River watershed. The results are listed in the bulleted sections below.

Socio-economics

- Economically depressed – no jobs, high taxes
- Fragmented political subdivisions and competing municipalities
- Special interest of legislators
- Lack of community involvement and negativity
- Traffic congestion and lack of public transportation
- Parochialism
- Declining population and increased residential development
- Redevelopment needed
- “Grow or die” mentality

- Lack of natural gas services
- Departure of young and educated people
- Deteriorated infrastructure
- Junk such as old cars and unused trailers
- People
- School systems/funding
- New building codes
- Losing small community quality
- County agencies
- Weather/climate
- Absence of good paying manufacturing jobs
- Loss of industrial jobs
- Low income
- Low tax base
- Growing elderly population
- Limited business
- PA DEP requirements without funding
- Poor-quality roads and drainage

Land Resources

- Agricultural pollution
- Unreclaimed surface mines
- Dividing properties for new residences
- Fragmentation due to excessive gas wells
- New building code
- Unplanned and planned development in rural areas
- Sand and gravel mining
- Poor soil composition
- Abandoned mine shafts
- Gravel banks
- State Game Lands
- Reclaimed coal-stripped ground
- No available space to grow

Water Resources

- Bad drinking water and a lack of drinking water systems
- Dragging their feet on sewage systems
- Poor water quality
- Stormwater
- Poor storm sewers
- Too many wetlands, mosquito breeders

Water Resources (continued)

- Encroachment
- Low water levels in early fall
- Abandoned Mine Drainage
- Difficult laws and permits (National Pollution Discharge Elimination System, Erosion and Sedimentation, etc.)
- Pollution from landfills, traffic

Biological Resources

- Overpopulation of geese

- Trash and geese feces
- Prune trees and shrubs
- Not enough plants and trees
- Overpopulation of whitetail deer

Cultural Resources

- No ORV trails
- Ten horsepower watercraft engine limit
- Lack of public awareness about watersheds and ecotourism
- Lack of cultural choices
- Garbage along highways

Methods for Improvement

Participants were asked to provide three methods for improvement to address negative attributes of the Shenango River watershed. The results are listed in the bulleted sections below.

Socio-economics

- Environmentally and economically sustainable jobs
- Keep rural areas rural
- Redevelopment instead of development
- Encourage new business investments
- Development and utilization of technology to improve the area
- Better informed and involved politicians and citizens
- Utilize river for recreational and commercial purposes
- Establish land trusts
- More conservation
- Discourage land parcelization
- Tax reform to encourage stewardship
- Good quality, high-paying and high-tech jobs to keep young people here
- Fix congested traffic areas
- Attract manufacturing to area
- Fewer restrictions on business and agriculture
- Uniform codes
- Living wages
- Tax relief for new businesses
- Attract new businesses
- Affordable housing
- State and federal programs to expand infrastructure and storm sewers
- Better roads

Land Resources

- Make farming profitable
- Make better use of conservation easements
- Coordination of land use as affecting watersheds
- Master plan of open space to ensure open space and limit development
- Restoration and redevelopment of brownfields or underutilized sites
- Broaden recycling programs
- Enforce litter regulation and make trash cans publicly available
- Clean banks of the river
- Conserve farmland

- Educate elected officials about need for open space
- Work with existing agriculture and respect the fact that agriculture is the most important industry
- Contain urban expansion
- Improve agricultural and forestry opportunities through sustainable practices
- Responsible land development
- Better use of agricultural lands

Water Resources

- Create greenways along major stream sections
- Community appreciation and utilization of water resources
- Improve water quality
- Septic systems corrections and wastewater treatment improvements
- Protect wetlands as originals – not as created by man
- Regional storm sewer system
- Open waterways to alleviate flooding
- More drainage for swampy areas
- Enforce water quality discharge limits
- Improve mine discharges
- Control agricultural runoff
- Streambank fencing
- Enforce environmental laws and regulations
- Funding to provide incentives for riparian area stewardship practices
- Clean up landfills
- Flood control

Biological Resources

- Use native species when replanting
- More plants
- Year-long open season on deer hunting

Cultural Resources

- Water quality and conservation education programs
- Engage conservation ethics starting with young people
- Bike and walking trails
- Improvement of river access
- New trail from Greenville to Pymatuning
- Increase horsepower limit on Pymatuning Reservoir
- No increased horsepower limit on Pymatuning Reservoir
- Keep beaches and public places open longer and supervised

Cultural Resources (continued)

- Remove obstructions, such as stumps, in Pymatuning Lake
- Involve more people in conservation
- Develop a positive rapport with agriculture producers
- Advertise area (education, business, location)
- Upgrade and install more recreation areas
- Promote recreation area at Shenango River Lake and Pymatuning State Park
- Money to develop parks and recreation areas

Other Watershed Concerns

Participants were given the opportunity to provide general comments or concerns about the watershed or the planning process. The results are listed in the bulleted sections below.

Socio-economics

- Need balance/compromise among multiple viewpoints to ensure “best” results
- Consider conservation and economic development
- Listen to the local citizens and let them guide the political direction in dealing with issues
- More unfunded mandates
- Concerned that legislative measures will be placed on business and agriculture
- Concerned about loss of jobs and tax base
- Equal representation from all groups of people

Land Resources

- Urban sprawl
- Agricultural pollution (runoff)
- Managed pasture – crop rotation
- Worried about factory farms locating in area
- Worried about longwall mining locating in area

Water Resources

- Good regulations are already in place
- Taste and odor issues are getting little attention in the watershed initiative
- No feedback to volunteer monitors
- Limestone mining continues and removes the alkalinity needed by our waters
- On-lot septic systems – need for innovation
- Stop stream erosion
- Focus on subwatersheds
- Fecal coliform in streams and drinking wells

Cultural Resources

- Promotion of tourism
- Education is key – need understanding of issue
- Amish need to be educated about conservation of water, trees, and all other resources

Potential Projects

Municipal officials were also asked to identify projects that could be done in their municipalities. The results are listed in the bulleted section below.

Land Resources

- Regional planning for industry, manufacturing, and commerce
- Preserve farmland and wooded areas
- Limit development from taking over farmlands and wooded areas
- Add additional recreation areas
- More scenic trails
- More cleanup crews
- Planned adult community
- Financial aid for agricultural preservation
- Need economic development zone
- Dredge Soul Run to prevent flooding along Lancaster and Lebanon Avenues

- Land set aside for business opportunities

Water Resources

- Infrastructure for quality living and protection of natural resources
- Clean up areas that are polluting the groundwater
- Clean up streams and lakes
- Promote activity
- Limit the amount of all types of coal mining
- Ensure that all housing developments have runoff plan
- Improve sewage disposal
- Control all types of non-point source pollution
- Upgrade drinking water
- New sewage plant
- Improve water quality
- Stormwater management
- Public water made available to Wilmington Township residents

Biological Resources

- PA DEP be regulated or made accountable for some decisions that cause hardship on local citizens
- Stop clear-cutting unless absolutely necessary
- Clean up Neshannock Creek area
- Promote fishing
- Backfill swamp areas and drain (reduce mosquito population)
- Reduction in the number of wildlife: deer, geese
- Fish stocking of Deer Creek
- Recognize areas that have endangered plants and animals

Cultural Resources

- Care and preservation of Leesburg Falls: make state- or nationally owned
- State fairgrounds
- Set aside designated areas for environmental education
- Promote canoeing on Neshannock Creek
- Allow additional recreational development around the Shenango River Reservoir
- Promote Greenville Canal Museum
- Education

Other

- Better paying jobs to keep young people from moving away
- Building homes in the middle of farmland or wide open spaces should be limited

Other (continued)

- Upgrade/improve highway system
- Addition of good paying jobs
- Promote fairgrounds
- Assist farmers with the creation of a free, large-scale farmers market
- Need to develop some areas to help maintain county and local stability
- Assistance in offering “clean” jobs
- Area lacks adequate economic, recreational, and cultural opportunities

Interview Results

Interviews were held with key individuals identified by the steering committee. The interviews were conducted via telephone and e-mail. The results of the interviews are listed by question below. A copy of the interview sheet is located in Appendix L.

Changes in the Shenango River Watershed over the Past Ten Years

Socio-economics

- Population declining
- Economics declining
- Move from industrial-based jobs to service-based jobs
- Loss of respect for landowners

Land Resources

- Development/urban sprawl
- Not enough planning for new developments
- Increased runoff
- Increase in litter
- Increased construction and reverting streams
- Wet areas are being drained
- Increased siltation of streams/lakes, resulting in streams/lakes being choked by weeds
- Decrease in farming and loss of smaller farms
- Increase in factory farming
- Farms reverting to fields, forest, or housing developments
- Restrictions on farming in wetlands, even though wetlands not officially designated
- Forestry production re-emerging
- Increase in number of timber harvests that utilize diameter limit cuts
- Increase in "posted land"

Water Resources

- Increased awareness of river
- More recreational opportunities
- Community cleanups
- More collaboration among environmental groups
- Abatement project at landfill near Patagonia
- Upgrading of sanitary sewer system (Hermitage, Westinghouse Plant)
- Westinghouse Plant cleanup started, but still needs work
- Old landfills being looked at in Wheatland for abatement project
- Cleanup of dead deer dump near Pymatuning resulting in less algal growth
- Water purification program by water suppliers

Water Resources (continued)

- Cleanup of Superfund site in Sharon
- Droughts and lower water levels in streams and lakes

Biological Resources

- Increase in deer population

Cultural Resources

- Shenango River Reservoir not developed to full potential

The Shenango River Watershed if No Additional Efforts are made in Five to Ten Years

Socio-economics

- Less industry
- Economic situation will continue to decline
- Less recreation/tourism

Land Resources

- More development/urban sprawl
- Forest fragmentation will continue
- Fields will be overgrown with brush, no wildflowers
- No growth or commercial development
- Little change from present condition
- Farms will be broken up and sold as entire tracts or divided into smaller tracts for development
- PA DEP will have to clamp down on discharges and regulations for development
- If no regulations, natural areas will be hurt because people will bring business and industry in at any cost

Water Resources

- Increased runoff and sedimentation
- Increased population
- Contaminated sediments in river must be removed completely or could pose threat to health of river
- More gas wells; more pumping water out of river
- More pollution from storm sewers
- Deep mines will fill with water
- More truck spills with increased traffic on major roads
- Water and land resources will continue to deteriorate

What the Shenango River Watershed Should be Like in Five to Ten YearsSocio-economics

- Develop riverfront
- Have more high-paying jobs
- Improve industry
- Create a sustainable economy

Land Resources

- Support a variety of land uses, including farming and forestry
- Keep open spaces intact; more greenways and forest lands

Land Resources (continued)

- Compromise between pristine areas and development
- Planned approach to growth; revitalize existing structures before developing new lands
- Convert farmland to forest
- Keep a natural landscape
- Protect pristine areas by making them parks
- No landfills within 150 feet of residential/commercial areas
- Clean up industrial sites

Water Resources

- Decrease erosion and eliminate sedimentation

- Decrease fertilizer use
- Establish best management practices for farms, golf courses, developments, etc.
- More habitat along the river
- Increase fish passage by removing dams (Duferco Steel dam, water company dam, Shenango dam)
- Conduct a watershed assessment
- Clean up riverbanks
- In 10 years, be able to consume fish from dam down
- Regulations to keep landfills away from water resources
- Increase awareness: activity in one part of the river affects rest of watershed
- Model watershed: planning and development

Cultural Resources

- Increased fishing, hiking, boating, hunting, canoeing, swimming
- Motor limit in Shenango River Reservoir should be decreased
- Motor limit should stay the same at Pymatuning Lake

Issues Being Talked About in the Shenango River Watershed Community

Community

- Improve quality of life for communities
- Community is divided over issues
- People are issue driven; need to be proactive
- Residents' fear of regulations
- Residents are suspicious of outsiders and their motives
- Local government corruption
- Debate over population goals for counties
- Historical Society preservation

Land Resources

- Save open spaces and farmlands
- Inability to compete with outsiders for property
- New developers
- New Castle downtown rehabilitation projects
- Abandoned gasoline stations
- Construction
- Illegal dumping

Water Resources

- Need to address industrial pollution
- Need to address non-point source pollution
- Methyl tertiary butyl ether (MTBE gas additive)
- Need regulations on sanitary sewers, septic systems, and stormwater management
- Must monitor waterways constantly
- Need watershed assessments and remediation plans
- Gas well drillings, effects on river and groundwater
- Sharon water pollution control plant
- Ready site that provides for anti-pollution facilities
- General public needs to be educated about water issues

- Make river more attractive to tourists

Problems Needing Addressed in the Conservation Plan

Socio-economics

- Developers will encroach
- Reach a balance between development and conservation: planning
- Promote greenways
- Zoning practices in townships, which support quality of life
- Use environment as revenue source locally and state-wide
- General education
- School students receiving inaccurate information

Land Resources

- Slag dumps
- Littering (especially cigarette butts)
- Active tire dumping
- Industrial waste
- Need to address old industrial areas
- Inaccurate information regarding sound silviculture practices by some timber buyers

Water Resources

- Residential and agricultural runoff
- Leakage of septic tanks needs to be addressed
- Need infrastructure for sewage facilities
- Release of money for various projects to eliminate silting
- Need buffer zones along streams
- Deep mines
- Abandoned mine drainage
- Accidental release of contaminants along highways
- Water quality looks bad: need to look at industries
- Inventory or assessment needed
- Have water pollution treatment plant using wetland filtration device
- PA DEP trying to do good job
- Need best management practices
- United States Army Corps of Engineers (USACE): keep control, but loosen up
- Equity funding from state for sanitary sewers

Cultural Resources

- Should have canoe path along entire river
- Increase funding

Opportunities for Programs or Projects Residents are Aware of within the Watershed

- Growing Greener grant project at Old Espyville Boat Launch area
- Streambank fencing
- Conservation Reserve Enhancement Program
- Stream cleanups
- Mahoning River: dredging river for metals, PCBs at confluence with Shenango River
- Cooperative Extension Programming

- Nutrient Management/CAFO
- Shenango River Watchers
- Forest Legacy
- Pheasants Forever
- Pennsylvania Game Commission Farm-Game Program
- Forest Resources Institute for Teachers
- 4-H Natural Resource projects
- Forest Landowner Associations
- Storm drain stenciling
- Handicapped-accessible fishing piers
- Turning unused areas into parks and public space
- Rails to Trails
- PCB removal near Westinghouse plant
- Tire recycling
- PA DEP's involvement with sewage and hazardous waste site
- Pymatuning State Park's Environmental Education Program and water quality testing
- Best Farming Practices
- USACE might consider some type of development of reservoir
- Natural Resources Conservation Service programs
- Headwaters watershed study
- Develop greenways
- PA CleanWays
- Source Water Grants
- Need more local battery collection
- Act 220: water resource legislation
- Tax incentives to reuse older buildings
- Shenango Valley Institute

Future Management of the Watershed

- Getting projects completed in a timelier manner
- Include industry, builders, and farm groups in public meetings, and outdoor associations in planning process
- Tax incentives/disincentives for private landowners to improve conservation practices, keep lands intact, and assist in multi-generation transfer of ownership
- Provisions for sustaining agricultural base and rural heritage
- Respect for private property open to the public
- Recreation: more fishing and canoeing opportunities, bike trails
- State provide monetary assistance to organization for education
- Public must have say in issues
- Protect open and farm areas
- Twenty to 30 years, eat fish out of river
- Raising car mileage rates
- Better environmental laws: harder for developers
- Take time for public opinion
- Support high water quality
- Promote zoning in townships, which enhances quality of life and water quality
- Environmental Advisory Council
- Watershed associations
- Raise awareness
- Environmental matters not high on people's radar screens
- Get farmers and businesses involved

- Keep it local
- Fish and wildlife monitoring
- Combination of government and non-government groups
- Monitoring training

Other Comments

- Work on getting the grant monies released in a more timely and effective manner
- Reach out and educate municipalities
- Educate school students grades 4-8
- Public needs to see benefit
- Publicize in newspapers
- Municipalities don't care: spend less time with them because of boundaries
- Need broad support from many individuals/groups who do not necessarily feel comfortable working together
- Doing a great job; asset to communities
- Agricultural areas have shrunk over past century; however, production has not been proportionally lost. Forest is just now emerging as a valuable industry. Production of agriculture and forestry should remain important.
- Glad this is being done
- Northwest Pennsylvania is behind the times

Items Needed to Make the Plan Successful

Socio-economics

- Financial help for landowners to achieve water and soil protection
- Financial backing to support sewerage, best farming practices, etc., along with technical support

Land Resources

- Decrease urban sprawl
- Persuade farmers to continue farming
- Protect agricultural land from residential development
- Means to support zoning
- Balance needs of the areas
- Proper planning as a result of public opinion

Water Resources

- Highlight better parts of river, what it could look like
- Educate about other pollution sources, besides industry
- Address potential problem areas
- Protect endangered species
- Canoe path for the river

Organization

- Clearly state purpose, objectives, and benefits with timelines and evaluation plan
- Develop long-term goals

- Strong recommendations and guidelines
- Contain specific recommendations that groups can do to make a positive outcome
- Work to get all proposed projects completed
- Make it easy to implement
- Planning models: SWOT (strength, weaknesses, opportunities, threats/barriers)

Community

- Community input and support
- Volunteers
- Improve stewardship
- Political community input
- Get the right people involved
- Don't rush in and get burned out
- Education
- Make people aware of consequences of actions
- Plan is for future generations

Compliance with Government Regulations

- Plan should contain either incentives for compliance or enforced fines for noncompliance
- No government control unless compensated
- Power to implement guidelines for violations
- Emphasize that CREP is voluntary

Items That Could Prevent the Plan from Being Successful

Public Awareness

- Lack of financial support
- Lack of clear mission statement
- Mistrust and suspicion of residents
- All groups need to be involved: rural, landowners, industry, etc.
- Needs to be balanced
- Must stay neutral on development and conservation
- Need to follow up on projects
- Plan must be understandable
- Unrealistic goals
- Need to look at problems from multiple perspectives
- Keep focused on weaknesses, threats, barriers, and opportunities

Politics

- Political pressure
- Plan must not limit landowners' use of land
- Not getting the approval for granting the grants
- Honesty: assessment of watershed, political problems
- If local officials don't support it

Community Issues

- Different groups will fight in either direction
- Don't tell people it will cost money
- Lack of community support

- Need education on issues
- Make friends, not enemies
- Don't be impatient to get everything done in one year
- Don't get discouraged
- Apathy
- People don't see long term
- Keep it local and relevant
- Don't look locally, look regionally

Regulations

- No compliance enforcement could be a deterrent
- Lack of enforcement
- Cannot be regulatory plan, must be advisory
- No government mandates
- Can't be too stringent with business and industry
- Industry and farming going to be difficult to deal with

CHAPTER 7. MANAGEMENT RECOMMENDATIONS

Management recommendations are suggestions to improve the quality of life within the watershed. They are non-regulatory in nature and may be used by any citizen, group, or agency. Potential partners are groups with the resources best suited to assist in meeting the objectives. Potential funding sources identify avenues through which the objectives may be financed. The groups listed as potential partners or potential funding sources are suggestions and should not be limited to the identified groups due to ever-changing circumstances.

The recommendations were derived from correspondence, comments, issues, and concerns identified by local citizens throughout the planning process. The issues and concerns are discussed in further detail in Chapter 6. The watershed community, through comments, interviews, and the completion of surveys, has provided the management recommendations. The prioritizations of the recommendations were determined by the steering and advisory committees, and by the public during the draft review phase. These rankings (high, medium, and low) are based upon impacts to the watershed, feasibility, and probability of funding.

This matrix of recommendations includes issues, recommended approaches, potential partners, potential funding sources, and priority ratings. The recommended approach is the action step, or objective, of the recommendation. An additional listing of potential funding sources and the type of projects that might be funded is included in Appendix M. The acronyms used in the management recommendation matrix are listed in Table 7-1.

Table 7-1. Acronyms Used in the Management Recommendations Matrix

CNHI	County Natural Heritage Inventory	PENNDOT	Pennsylvania Department of Transportation
CREP	Conservation Reserve Enhancement Project	PENNTAP	Pennsylvania Technical Assistance Program
DCED	Pennsylvania Department of Community and Economic Development	PENNVEST	Pennsylvania Infrastructure Investment Authority
FEMA	Federal Emergency Management Act	PFBC	Pennsylvania Fish and Boat Commission
NRCS	United States Department of Agriculture Natural Resource Conservation Services	PGC	Pennsylvania Game Commission
ODNR	Ohio Department of Natural Resources	PHFA	Pennsylvania Housing Finance Agency
ODOT	Ohio Department of Transportation	PHMC	Pennsylvania Historic Museum Commission
OhioEPA	Ohio Environmental Protection Agency	RUS	United States Department of Agriculture Rural Utility Service
ORSANCO	Ohio River Valley Sanitation Commission	US EPA	United States Environmental Protection Agency
ORV	Off-Road Vehicles	USACE	United States Army Corps of Engineers
MCWOA	Mercer County Woodland Owners Assoc.	USFS	United States Forest Service
PA DCNR	Pennsylvania Department of Conservation and Natural Resources	USFWS	United States Fish and Wildlife Service
PA DEP	Pennsylvania Department of Environmental Protection	WPC	Western Pennsylvania Conservancy
PABS	Pennsylvania Biological Survey	WREN	League of Women Voters Watershed Resources Education Network
PASA	Pennsylvania Association for Sustainable Agriculture		

Project Area Characteristics

Issue and Recommended Approaches	Potential Partners	Potential Funding	Priority
Land Use Planning and Regulation			
Alter perceptions of zoning by building partnerships and educating residents about the value of zoning.	Municipalities, Citizens, Planning Departments. Cooperative Extensions	DCED	High
Designate growth and conservation areas based upon data analysis from County Comprehensive Plans, CNHIs, the Pymatuning Interstate Watershed Plan, and the Shenango River Watershed Conservation Plan.	Planning Departments, Conservation Districts, Municipalities, WPC, Conservation groups	PA DCNR, ODNR	High
Develop individual or joint municipal comprehensive plans.	Municipalities, Planning Departments	DCED, Municipalities	Medium
Encourage municipalities to utilize regulation control powers available to them, including zoning, to preserve and improve quality of life for watershed residents.	Municipalities, Planning Departments, Cooperative Extensions	DCED	Medium
Enforce existing land use ordinances.	Municipalities	Private sources	Medium
Establish environmental advisory committees.	Municipalities, Planning Departments, Conservation Districts, Conservation Groups, Cooperative Extensions	DCED, PA DEP, Private sources, OhioEPA	Medium
Establish regional or county-based planning and zoning, in addition to municipal zoning.	Municipalities, Planning Departments, Cooperative Extensions	DCED	Medium
Establish planning and zoning in municipalities where ordinances are lacking.	Municipalities	DCED	Medium
Implement smart growth practices when developing residential and commercial areas.	Municipalities, Planning Departments	DCED, PHFA, Transportation Departments, Private sources	High
Protect critical and environmentally sensitive areas with land-use regulations.	Planning Departments, Conservation Districts, Municipalities, Cooperative Extensions	PA DCNR, ODNR	High
Update and enforce Act 537 sewage plans, especially in areas where development is occurring or where future development is likely to occur.	Municipalities, Planning Departments	PA DEP, PENNVEST	Medium
Establish a greenway plan for economic revitalization of downtown areas.	Municipalities, Planning Departments, Businesses	PA DCNR, ODNR, DCED	High

Project Area Characteristics (continued)

Issue and Recommended Approaches	Potential Partners	Potential Funding	Priority
Economics			
Attract new businesses to the region with incentives and tax breaks.	Municipalities, Planning Departments, Legislators	Legislature, DCED	Medium
Create tax incentives for private landowners who implement conservation practices.	Municipalities, Planning Departments, Legislators, Conservation Districts	Legislature, DCED	Medium
Revitalize downtown areas such as New Castle, Sharon, and Greenville.	Municipalities, Planning Departments	DCED	Medium
Develop riverfront attractions, such as hotels, restaurants, and family entertainment facilities, in the Lower Shenango River subwatershed to highlight the river and its importance to the region.	Municipalities, Planning Departments, Businesses, Chambers of Commerce	ODNR, DCED	Low
Offer incentives to help keep young adults in the area.	Municipalities, Planning Departments, Legislators	Legislature, DCED	Medium
Promote redevelopment of abandoned industrial sites through the Brownfields program, incentives, tax breaks, or other efforts.	Planning Departments, Municipalities, US EPA, Legislators, Businesses	PA DEP, ODNR, US EPA, Foundations, Private Sources	High
Utilize available nature-based tourism opportunities to increase revenue.	Municipalities, Businesses, Planning Departments, Tourist Bureau	DCED, Business Associations	Medium
Encourage the establishment of value added agriculture processing to provide income opportunities for small agricultural producers.	PASA, Conservation Districts, PennTAP	Legislature, PA DCNR, Foundations	Medium
Work with elected officials to create a tax reform to assist landowners in being able to maintain their property.	Landowners, Elected Officials, School Districts, Citizens	Private Sources	Low
Establish tax incentives to keep large tracts of lands intact	Municipalities, Landowners, Conservation Groups	Private Sources, Foundations	High
Other			
Establish more collaboration amongst environmental groups, including the development and support for more groups.	Conservation Groups, Conservation Districts	Private Sources, Foundations	Medium
Establish memorandums of understanding between municipalities, and public entities to utilize equipment to clean up after local disasters such as flooding, and tornados.	Municipalities, Businesses, Agencies	Private Sources	High

Project Area Characteristics

Issue and Recommended Approaches	Potential Partners	Potential Funding	Priority
Other (continued)			
Conduct workshops and programs to educate the agricultural community about best management practices and new technologies and programs available.	Landowners, Farmers, Conservation Districts, Municipalities, NRCS, Planning Departments, Conservation Groups	PA DEP, ODNR, OhioEPA, US EPA, PA DCNR, Private Sources, Foundations	Medium
Education			
Conduct workshops, seminars, and demonstrations for decision makers, including developers and government leaders, emphasizing best management practices.	Conservation Districts, Municipalities, NRCS, Planning Departments, Conservation Groups	PA DEP, ODNR, OhioEPA, US EPA, PA DCNR, Private Sources, Foundations	High
Identify additional local, state, federal, and private funding for environmental education.	School Districts, Conservation Districts, Conservation Groups	Private Sources, Foundations	Medium
Increase municipal awareness and cooperation for preserving, protecting, and restoring the natural resources of the watershed.	Conservation Districts, Municipalities, NRCS, Planning Departments, Conservation Groups	PA DEP, ODNR, OhioEPA, US EPA, PA DCNR, Private Sources, Foundations	High
Provide public education and awareness programs about the economic benefits and importance of watershed protection.	Landowners, Conservation Districts, Municipalities, Conservation Groups, PA DCNR	PA DEP, PA DCNR, ODNR, Private Sources, Foundations	High

Land Resources

Issue and Recommended Approaches	Potential Partners	Potential Funding	Priority
Agricultural Lands			
Enroll agricultural landowners in the Conservation Reserve Enhancement Program (CREP), a voluntary program, to take marginal farmland out of production for wildlife habitat, or other similar programs.	ODNR, Conservation Districts, NRCS, Conservation groups, PGC,	PA DEP, US EPA	Medium
Identify additional local, state, and federal funding for the implementation of agricultural best management practices.	Conservation groups, Conservation Districts	Private Sources, Foundations	Medium
Promote and implement conservation practices such as cover crops and crop residue, contour strips, grassed waterways, and minimal pesticide/herbicide use.	Conservation Districts, Cooperative Extensions, NRCS, Farm Bureau	PA DEP, OhioEPA, NRCS, Farm Bureaus	High
Promote and utilize farmland preservation programs to sustain agricultural base and rural heritage.	Conservation Districts, NRCS, Agricultural Preservation Groups, Cooperative Extensions, Farmers, Municipalities	Farm Bureaus, Conservation groups	High
Promote the importance and economic viability of small farms through marketing education and creation of avenues for adding value to locally produced agriculture commodities.	PASA, Cooperative Extensions, PENNTAP	PASA, Foundations, Legislature	High
Protect active farmlands to retain their agricultural uses by designating them as agricultural security areas, purchasing conservation easements, or assisting in the multi-generation transfer of ownership.	Conservation Districts, Agricultural Preservation Groups, Conservation Groups, Landowners, Municipalities	Farm Bureaus, Conservation groups, Private Sources	High
Promote local production of agricultural products, producers, markets, and preservation programs.	Conservation Groups Cooperative Extensions, Farmers	Farm Bureaus, Private Sources	Medium

Erosion and Sedimentation

Establish land-use planning and zoning to limit development in floodplains and other critical areas subject to erosion and sedimentation problems.	Conservation Districts, Planning Departments, Municipalities	FEMA	High
Include sound geologic investigation and best management practices during maintenance and construction of roadways.	Planning Departments, Municipalities, ODOT, PENNDOT	ODOT, PENNDOT	Medium
Utilize best management practices to control erosion and sedimentation in agriculture, forestry, development, and mining industries.	Conservation Districts, Conservation Groups	PA DEP, OhioEPA, PA DCNR, ODNR	High

Land Resources (continued)

Issue and Recommended Approaches	Potential Partners	Potential Funding	Priority
Host workshops and/or programs promoting sustainable forestland management for loggers, landowners, and municipal officials.	Municipalities, USFS, Foresters, Conservation groups, PA DCNR, Conservation Districts, Cooperative Extensions	PA DCNR, ODNR, MCWOA	High
Decrease forest fragmentation by maintaining contiguous forest tracts and/or by maintaining travel corridors between non-contiguous forest tracts.	MCWOA, Conservation groups, Landowners	PA DCNR, ODNR, Private Sources, Foundations, MCWOA	Medium
Decrease forest parcelization by protecting large forest tracts with conservation easements, forest stewardship program participation, and zoning ordinances.	Landowners, Conservation Districts, Conservation groups, MCWOA	MCWOA	Medium
Educate forestland owners by providing them with accurate information regarding sound silviculture practices, forest management plan development, and insect and disease problems that can affect forest health.	Foresters, Landowners, MCWOA, Conservation groups, Cooperative Extensions, Conservation Districts	PA DCNR, ODNR, Private Sources, Foundations, MCWOA	High
Encourage the development and use of Forest Stewardship Plans or forest management plans and participation in the PA Forest Stewardship Program and/or the Tree Farm Program.	Landowners, Foresters, MCWOA	PA DCNR, ODNR, MCWOA	Medium
Discourage the use of high grading practices like diameter limit harvests and selective cutting, and encourage timber harvesters to use sustainable BMPs under the direction of a professional forester.	Foresters, Landowners, MCWOA, Conservation groups	PA DCNR, ODNR, MCWOA	High
Promote tree plantings and sustainable harvesting.	Foresters, Conservation Groups, Conservation Districts, MCWOA	PA DCNR, ODNR, Private Sources, Foundations, MCWOA	High
Work with Woodland Owners Association efforts to educate the public, restore degraded areas, and develop demonstration areas	Woodland Owners Association, PA DCNR, Cooperative Extensions, ODNR, Conservation Districts, Conservation Groups	PA DCNR, ODNR, Private Sources, Foundations	High
Support laws and regulations to maintain whitetail deer populations at levels that will ensure healthy forests, productive agricultural lands, and healthy deer populations.	Foresters, PGC, ODNR, Conservation Groups,	Conservation groups, PGC, ODNR	Medium

Land Resources (continued)

Issue and Recommended Approaches	Potential Partners	Potential Funding	Priority
Waste Disposal			
Educate citizens about the economic and environmental impacts of illegal dumping.	Solid Waste Authorities, Citizens, Municipalities, Conservation Districts, Conservation groups	PA DEP, ODNR	Medium
Partner with local landowners, businesses, and community groups to sponsor community cleanups to remove trash along roadways, streambanks, and at dumpsites.	Municipalities, Community Groups, Businesses, Watershed Associations	PA DEP, ODNR, PA CleanWays, ORSANCO, Private Sources, Foundations	Medium
Work with county planning departments to prohibit any new or proposed landfills near water sources and residential areas.	Municipalities, Planning Departments, PA DEP, OhioEPA	PA DEP, OhioEPA	Medium
Establish chapters of PA CleanWays in Mercer and Crawford counties to assist in identification, education, and cleanup of illegal dumpsites.	Community Groups, Conservation groups, Solid Waste Authorities	Business, Private Sources, Foundations	Medium
Identify additional local, state, and federal funding to address the waste disposal needs of the area.	Community Groups, Conservation groups, Solid Waste Authorities	Business, Private Sources, Foundations	Medium
Conduct an inventory and develop a remediation plan for illegal dumpsites in the watershed.	PA CleanWays, Solid Waste Authorities, Conservation Districts	PA DEP, ODNR, Businesses, Private Sources, Foundations	Medium
Educate citizens about traditional and innovative ways to reduce, reuse, recycle, and properly dispose of household hazardous waste by providing public service announcements, recycling workshops, and other education and outreach programs.	PA CleanWays, Solid Waste Authorities, Conservation Districts, Conservation Groups, Schools, Citizens	PA DEP, ODNR, PA CleanWays, Businesses, Foundations, Private Sources	Medium
Provide convenient and affordable alternative disposal options, such as offering special collection days and drop-off locations for appliances and household hazardous wastes.	Municipalities, Solid Waste Authorities, PA CleanWays	PA, DEP, ODNR, PA CleanWays, Businesses, Private Sources, Foundations	Medium
Riparian Corridors			
Educate landowners along waterways about the value of riparian buffers.	Conservation Districts, Conservation groups	PA DEP, OhioEPA, ODNR, PA DCNR	High
Establish greenway corridors and trails along waterways.	Conservation groups, PA DCNR, PFBC, ODNR	PA DCNR, ODNR, PFBC, Private Sources, Foundations	Low
Establish and protect riparian buffers along streams using smart growth practices as identified in the project area characteristics chapter.	Planning Organizations, Conservation groups, NRCS	PA DEP, ODNR, US EPA, Private Sources, Foundations	Medium

Land Resources (continued)

Issue and Recommended Approaches	Potential Partners	Potential Funding	Priority
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Riparian Corridors (continued)

Continue streambank restoration and riparian buffer initiatives on agricultural lands to minimize nutrients and sediments entering the waterways.	Conservation groups, NRCS, PGC, WPC	PA DEP, US EPA, Private Sources, Foundations	Medium
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Development and Redevelopment

Establish a planned approach to growth; revitalize existing structures before developing new lands.	Planning Departments, Municipalities	DCED	High
Promote the inclusion or preservation of open space in community development programs.	Planning Departments, Municipalities, Conservation groups	ODNR, DCED, Private Sources, Foundations	Medium
Establish more greenways and forestlands that are available for public use.	State Agencies, Private Landowners, Conservation groups	PA DCNR, PGC, Private Sources, Foundations	Medium
Protect natural areas by converting them into parks, purchasing conservation easements, or utilizing other conservation methods.	Conservation groups, PGC, PA DCNR, ODNR	ODNR, PA DCNR, PGC, National Park Service	Medium
Promote redevelopment of abandoned industrial sites through the Brownfields program, incentives, tax breaks, or other efforts.	Planning Departments, Municipalities, US EPA, Legislators, Businesses	PA DEP, ODNR, US EPA, Foundations, Private Sources	High
Redevelop the reclaimed River Road Landfill site for a park/recreation area.	Conservation groups, Municipalities	US EPA, PA DEP, PA DCNR, Private Sources, Foundations	Low

Other

Conduct outreach campaigns to educate watershed residents about the land uses in their communities.	Conservation groups, Conservation Districts	Private Sources, Foundations, WREN	Medium
Establish a regional sanitary authority.	Solid Waste Authorities, Counties, Municipalities, Planning Departments	PENNVEST	Medium
Educate the public to utilize practices such as "Leave no trace" on public lands and private lands open to public use.	Landowners, Conservation groups, Landowner Associations	Private Sources, Foundations	Medium

Water Resources

Issue and Recommended Approaches	Potential Partners	Potential Funding	Priority
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Water Conservation

Establish guidelines that require installation of low-flow devices for all new construction.	Municipalities, Planning Departments	PA DEP, OhioEPA, Foundations, Private Sources	Medium
Promote and establish a program for retrofitting homes and businesses for water conservation practices through tax breaks and rebates.	Municipalities, Businesses, Homeowners	Legislature, PA DEP, OhioEPA, Foundations, Private Sources	Medium
Launch a watershed-wide water conservation program to educate the public about the value of reducing water consumption and utilizing water conservation products and techniques.	Conservation groups, PA, DCNR, Conservation Districts	WREN, PA DEP, OhioEPA, Foundations, Private Sources	Medium
Upgrade antiquated water service lines to eliminate wasteful leaks.	Municipalities, Planning Departments	PENNVEST, PA DEP, RUS	High

Wetlands

Encourage interstate collaboration on standardizing methods used to delineate and identify wetlands.	PA DEP, OhioEPA	PA DEP, OhioEPA	Medium
Protect wetland habitats for their many uses and benefits.	Conservation groups, PGC, Conservation Districts	PA DEP, OhioEPA, PA DCNR, ODNR, US EPA	High
Update wetland maps, and assess wetlands in the watershed for the purpose of prioritizing future conservation projects.	Conservation groups, Conservation Districts	PA DEP, OhioEPA	Medium
Expand outreach to municipal and county officials for planning and implementation of future wetland mitigation and the establishment of new wetlands.	Planning Departments, Municipalities, PENNDOT, ODOT	PA DEP, OhioEPA	Medium
Inventory and monitor wetland plants and animals; take action when and where necessary to eradicate any invasive species.	PA DEP, Conservation Districts, NRCS, Conservation groups	PA DEP, OhioEPA, Foundations, Private Sources	Low
Educate landowners about the importance of wetlands for habitat and water quality.	PA DEP, Conservation Districts, NRCS, PA DCNR, Conservation groups, Landowners	PA DEP, OhioEPA, Foundations, Private Sources	High
Encourage state acquisition of important wetlands for protection of groundwater recharge areas.	Conservation Districts, NRCS, PA DCNR, ODNR, OhioEPA, Conservation groups	PA DCNR, ODNR, Foundations, Private Sources	Medium

Water Resources (continued)

Issue and Recommended Approaches	Potential Partners	Potential Funding	Priority
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Wetlands (continued)

Enhance/promote programs that restore wetlands to agricultural areas of limited value.	Conservation Districts, NRCS, PA DCNR, ODNR, OhioEPA, Conservation groups	PA DCNR, ODNR, Foundations, Private Sources	Medium
Stop the conversion of wetlands to non-wetland uses.	Conservation Districts, PA DEP, PA DCNR, OhioEPA, Conservation groups, Planning Commissions, Developers	N/A	High
Inventory and monitor wetland flora and fauna at West Park Nature Center.	PA DEP, Lawrence Conservation District, NRCS, Conservation groups	PA DEP, Foundations, Private Sources	Low
Study the impacts that economic development has had on historical wetland loss.	Conservation groups, Colleges & Universities	Foundations, Private Sources	Medium

Floodplains

Update and strengthen the enforcement of municipal floodplain ordinances.	Municipalities	FEMA, DCED	High
Conduct a detailed flood-prone area assessment, and update floodplain maps.	Conservation groups, Municipalities	PA DEP, OhioEPA, FEMA, Foundations, Private Sources	High
Develop educational programs on flood prevention and recovery.	Conservation groups, Municipalities	PA DEP, OhioEPA, FEMA, Foundations, Private Sources	Medium
Acquire properties that are frequently impacted by serious flooding and convert them to public open space such, as parks, natural areas, or State Game Lands.	Conservation groups, Municipalities	PA DCNR, ODNR, USACE, FEMA	Low
Encourage non-structural approaches to floodplain management.	Conservation Districts, PA DEP, FEMA	PA DEP, OhioEPA, FEMA, Foundations, Private Sources	High
Establish adequate vegetation and floodplain integrity to limit degradation of water quality and biological resources.	Conservation groups, Municipalities, PA DEP, Landowners	PA DEP, Foundations, Private Sources	High
Partner with community organizations and landowners to maintain culverts free of debris to alleviate flooding.	Conservation groups, Landowners, Municipalities	Municipalities	Medium

Water Resources (*continued*)

Issue and Recommended Approaches	Potential Partners	Potential Funding	Priority
Riparian Buffers			
Protect and enhance existing riparian buffers to achieve maximum protection of water resources.	Conservation groups, Municipalities, PA DEP	PA DEP, Foundations, Private Sources	High

Establish riparian buffers along all types of waterways following the guidelines in Figure 3-10.	Conservation groups, PGC, Conservation Districts, Landowners	PA DEP, OhioEPA, Foundations, Private Sources, CREP	Medium
Educate all watershed stakeholders about the importance of riparian corridors.	Conservation groups, PGC, Conservation Districts, Landowners	PA DEP, Foundations, Private Sources	High

Lake Management

Control and mitigate exotic species that directly affect lake uses.	Conservation Groups, Conservation Districts	PA DEP, OhioEPA, Foundations, Private Sources	Medium
Assess and inventory lakes in the watershed for size, use, and water quality.	Conservation Groups, Conservation Districts, Colleges & Universities	PA DEP, OhioEPA, Foundations, Private Sources	Medium
Study water quality in Pymatuning Reservoir and Shenango River Lake to determine causes of nutrient loading and subsequent sources of taste and odor issues.	Conservation Groups, Conservation Districts, Colleges & Universities	PA DEP, OhioEPA, Foundations, Private Sources	High
Conduct a study of Mud and Crystal Lakes to document and protect their unique qualities as rare glacial lakes.	Conservation Groups, Colleges & Universities	PA DEP, OhioEPA, Foundations, Private Sources	Medium

Water Pollution

Educate homeowners about the significance of water-use designations and ways to minimize non-point source pollution (Ex. Environmentally sensitive lawn and landscape maintenance).	PA DEP, Conservation Districts, Conservation groups, Citizens	PA DEP, OhioEPA, WREN	Medium
Develop and implement education workshops and/or outreach programs about point source pollution, how to report point source violations, and how to research permit information.	Conservation Districts, Conservation groups, PA DEP, OhioEPA	PA DEP, OhioEPA, WREN, Foundations, Private Sources	Medium
Encourage the transfer of permit violation fees to a local organization for water quality improvements within the watershed.	PA DEP, OhioEPA, Conservation groups	PA DEP, OhioEPA	Medium
Work with PA DEP and OhioEPA to develop TMDLs on all impaired streams.	PA DEP, OhioEPA, Conservation groups	PA DEP, OhioEPA	Medium

Water Resources (*continued*)

Issue and Recommended Approaches	Potential Partners	Potential Funding	Priority
Water Pollution (<i>continued</i>)			
Implement TMDLs that have been developed.	PA DEP, OhioEPA, Conservation groups	PA DEP, OhioEPA	Medium

Encourage the establishment and maintenance of wetlands and riparian vegetation as cost-effective means of non-point source pollution reduction.	PA DEP, OhioEPA, Conservation groups	PA DEP, OhioEPA	High
Support updates to and utilize the Pennsylvania Non-Point Source Management Plan	PA DEP, Conservation Districts, Conservation groups, Municipalities	PA DEP	Medium
Support and strengthen the water quality trading program to improve overall water quality and industrial discharges.	PA DEP, Legislators, Conservation groups, Businesses & Industry	PA DEP, Legislators	Low

Stormwater

Complete and implement an Act 167 stormwater management plan for the Shenango River watershed.	Municipalities	PA DEP	High
Utilize the developed Act 167 plan to produce stormwater ordinances.	Municipalities	PA DEP	High
Minimize the amount of impervious cover created by development by implementing stormwater best management practice recommendations made by the Center for Watershed Protection from their Eight Tools of Watershed Protection.	Municipalities, Conservation groups, Landowners	PA DEP, OhioEPA, ODNR, Foundations, Private Sources	High
Increase local, state, and federal funding for adequate stormwater management facilities.	Conservation groups, Municipalities	PA DEP, OhioEPA, ODNR, Foundations, Private Sources	High
Work with PENNVEST to address current water and wastewater issues.	Municipalities	PENNVEST, Private Sources	Medium
Continue educational outreach to municipal and county officials about planning for future stormwater best management practice implementation.	Municipalities, Planning Departments	PA DEP, OhioEPA, ODNR, Foundations, Private Sources	High
Protect those watersheds with 10 percent or less impervious cover.	PA DEP, Conservation groups, OhioEPA, Municipalities, Planning Departments, Conservation Districts	PA DEP, OhioEPA, Foundations, Private Sources	High

Water Resources (*continued*)

Issue and Recommended Approaches	Potential Partners	Potential Funding	Priority
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Stormwater (*continued*)

Employ watershed protection and stormwater management techniques in stormwater-impacted watersheds.	PA DEP, Conservation groups, OhioEPA, Municipalities, Planning Departments, Conservation Districts	PA DEP, OhioEPA, Foundations, Private Sources	High
Inventory individual watersheds to determine percent impervious cover and stormwater impacts.	PA DEP, OhioEPA, Municipalities, Planning Departments, Conservation Districts, Conservation groups	PA DEP, OhioEPA, Foundations, Private Sources	Medium
Employ restoration efforts to improve water and habitat quality in those watersheds considered damaged from stormwater runoff.	PA DEP, OhioEPA, Municipalities, Planning Departments, Conservation Districts, Conservation groups	PA DEP, OhioEPA, Foundations, Private Sources	Medium
Employ pollution prevention techniques in those (urbanized) watersheds containing over 60 percent impervious cover.	PA DEP, OhioEPA, Municipalities, Planning Departments, Conservation Districts, Conservation groups	PA DEP, OhioEPA, Foundations, Private Sources	Medium

Erosion and Sedimentation

Implement streamside stabilization improvement projects using bioremediation techniques.	Conservation groups, Conservation Districts	PA DEP, OhioEPA, Foundations, Private Sources	Medium
Promote tax incentives and cost-share programs for streambank fencing, barnyard stabilization, and other BMPs.	Conservation groups, Conservation Districts, Landowners	PA DEP, OhioEPA, Foundations, Private Sources, CREP	High
Utilize Munnell Run Farm to demonstrate agricultural BMPs and educate landowners about conservation practices.	Conservation groups, Farmers, Conservation Districts	PA DEP, Foundations, Private Sources	Medium
Increase local, state, federal, and private funding to continue the Riparian Restoration Protection Initiative in the watershed.	Partners for Fish and Wildlife	PA DEP, Foundations, Private Sources	High
Continue support of and municipal participation in the Dirt and Gravel Roads Program to reduce erosion and sedimentation.	Conservation Districts, Municipalities	PA DEP	Medium
Reduce erosion and sedimentation by incorporating BMPs in all earth-moving activities, including logging, construction and development, and natural resource extraction.	Conservation Districts	PA DEP, OhioEPA	High

Water Resources (*continued*)

Issue and Recommended Approaches	Potential Partners	Potential Funding	Priority
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Sewage

Upgrade sanitary sewer systems to eliminate CSOs, specifically in Sharon, Hermitage, Kinsman, Brookfield, and Hubbard.	Municipalities, DCED	DCED, Foundations, Private Sources	Medium
Lobby for increased state and federal funding for the implementation of adequate sewage treatment and septic facilities.	Conservation groups, Landowners	PA DEP, OhioEPA, Foundations, Private Sources	High
Encourage PA DEP to approve more alternative sewage treatment types in rural areas; construct demonstration sites for alternative systems; and develop outreach information.	Conservation groups, Rural Landowners	PA DEP	Medium
Work with local sewage enforcement officers, PA DEP, and municipalities to regularly update and enforce Act 537 Sewage Plans.	Municipalities, PA DEP	PA DEP	Medium
Provide programs for homeowners about maintenance and repair of on-lot sewage systems.	Municipalities, PA DEP, OhioEPA, Homeowners, ODNR	PA DEP, OhioEPA, ODNR	High
Perform a watershed-wide assessment of on-lot and municipal sewage systems to identify raw sewage discharges, combined sewage overflows, and sanitary sewage overflows.	PA DEP, OhioEPA, Conservation Districts, Conservation groups, Municipalities	PA DEP, OhioEPA, Foundations, Private Sources	Medium
Encourage installation of community sewage systems in residential development areas, following the model from Broad Top Township, Bedford County, PA.	PA DEP, OhioEPA, Conservation Districts, Conservation groups, Municipalities	PA DEP, OhioEPA, Foundations, Private Sources	Medium
Establish and/or continue cost-share programs similar to that in Trumbull County to assist homeowners in septic repair, maintenance, and replacement.	PA DEP, OhioEPA, Conservation Districts, Conservation groups, Municipalities	PA DEP, OhioEPA, Foundations, Private Sources	Medium

Agriculture

Encourage farmers to take advantage of current cost-share programs to implement BMPs.	Farm Bureaus, Conservation groups, Cooperative Extensions	PA DEP, OhioEPA, CREP, Foundations, Private Sources	High
Encourage farmers to develop nutrient management plans to boost productivity and protect water resources.	Farmers, Farm Bureaus, Conservation Districts, Cooperative Extension	NRCS, Foundations, Private Sources	Medium
Secure additional funding for agricultural BMPs.	PA DEP, Farmers, Farm Bureaus, Conservation Districts, Cooperative Extension, Legislators	PA DEP, NRCS, Foundations, Private Sources	Medium

Water Resources (continued)

Issue and Recommended Approaches	Potential Partners	Potential Funding	Priority
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Agriculture (continued)

Encourage the establishment and maintenance of wetlands and riparian vegetation as cost-effective means of non-point source pollution	PA DEP, Farmers, Farm Bureaus, Conservation Districts, Cooperative	PA DEP, NRCS, Foundations, Private Sources	High
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reduction.	Extension		
Encourage extensive use of pasture on animal-dependent farms (ex. dairy and beef) to minimize the concentration of animals in feedlots.	Project Grass, Cooperative Extensions, Farm Groups	USDA	Medium
Encourage diverse farming operations that are environmentally responsible and economically viable.	PASA, Conservation Districts, Cooperative Extensions, Farm Groups	PASA, Foundations	Medium

Monitoring

Host workshops or trainings for adult and student volunteers about stream monitoring.	PA DEP, Conservation Districts, Conservation Groups, Colleges and Universities	PA DEP, OhioEPA, Foundations, Private Sources	Medium
Conduct sub-basin watershed assessments and develop restoration plans.	PA DEP, NRCS, Conservation Districts, Conservation Groups	PA DEP, OhioEPA, Foundations, Private Sources	Medium
Conduct seasonal chemical, biological, and visual assessments for at least one year to provide background data for prioritization of future projects.	Conservation Districts, Conservation Groups, Colleges & Universities	PA DEP, OhioEPA, Foundations, Private Sources	High
Increase local and state funding to continue watershed monitoring efforts currently being conducted, in particular for the RRPI, local educational institutions, and the Shenango River Watchers.	Conservation Districts, Conservation Groups	PA DEP, OhioEPA, Foundations, Private Sources	Medium
Monitor the biochemical oxygen demand above and below sewage effluents.	Conservation Groups, Conservation Districts, School Districts, PA DEP, OH EPA, Colleges and Universities	PA DEP, OH EPA, US EPA, Private Sources, Foundations	Low
Compare new monitoring results to older monitoring results to check for changes in conditions either positive or negative.	Conservation Groups, Conservation Districts, School Districts, Colleges and Universities,	Private Sources, Foundations	Medium

Water Resources (continued)

Issue and Recommended Approaches	Potential Partners	Potential Funding	Priority
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Source Water

Develop a locally based program for disseminating information about protecting private well supplies to homeowners.	Conservation Districts, Conservation Groups, Homeowners, PA DEP, OhioEPA, Master Well Owners, Cooperative Extensions	PA DEP, OhioEPA, WREN, Foundations, Private Sources	High
Educate homeowners about effects that overuse of fertilizer, pesticide, and herbicide has on groundwater.	Conservation Groups, Homeowners, PA DEP, OhioEPA, NRCS	PA DEP, OhioEPA, WREN, Foundations, Private Sources	High
Educate community residents and water suppliers about potential threats to the public water supply.	Conservation Groups, Conservation Districts, PA DEP, OhioEPA, Municipalities	PA DEP, OhioEPA, WREN, Foundations, Private Sources	Medium
Partner with water suppliers to identify the source of the taste and odor issues of public drinking water.	Water Suppliers, Conservation Groups, Conservation Districts	PA DEP, OhioEPA, WREN, Foundations, Private Sources	Medium
Promote groundwater quality awareness when conducting education and outreach programs for the watershed.	PA DEP, Conservation Districts, Conservation Groups	PA DEP, OhioEPA, WREN, Foundations, Private Sources	Medium
Develop Source Water Protection Plans for all public water supplies.	Conservation Districts, Conservation Groups	PA DEP, OhioEPA, WREN, Foundations, Private Sources	Medium

Other

Study and monitor the effects of gas well drilling on surface and groundwater to determine its impact on water quality; work to minimize those impacts.	Conservation Districts, Conservation Groups, PA DEP	PA DEP, WREN, Foundations, Private Sources	Medium
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Biological Resources

Issue and Recommended Approaches	Potential Partners	Potential Funding	Priority
Wildlife and Biodiversity			
Develop areas for wildlife viewing and education to raise awareness about the high biodiversity in the watershed.	Colleges & Universities, PA DCNR, Conservation groups, PGC, Conservation Districts, Municipalities, Munnell Run Farm	PGC, Private Sources, USFWS, Foundations	Medium
Encourage diversified farms that provide food and cover for wildlife.	Colleges & Universities, PA DCNR, Conservation groups, PGC, Conservation Districts, Municipalities, Munnell Run Farm	USDA, PDA, PA DEP	Medium
Develop stronger partnerships between organizations to discuss the threats to natural resources and develop protection strategies; this may include regular meetings with numerous conservation groups.	NRCS, Conservation and Sportsmen Organizations, Conservation Districts, PA DCNR	Private Sources	Medium
Educate citizens about biological diversity and the vital importance of habitats in protecting species.	Conservation Groups, Conservation Districts, PGC, PA DCNR, PA DEP, OhioEPA, ODNR, PFBC, PABS	PA DEP, PA DCNR, OhioEPA, ODNR, Foundations, Private Sources	High
Improve aquatic life habitat for fish, mussels, and other organisms by implementing best management practices and other restoration activities.	Conservation groups, Conservation Districts, PFBC, PA DCNR	USFWS, PFBC, ODNR, Foundations, Private Sources	Medium
Monitor aquatic and terrestrial trends in biodiversity.	PGC, PFBC, Conservation groups, Colleges & Universities, School Districts, PA DCNR	USFWS, PFBC, ODNR, Foundations, Private Sources	Medium

Important Habitats Areas

Continue to make the Shenango River upstream and downstream of Kidd's Mills Bridge a priority for restoration and protection through BMP programs, reduction of road runoff, and establishment of better flow regimes.	PA DEP, Mercer County Conservation District, Conservation Groups	PA DEP, Foundations, Private Sources	High
Develop a program or means through which landowners can obtain conservation easements for biologically diverse areas on their properties.	Conservation groups, Landowners	Foundations, Private Sources	High

Biological Resources (*continued*)

Issue and Recommended Approaches	Potential Partners	Potential Funding	Priority
Important Habitat Areas (continued)			
Work to ensure that the tax advantages of granting conservation easements remain as an encouragement to landowners.	Conservation groups, Legislators	Private Sources, Foundations	Medium
Develop an incentive program to encourage and reward landowners who develop management plans, decrease development, and employ other conservation practices in and around riparian corridors and biologically diverse areas.	Conservation Districts, Conservation groups, Municipalities, Planning Departments, Landowners	PA DCNR, ODNR, Foundations, Private Sources	Medium
Establish more private backyard conservation areas to serve as wildlife habitat and travel corridors by providing activities and programs for landowners.	PA DCNR, ODNR, PGC, National Wildlife Federation, Conservation groups, Landowners	PGC, Foundations, Private Sources, USFWS, ODNR	High
Identify and protect additional environmentally sensitive areas and areas of high biodiversity.	Conservation groups, PA DCNR, ODNR	PA DCNR, ODNR, Foundations, Private Sources	High
Increase habitat and passage for fish, mussels, and other aquatic organisms by removing dams on small tributaries and maintaining stable flow regimes downstream from Pymatuning and Shenango Reservoirs.	Conservation groups, PFBC, ODNR	PFBC, Foundations, Private Sources, ODNR	Medium
Maintain old fields in state, county, and public parks for grassland species through practices such as controlled burns and limited mowing activity.	PA DCNR, ODNR, Municipalities, Conservation groups	Municipalities, PA DCNR, ODNR	High
Modify municipal ordinances to protect wetland areas of biological importance, such as Pennsy, Celery, and Black Swamp Important Bird Areas.	Municipalities, PGC	Private Sources	High
Preserve natural habitats using smart land-use planning strategies that set aside open space for wildlife corridors.	Planning Departments, PGC, Conservation groups	PGC, Foundations, Private Sources, USFWS, ODNR	High
Protect wetland habitats for birds and wildlife by limiting development, storm runoff, and other disturbances in wetland areas and buffers surrounding them.	Conservation Districts, NRCS, Conservation groups, PGC, ODNR	PGC, Foundations, Private Sources, USFWS, ODNR	Medium
Preserve important habitats such as Otter Creek swamp.	Conservation groups, PA DCNR, ODNR, PGC	Foundations, Private Sources, PA DCNR, ODNR, Conservation groups	High

Biological Resources (continued)

Issue and Recommended Approaches	Potential Partners	Potential Funding	Priority
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Deer Management

Promote and support deer management strategies such as special hunting tags and deer enclosures in natural areas.	Conservation Groups, PGC, ODNR	PGC, ODNR, Private Sources	Low
Sponsor outreach programs about deer management strategies and practices for private landowners.	Conservation Groups, PGC, ODNR	PGC, ODNR, Private Sources	Low
Work with sportsmen groups and landowners to eliminate “No Hunting” areas.	Conservation Groups, PGC, Legislature, Landowners	Legislature, Private Sources	Medium

Riparian Areas

Encourage streamside property owners to leave a minimum 15-foot buffer from the edge of the stream when mowing their lawn.	Conservation Groups, Conservation Districts, Landowners	PA DEP, OhioEPA, Foundations, Private Sources	High
Increase habitat by planting riparian buffers or allowing them to grow back through streambank fencing programs.	Conservation Groups, Conservation Districts, Landowners, NRCS	PA DEP, OhioEPA, Foundations, Private Sources	High
Promote the preservation of riparian areas through education about their benefits for wildlife, flood prevention, and groundwater supplies.	Conservation Groups, Conservation Districts, Landowners, PA DEP	PA DEP, OhioEPA, Foundations, Private Sources	High

County Natural Heritage Inventories

Develop a land steward program for Biological Diversity Areas through which volunteers would be responsible for regular monitoring of these areas and educating landowners.	Conservation Groups, WPC	Foundations, Private Sources	High
Develop more detailed management plans by working with landowners of biologically diverse areas, including inventories of natural features and invasive or exotic species monitoring plans for the properties.	Conservation Groups, PA DCNR, ODNR, Landowners	PA DCNR, ODNR, Foundations, Private Sources	Medium
Educate the public about the use and purpose of County Natural Heritage Inventories in planning, with an additional focus on understanding the importance of the natural resources that exist.	WPC, Municipalities, Planning Departments, PA DCNR	PA DCNR, Foundations, Private Sources	High
Incorporate County Natural Heritage Inventories into municipal plans.	WPC, Municipalities, Planning Departments	Private Sources	High
Study and expand areas to be included in natural heritage inventories as Biological Diversity Areas.	WPC, Municipalities, Planning Departments, PA DCNR, Conservation groups	PA DCNR, Foundations, Private Sources	High

Biological Resources (continued)

Issue and Recommended Approaches	Potential Partners	Potential Funding	Priority
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Rare, Threatened or Endangered Species

Develop monitoring strategies and management plans for species of concern that are particularly vulnerable to habitat destruction by working with the Pennsylvania Natural Heritage Program.	Conservation Groups, PFBC, PA DCNR, PGC, WPC	Foundations, Private Sources, USFWS, PFBC, PA DCNR, PGC	High
Protect habitats that support threatened and endangered species and species of concern through acquisition, easements, and/or landowner education.	Conservation Groups, PFBC, PA DCNR, PGC, ODNR	Foundations, Private Sources, USFWS, PFBC, PA DCNR, PGC, ODNR	High
Establish a reserve of native seed species to teach residents to identify rare, threatened, or endangered species native to the region.	Conservation Groups, Colleges and Universities, School Districts	PA DCNR, ODNR, Foundations, Private Sources	Medium

Other

Provide educational programs for municipal officials about land-use planning that incorporates conservation goals to make communities more attractive and protects biodiversity.	Conservation Groups, Planning Departments, Municipalities	PA DEP, OhioEPA, Foundations, Private Sources	Medium
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Invasive Species

Compile an Internet database of exotic and invasive species sightings within the watershed that can be accessed and added to by the public.	Conservation Groups, PA DEP, OhioEPA, PABS, PA DCNR, ODNR	PA DCNR, ODNR, Foundations, Private Sources	Medium
Conduct a watershed-wide invasive species plant survey by subwatershed to develop a list of areas where invasive species pose the greatest threats to biodiversity.	Conservation Groups, PABS, PA DCNR, ODNR	PA DCNR, ODNR, Foundations, Private Sources	Medium
Develop an eradication strategy for removing invasive species, especially from high-quality areas or areas where an invasive species is expanding its territory.	Conservation Groups, PA DEP, OhioEPA, PABS, PA DCNR, ODNR	PA DCNR, ODNR, Foundations, Private Sources	Medium
Develop monitoring plans for invasive species on private properties by working with landowners, especially those whose properties contain high-quality natural communities.	Conservation Groups, PA DEP, OhioEPA, PABS, PA DCNR, ODNR	PA DCNR, ODNR, Foundations, Private Sources	Medium
Identify and eradicate invasive species at West Park Nature Center.	Conservation Groups, Lawrence Conservation District, PA DCNR	PA DCNR, Foundations, Private Sources, PA DEP	Medium

Biological Resources (continued)

Issue and Recommended Approaches	Potential Partners	Potential Funding	Priority
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Native and Sensitive Plants

Encourage the use of native plants in landscaping and wildlife habitat plantings.	Conservation Groups, PABS	Foundations, Private Sources	High
Promote native tree plantings in streambank fencing projects.	Conservation Groups, PABS	PA DEP, Foundations, Private Sources	High
Establish a reserve of native seed species that can be used in remediation efforts such as riparian corridors and streambank stabilization projects.	Conservation Groups, PABS, PA DCNR, ODNR, Colleges and Universities	PA DCNR, ODNR, Private Foundations, Private Sources	Medium
Utilize native plantings at West Park Nature Center for landscaping, beautification, and educational activities.	Conservation Groups, Lawrence Conservation District	PA DEP, PA DCNR, Private Sources, Foundations	Medium

Cultural Resources

Issue and Recommended Approaches	Potential Partners	Potential Funding	Priority
Environmental Education			
Educate developers, planners, and municipal officials about environmentally friendly development.	Municipalities, Planning Departments, Conservation Districts	Private Sources, Foundations	High
Promote environmental education campaigns such as "Everybody lives downstream" and storm drain stenciling.	Conservation groups, School Districts	WREN, PA DEP	High
Secure local, state, federal, and private funding to provide environmental education programs for municipal officials, watershed residents, businesses, and school-aged children about the importance of watershed protection, watershed issues, and the value of natural resources.	Municipalities, Landowners, Conservation Districts, Conservation groups, School Districts	PA DEP, OhioEPA, Private Sources, Foundations	High
Utilize and develop West Park Nature Center for environmental education opportunities.	Lawrence Conservation District, PA DEP, PA DCNR, School Districts, Colleges and Universities, Conservation groups	PA DEP, PA DCNR, Private Sources, Foundations	Medium
Continue development of Munnell Run Farm as an ecological and agricultural education center.	Mercer Conservation District, PA DEP, PA DCNR, School Districts, Colleges and Universities, Munnell Run Farm Foundations, Conservation groups, Mercer County Historical Society	PA DEP, PA DCNR, Private Sources, Foundations, USDA, PDA	Medium

Historical Preservation

Establish driving, walking, and/or biking tours highlighting historical sites and structures to increase awareness of local historical sites, structures, and history.	Tourist Bureaus, Historical Societies, Citizens, Chambers of Commerce, Related Businesses, National Trust for Historic Preservation	PHMC, Private Sources, Foundations	Medium
Increase local, state, federal, and private funding for historic preservation.	Historical Societies, Chambers of Commerce, Businesses, National Trust for Historic Preservation	Private Sources, Foundations	Medium
Partner with county and local historical societies to preserve existing historical sites and structures such as the canal lock in Pulaski.	Related Businesses, Preservation Historical Societies, Organizations, National Trust for Historic Preservation	PHMC, Private Sources, Foundations	High

Cultural Resources *(continued)*

Issue and Recommended Approaches	Potential Partners	Potential Funding	Priority
Historical Preservation (continued)			
Work with Pennsylvania Historic Museum Commission, individuals, and agencies to determine if local historical sites and structures could be added to the National Register.	National Park Service, PHMC, Historical Societies, National Trust for Historic Preservation	PHMC, Private Sources, Foundations	Medium
Marketing Recreation			
Identify local, state, federal, and private funding to promote ecotourism.	PA DCNR, ODNR, Tourist Bureaus, Conservation & Recreation Organizations	Private Sources, Foundations, PA DCNR, Businesses, ODNR	Medium
Promote tourism utilizing available natural and recreational resources.	Conservation & Recreation Organizations, Tourist Bureaus	Private Sources, Foundations, Businesses, PA DCNR, ODNR	Medium
Utilize river resources for recreation opportunities.	Tourist Bureaus, PFBC, Recreation & Conservation groups, PA DCNR	Private Sources, Foundations, PA DCNR, Businesses	Medium
Recreational Opportunities			
Develop additional public access sites to the Shenango River and some of its tributaries, including adequate parking and amenities.	PA DCNR, PFBC, ODNR, Recreation & Conservation groups, USACE	PA DCNR, ODNR, USACE, Private Sources, Foundations	Medium
Enhance existing community parks with updated equipment.	Municipalities, Recreation Organizations	PA DCNR, Private Sources, Foundations	Medium
Enhance recreational facilities to be multi-use facilities providing a variety of activities and amenities.	PA DCNR, Municipalities, ODNR, Conservation & Recreation Organizations	PA DCNR, ODNR, Foundations, Private Sources	Medium
Establish community parks in municipalities that currently do not have recreational facilities.	Municipalities, PA DCNR, Recreation Organizations	PA DCNR	Medium
Establish year-round recreational opportunities.	PA DCNR, ODNR, USACE, Sportsmen & Recreation Organizations	PA DCNR, ODNR, USACE, Private Sources, Foundations	Medium
Identify and protect areas open to hunting.	Sportsmen & Conservation groups, ODNR, PGC	PGC, PA DCNR, ODNR, Foundations, Private Sources	Medium
Increase local, state, federal, and private funding for establishing and maintaining multi-use parks, providing access to waterways, maintaining open space, and maintaining area fisheries.	Conservation Districts, Conservation & Recreation Organizations	PA DCNR, ODNR, PFBC, Foundations, Private Sources	Medium

Cultural Resources (continued)

Issue and Recommended Approaches	Potential Partners	Potential Funding	Priority
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Recreational Opportunities (Continued)

Encourage landowners to allow hunting on their properties and educate hunters on the importance of land etiquette	Sportsmen, ODNR, PGC	PGC, PA DCNR, ODNR, Private Sources	High
Protect and improve area waterways to maintain fisheries.	ODNR, PA DEP, Sportsmen & Conservation groups, PFBC, Conservation Districts	PFBC, PA DEP, OhioEPA, ODNR	Medium
Work with private landowners to provide access to waterways for anglers and small non-powered watercraft.	Landowners, PFBC, ODNR, Conservation groups	PA DCNR, Private Sources, Foundation	Medium
Remove some low head dams to increase canoeing and kayaking and natural fish passage.	PA DEP, PFBC, Conservation groups	PA DEP	Low

Trails

Conduct feasibility studies for the development of recreational areas and trails for off-road vehicles.	Trail Groups, ORV Riders, Municipalities, Counties	PA DCNR, ODNR	Low
Convert abandoned rail lines into multi-use trails.	Trail Groups, Landowners, Conservation groups	PA DCNR, ODNR	Medium
Develop additional trailheads on existing trails.	Trail Groups, Conservation groups, Counties, Municipalities	PA DCNR, ODNR	Medium
Educate off-road vehicle riders to recreate in an environmentally sound manner.	ORV Riders, PA DCNR, ODNR, USFS	PA DCNR, ODNR	High
Establish a network of multi-use trails by connecting existing and new trails together.	Municipalities, Trail Groups, Conservation groups	PA DCNR, ODNR	Medium
Establish environmentally sound public trails or parks for off-road vehicles.	ORV Riders, Trail Groups, PA DCNR, ODNR	PA DCNR, ODNR	Medium
Establish water trails on Neshannock Creek and the Shenango River.	Conservation groups, PFBC, ODNR, PA DCNR	PFBC, PA DCNR, ODNR	High
Increase local, state, federal, and private funding for trail maintenance and development.	Conservation & Recreation Organizations, Trail Groups	Private Sources, Foundations	High
Increase safety for trails along roadways by erecting signs alerting motorists to trails and trail crossings, and offering trail safety seminars to trail users.	Trail Groups, PENNDOT, ODOT, Municipalities, Counties	Private Sources, Foundations	Medium
Maintain trail paths whether water or land free of debris for the safety of those utilizing the resources available.	Trail Groups, PFBC, Conservation Organizations, Citizens	PA DCNR, ODNR, Foundations, Private Sources	Medium

<p>Establish a bike trail and loop around Linesville using abandoned rail lines and Pymatuning State Park.</p>	<p>Trail Groups, Citizens, Municipalities, Businesses, Conservation & Recreation Organizations</p>	<p>PA DCNR</p>	<p>Medium</p>
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APPENDIX A. GLOSSARY

303(d) List	A listing of Pennsylvania streams that have not met or cannot maintain required water quality standards. See Integrated Waterbody List.
305(b) Report	A listing of Pennsylvania streams that have documented water quality issues. See Integrated Waterbody List.
Abandoned Mine Drainage	A groundwater discharge that emanates from former underground or surface mines.
Acid	Having a pH less than 7.
Acidity	The capacity of water for neutralizing a basic solution.
Agricultural Security Areas	Lands enrolled in a statewide program that has been established to promote the conservation and preservation of agricultural lands and the agricultural community.
Alkaline	Having a pH greater than 7.
Alkalinity	Buffering capacity; the ability to resist pH change.
Alluvial	Pertains to the environments, processes, and products of streams or rivers. Materials deposited by flowing water are referred to as alluvial deposits.
Bedrock	The solid rock that underlies the soil and other unconsolidated material, or that is exposed at the surface.
Best Management Practices	Refer to the most environmentally appropriate techniques for agriculture, forestry, mining, development, urban stormwater management, and other practices that are potential threats to natural resources.
Biodiversity	The number and variety of organisms found within a specified geographic region, or a particular habitat; the variability among living organisms on the earth, including the variability within and between species and within and between ecosystems.
Bog	Peatland that has virtually no contact with groundwater.

Brownfield	A piece of industrial or commercial property that is abandoned or underused and often environmentally contaminated, especially one considered as a potential site for redevelopment.
Buffer	To cushion, shield, or protect; any substance capable of neutralizing both acids and bases in a solution without appreciably changing the solution's original acidity or alkalinity.
Channelization	The physical cutting or forming of a desired channel or path to direct a stream or river.
Colluvial	Of or pertaining to loose earth material that has accumulated at the base of a slope.
Colluvium	Deposited at the edge of the slope.
Combined Sewage Overflows	Exceeding the capacity of a sanitary sewage system allowing untreated wastewater to be discharged to the stream.
Comprehensive Plan	A general policy guide for the physical development of a municipality, taking into account many factors, including locations, character, and timing of future development.
Confluence	The meeting of two waterways.
Coniferous Forest	A forest consisting primarily of trees that are evergreen.
Conservation	The maintenance of environmental quality and physical, biological, and cultural resources; ecosystem management within given social and economic constraints; producing goods and services for humans without depleting natural ecosystem diversity, and acknowledging the natural dynamic character of biological systems.
Conservation Easement	A deed restriction that landowners can voluntarily place on their properties to protect natural resources.
Contamination	The act of making impure or unsuitable by contact or mixture with something unclean, bad, etc.
Critical Areas	Areas that have constraints that limit development and various other activities.
Cropland	Land used for cultivating crops.

Cultivation	Preparation and use of land for crops.
Deciduous Forest	A forest consisting primarily of trees that shed their leaves annually.
Dendritic Drainage Pattern	A drainage pattern of a branching form.
Drumlins	Clusters of elongated hills of unstratified mixtures of clay, silt, sand, gravel, and boulders.
Easement	A deed restriction that a landowner may voluntarily place on a property to protect its future uses.
Ecology	The study of the interrelationships among and between organisms, and between them and all aspects, living and nonliving, of their environments.
Elevation	The height above sea level of a location.
Encroachment	The act of advancing beyond established or proper limits.
Environmental Education	A learning process that increases knowledge and awareness of the environment and associated challenges, develops skills and expertise to address these challenges, and fosters attitudes, motivation, and commitment to make informed decisions and take responsible actions.
Envirothon	An environmental competition among high school students.
Ephemeral Streams	Streams that flow for a short time, usually after a rain or snowmelt event.
Erosion	The mechanical transfer by water and air of soils and rocks that have been weathered into finer particles.
Eskers	A sinuous ridge of sediment, typically gravel or sand, deposited by streams that cut channels under or through a glacier's ice.
Fauna	Animal life.
Fens	Nutrient rich, high alkalinity, wetlands composed of decaying matter.

Floodplains	The level land along the course of a river or stream formed by the deposition of sediment during periodic floods.
Flora	Plant life.
Fluvial	Of or pertaining to rivers or streams.
Fragipan	Dense subsoil that roots cannot penetrate.
Fragmentation	Broken or split into several pieces or portions.
Geology	The study of the development of the earth's crust, including rocks, fossils, etc.
Glaciers	A river of ice moving very slowly.
Greenway	A corridor of open space.
Groundwater	Water beneath the earth's surface; found in pore spaces in rock material. Supplies wells and springs as a source of drinking water for many; also contributes to surface water.
Hazardous Areas	Those areas that pose danger, risk, or difficulty.
Headwaters	Refers to upstream reaches of a stream or river.
Herpetological	Dealing with reptiles and amphibians.
Hydrology	The study of the movement of water on the earth; includes surface water and groundwater.
Illegal Dumps	Sites where trash and other unwanted items are disposed of illegally. Typically along streams and roadways.
Impervious Cover	Material that covers the land that water cannot penetrate.
Important Bird Areas	Those areas protected for outstanding avian habitat as determined by a group of scientific advisors, based on strict scientific criteria. IBAs include migratory staging areas, winter feeding and roost sites, and prime breeding areas. They also include critical habitats, such as grasslands, bogs, marshes, and bottomland hardwood swamps.

Impoundment	Usually refers to a manmade body of water, often through damming a stream or river.
Infrastructure	The basic facilities, services, and installations needed for the functioning of a community or society, such as transportation and communications systems, water, sewer, and power lines, and public institutions, including schools, post offices, and prisons.
Integrated Waterbody List	An integrated format for Clean Water Act Section 305(b) reporting and Section 303(d) listing. This document contains summaries of various water quality management programs including water quality standards, point source control and non-point source control. It also includes descriptions of programs to protect lakes, wetlands, and groundwater quality, and a summary of the use support status of streams and lakes.
Invasive Species	Environmentally noxious weeds that grow aggressively, spread easily, and displace other plants.
Kames	Deposits that are formed when running water and stagnant ice come into contact.
Kettles	Blocks of ice left behind on outwash plains by retreating glaciers, or outburst floods from ice-dammed glacial lakes caused by collapse of the ice dam.
Landslides	The falling or sliding of a mass of soil, detritus, or rock from a steep slope.
Limestone	A sedimentary type of rock comprised largely of calcium carbonate.
Lysimeters	Devices used for measuring percolation and leaching losses of water and solute uses.
Macroinvertebrates	Organisms generally associated with soil or stream substrates that lack backbones and can be seen without magnification.
Management Recommendations	Non-regulatory suggestions to improve the quality of life.
Marshes	Wetlands that are seasonally inundated with water.
Mitigate	To lessen or minimize the impacts of.
Moraines	Sediment consisting of mud, sand, gravel, and boulders deposited in long mounds.

Native Plants	Plant species that occur naturally in a given area.
Natural Heritage Inventory	A method of assessing areas of important plants, animals, and ecological communities.
Nitrification	Conversion of ammonium to nitrate by bacteria.
Non-point Source Pollution	Pollutants that have no readily visible source and often require detailed analysis and research to discern the source.
Non-regulatory	Not enforceable.
Nutrient Management Plans	Plans providing information about nutrient allocations, excess manure utilization, runoff controls, and best management practices for farms with an annual density of more than two animal units per acre.
Ordinance	An authoritative decree or law; a municipal regulation.
Outwash Plains	Gentle slopes in front of a glacier where eroded materials, transported by water, were deposited.
Palustrine Community	Animal and plant species found in marshes and swamps.
Peat	Partially carbonized vegetable matter, usually mosses, found in bogs and used as fertilizer and fuel.
Pennsylvania Natural Heritage Program	A partnership that conducts inventories and collects data to identify the state's most sensitive and significant organisms and features.
Permeability	The rate of flow of a liquid or gas through a porous material.
Permit	A decree granting permission to do something.
pH	A measure of acidity or alkalinity of a medium.
Physiographic	The physical relatedness of all areas within a given region.
Point Source Pollution	Pollutants that can easily be traced to their sources.

Potable	Suitable for drinking.
Preservation	The act or process of keeping something safe from harm or injury; the act of maintaining or reserving.
Prime Agricultural Soils	Soils that are extremely well suited for agricultural uses and meet certain physical, chemical, and slope characteristics.
Rails to Trails	A program that converted abandoned or unused railroad corridors into public trails.
Reclamation	The conversion of wasteland into land suitable for use of habitation or cultivation.
Recycle	To treat or process used or waste materials so as to make suitable for reuse.
Restoration	Returning to its original state or condition.
Riparian Habitats	Area of protective vegetation next to a body of water that serves as a barrier against polluted runoff and provides habitat corridors for wildlife.
Riverine Species	Animals and plant species found in or near a river.
Runoff	Rainfall or snowmelt not absorbed by soil that flows over the surface of the ground to a receiving waterway.
Sanitary Sewage Overflows	Occur when water entering a sanitary sewage system causes it to exceed capacity, resulting in raw sewage being discharged to nearby streams.
Sedimentation	The deposit of particles moved by erosion.
Sewage enrichment	Addition of nutrients to a waterway from sewage waste.
Silviculture	The branch of forestry dealing with the development and care of forests.
Sinkhole	A hole formed in soluble rock by the action of water, serving to conduct surface water to an underground passage.
Smart Growth	A current movement that focuses on redevelopment of established urban areas and other ways to reduce sprawl pressures on undeveloped countrysides.
Soil Associations	A classification of soil types that comprise two to three major soil types and a few minor soil types.

Stakeholder	Anyone who lives, works, and recreates in an area.
Stewardship	Management of a property.
Stormwater	Water that runs off the land into surface waters during and immediately following periods of precipitation.
Stormwater Management	Planning for surface runoff into streams and river systems during rain and/or snowmelt events.
Subsidence	The downward movement of surface material involving little or no horizontal movement.
Subwatershed	The watershed of a tributary stream; it is a sub-unit of the receiving stream, river, or lake's watershed.
Succession	A series of things or events that follow one another.
Superfund Sites	A hazardous waste site placed on the Superfund National Priorities List and financed for clean up by the US EPA.
Swamps	Wetlands with standing or gently flowing water, seasonally inundated from an adjoining stream or lake.
Temperate Climate	A climate without extremes of temperature or precipitation.
Terrestrial	Living or growing on land; not aquatic.
Total Maximum Daily Load	A limit for pollutant load placed on a waterway by PA DEP. TMDLs are determined for a waterway based on how much pollutant it is determined that the waterway can assimilate and still meet its designated use criteria. TMDLs will be used to regulate the percentage of total pollutant load that each source in a watershed can contribute.
Topography	Describes landscape features of an area.
Tributary	A stream that feeds into another (receiving) stream, river, lake, or ocean.
Vegetation	Plants, collectively.
Vernal Pools	Temporary ponds of water typically found in the spring.
Water Budgets	A document detailing water needs, water usage, and water availability.

Water Conservation	The act of using water wisely, as to not waste or injure the quality or quantity.
Watershed	The area of land that drains to a particular point along a stream. Each stream has its own watershed. Topography is the key element affecting this area of land. The boundary of a watershed is defined by the highest elevations surrounding the stream. A drop of water falling outside the boundary will drain to another watershed.
Wetlands	Areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.
Woodland	Land mostly covered with trees.

APPENDIX B. PLANNING COMMITTEES

Shenango River Watershed Conservation Plan Steering Committee

Jennifer Barborak	Shenango River Watchers
Joyce Cuff	Shenango River Watchers Thiel College
Megan Gahring	Lawrence County Conservation District Penn Ohio Watershed Association
Lewis Grell	Pulaski Township Supervisor
Jim Mondok	Mercer Conservation District Penn Ohio Watershed Association Shenango Conservancy
Brian Pilarcik	Crawford County Conservation District Penn Ohio Watershed Association
Denny Puko	Mercer County Regional Planning Commission Shenango Conservancy
Amy Reeher	Penn Ohio Watershed Association Trumbull County Soil and Water Conservation District
Jay Russell	Lawrence County Conservation District
Ann Throckmorton	Westminster College

Shenango River Watershed Conservation Plan Advisory Committees

Project Area Characteristics

Nancy Bergey	League of Women Voters Lawrence County
Bill Morocco, Sr.	Mayor of Farrell
Dave Barendfeld	Western Pennsylvania Conservancy, Local Steel Mill Owner

Land Resources

Doug Gilbert	Crawford County Farm Bureau
Richard Kind	Lawrence County Farm Bureau
Richard Marttala	Pennsylvania Department of Environmental Protection
Mark Bodamer	DCNR Bureau of Forestry
Jerry DiDesiderio	USDA Natural Resources Conservation Service
Edward Petrus	USDA Natural Resources Conservation Service
Gary Micsky	Mercer County Cooperative Extension
John Courtney	Mercer County Agriculture Development Council and Cooperative Extension
Kerry Prince	USDA Natural Resources Conservation Service
Philip Dean	Local farmer

Water Resources

Nancy Bergey	League of Women Voters Lawrence County
Doug Gilbert	Crawford County Farm Bureau
Richard Kind	Lawrence County Farm Bureau
Jerry DiDesiderio	USDA Natural Resources Conservation Service
Edward Petrus	USDA Natural Resources Conservation Service
Tom Amundsen	Shenango River Watchers
Kerry Prince	USDA Natural Resources Conservation Service
Fatimala Pale	Thiel College
Michael Balas	Thiel College

Biological Resources

Doug Gilbert	Crawford County Farm Bureau
Richard Marttala	Pennsylvania Department of Environmental Protection
Mark Bodamer	DCNR Bureau of Forestry
John Courtney	Mercer County Agriculture Development Council and Cooperative Extension
Gary Micsky	Mercer County Cooperative Extension
Fatimala Pale	Thiel College
Michael Balas	Thiel College
Dr. Peter Quinby	Pymatuning Ecology Lab

Cultural Resources

Tom Amundsen	Shenango River Watchers
Linda Armstrong	Pymatuning State Park
William Philson	Mercer County Historical Society
Erik Bielata	Greenville Parks and Recreation

APPENDIX C. PRIME AGRICULTURAL SOILS BY COUNTY

Symbol	Soil Name	Characteristics
<i>Ashtabula County, OH</i>		
CaB	Cambridge silt loam	2 to 6 percent slope
CkB	Chenango gravelly loam	2 to 6 percent slope
RhB	Red hook silt loam, where drained	2 to 6 percent slope
VeA	Venango silt loam, where drained	0 to 2 percent slope
VeB	Venango silt loam, where drained	2 to 6 percent slope
<i>Crawford County, PA</i>		
BrA	Braceville gravelly loam	0 to 3 percent slope
BrB	Braceville gravelly loam	3 to 8 percent slope
CoA	Chenango gravelly loam	0 to 3 percent slope
CoB	Chenango gravelly loam	3 to 8 percent slope
HvA	Haven silt loam	0 to 3 percent slope
Ph	Philo silt loam	No slope
ScA	Scio silt loam	0 to 3 percent slope
<i>Lawrence County, PA</i>		
AgB	Allegheny silt loam	3 to 8 percent slope
BcB	Braceville loam	3 to 8 percent slope
CdB	Canfield silt loam	3 to 8 percent slope
Cg	Chagrin silt loam	No slope
ChB	Chili silt loam	3 to 8 percent slope
CoB	Conotton gravelly loam	3 to 8 percent slope
Lb	Lobdell silt loam	No slope
MoA	Monongahela silt loam	0 to 3 percent slope
RaA	Ravenna silt loam	0 to 3 percent slope
RaB	Ravenna silt loam	3 to 8 percent slope
WoB	Wooster gravelly silt loam	3 to 8 percent slope
<i>Mahoning County, OH</i>		
Fr	Frenchtown silt loam, where drained	No slope
LdB	Loudonville loam	2 to 6 percent slope
LdC2	Loudonville loam, moderately eroded	6 to 12 percent slope
LdD2	Loudonville loam, moderately eroded	12 to 18 percent slope
MsD2	Muskingum channery silt loam, moderately eroded	12 to 18 percent slope
MsE2	Muskingum channery silt loam, moderately eroded	18 to 25 percent slope
RaA	Ravenna silt loam, where drained	0 to 2 percent slope
RaB	Ravenna silt loam, where drained	2 to 6 percent slope
ReA	Remsen silt loam	0 to 2 percent slope
Sb	Sebring silt loam, where drained	No slope

Symbol	Soil Name	Characteristics
Mahoning County, OH (continued)		
Se	Sebring silt loam, till substratum, where drained	No slope
Wc	Wayland silt loam, where drained and protected from flooding or not frequently flooded during growing season	No slope
WsC2	Wooster silt loam, moderately eroded	6 to 12 percent slope

Mercer County, PA

BrB2	Braceville gravelly loam	3 to 8 percent slope
BvA	Braceville silt loam	0 to 3 percent slope
CdA	Canfield silt loam	0 to 3 percent slope
CdB2	Canfield silt loam	3 to 8 percent slope
Cf	Chenango fine sandy loam, flooded	No slope
Ch	Chenango fine sandy loam, low terrace	No slope
ClA	Chenango gravelly loam	0 to 3 percent slope
CIB2	Chenango gravelly loam	3 to 8 percent slope
CoA	Chenango silt loam	0 to 3 percent slope
CoB2	Chenango silt loam	3 to 8 percent slope
RaA	Ravenna silt loam	0 to 3 percent slope
RaB2	Ravenna silt loam	3 to 8 percent slope
Rf	Red Hook silt loam, flooded	No slope
Rh	Red Hook silt loam, low terrace	No slope

Trumbull County, OH

CaB	Cambridge silt loam	2 to 6 percent slope
CfB	Canfield silt loam	2 to 6 percent slope
CnA	Chili loam	0 to 2 percent slope
CnB	Chili loam	2 to 6 percent slope
Ct	Condit silt loam, where drained	No slope
Da	Damascus loam, where drained	No slope
EhB	Ellsworth silt loam	2 to 6 percent slope
EhB2	Ellsworth silt loam	2 to 6 percent slope eroded
FcA	Fitchville silt loam, where drained	0 to 2 percent slope
FcB	Fitchville silt loam, where drained	2 to 6 percent slope
GfB	Glenford silt loam	2 to 6 percent slope
HaA	Haskins loam, where drained	0 to 2 percent slope
HaB	Haskins loam, where drained	2 to 6 percent slope
Ho	Holly silt loam, where drained and either protected from flooding or not frequently flooded during growing season	No slope
JtA	Jimtown loam, where drained	0 to 2 percent slope
JtB	Jimtown loam, where drained	2 to 6 percent slope
Lo	Lorain silty clay loam, where drained	No slope
Lp	Lorain silty clay loam, loamy substratum, where drained	No slope

Symbol	Soil Name	Characteristics
<i>Trumbull County, OH (continued)</i>		
LyB	Loudonville silt loam	2 to 6 percent slope
MgA	Mahoning silt loam, where drained	0 to 2 percent slope
MgB	Mahoning silt loam, where drained	2 to 6 percent slope
MhA	Mahoning silt loam, shale substratum, where drained	0 to 2 percent slope
MhB	Mahoning silt loam, shale substratum, where drained	2 to 6 percent slope
MtA	Mitiqanga silt loam, where drained	0 to 2 percent slope
MtB	Mitiqanga silt loam, where drained	2 to 6 percent slope
Or	Orrville silt loam, frequently flooded, where drained and either protected from flooding or not frequently flooded during growing season	No slope
OsB	Oshtemo sandy loam	2 to 6 percent slope
RaA	Ravenna silt loam, where drained	0 to 2 percent slope
RaB	Ravenna silt loam, where drained	2 to 6 percent slope
RdB	Rawson silt loam	2 to 6 percent slope
RsB	Rittman silt loam	2 to 6 percent slope
Sb	Sebring silt loam, where drained	No slope
Sc	Sebring silt loam, till substratum, where drained	No slope
Tg	Tioga loam, occasionally flooded	No slope
VeA	Venango silt loam, where drained	0 to 2 percent slope
VeB	Venango silt loam, where drained	2 to 6 percent slope
WbA	Wadsworth silt loam, where drained	0 to 2 percent slope
WbB	Wadsworth silt loam, where drained	2 to 6 percent slope

APPENDIX D. MINING PERMITS

Mine	Permit #	Permit Holder	Municipality	County	Status	Operation
<i>Upper Shenango River Subwatershed</i>						
Dehart Mine	20860804	Robert Dehart	Conneaut Township	Crawford	Active	Small Industrial Mineral
Cornell Mine	20820310	Edward Cornell	Pine Township	Crawford	Active	Small Industrial Mineral
Majome Mine	20870304	Heritage Excavating & Stone	South Shenango Township	Crawford	Active	Large Industrial Mineral
Oskin 1 Mine	20870806	David L. Oskin	Conneaut Township	Crawford	Active	Small Industrial Mineral
Thompson Mine	2079301	Sue & William J. Thompson	Conneaut Township	Crawford	Active	Large Industrial Mineral
Wincek 1 Mine	20020801	Joseph M. Wiencek	Conneaut Township	Crawford	Active	Small Industrial Mineral

<i>Middle Shenango River Subwatershed</i>						
Atlas Mine	4876SM2	Lakeland Sand & Gravel, Inc.	East Fallowfield Township	Crawford	Active	Large Industrial Mineral
Byler Mine	20032809	Andrew M. Kosturick	East Fallowfield Township	Crawford	Not Started	Small Industrial Mineral
David 1 Mine	43992805	David Const. Co.	Hempfield Township	Mercer	Not Started	Small Industrial Mineral
Decarman Mine	20982804	Andrew M. Kosturick	East Fallowfield Township	Crawford	Active	Small Industrial Mineral
Greene 1 Mine	43830305	Gerald S. Greene	Greene Township	Mercer	Active	Small Industrial Mineral
Hadley Mine	43910307	Custom Crushing, LTD	Perry Township	Mercer	Active	Large Industrial Mineral

Mine	Permit #	Permit Holder	Municipality	County	Status	Operation
<i>Middle Shenango River Subwatershed (Continued)</i>						
J. Taylor Sand & Gravel Mine	3076SM7	J. Taylor Sand & Gravel	Jefferson Township	Mercer	Stage 1	Large Industrial Mineral
J Taylor Sand & Gravel Mine	3077SM9	J. Taylor Sand & Gravel	Jefferson Township	Mercer	Active	Large Industrial Mineral
Lackey Mine	3076SM24	H & H Materials, Inc.	New Vernon Township	Mercer	Active	Large Industrial Mineral
Lackey Mine	43820304	H & H Materials, Inc.	New Vernon Township	Mercer	Active	Large Industrial Mineral
Leali Bors 1 Mine	43930303	Leali Bros Excavating, Inc.	Hempfield Township	Mercer	Active	Large Industrial Mineral
McCrary 2 Mine	43020302	White Rock Silica Sand Co., Inc.	Hempfield Township	Mercer	Active	Large Industrial Mineral
McCrary Mine	3076SM13	White Rock Silica Sand Co., Inc.	Hempfield Township	Mercer	Active	Large Industrial Mineral
Miller Farm Mine	3073SM11	Seidle Sand & Gravel, Inc.	Jefferson Township	Mercer	Stage 1	Large Industrial Mineral
Mullet Mine	20982803	Andrew M. Kosturick	East Fallowfield Township	Crawford	Active	Small Industrial Mineral
Penn Sylvan Mine	43990801	Sylvan Resources, LLC	Hempfield Township	Mercer	Active	Small Industrial Mineral
Pine Road Mine	20032808	Lakeland Sand & Gravel, Inc.	East Fallowfield Township	Crawford	Not Started	Small Industrial Mineral
Pine Road Mine	20040301	Lakeland Sand & Gravel, Inc.	East Fallowfield Township	Crawford	Proposed	Large Industrial Mineral
Sand Hill Mine	4877SM10	Lakeland Sand & Gravel, Inc.	East Fallowfield Township	Crawford	Active	Large Industrial Mineral
Walter Shevitz Mine	SM240-1	Walter Shevitz	East Fallowfield Township	Crawford	Active	Small Industrial Mineral

Mine	Permit #	Permit Holder	Municipality	County	Status	Operation
<i>Lower Shenango River Subwatershed</i>						
SQP 1 Mine	43020305	SQP Ind	Sharpsville Borough	Mercer	Active	Large Industrial Mineral
SQP 1 Mine	43022804	SQP Ind	Sharpsville Borough	Mercer	Reclamation Completed	Small Industrial Mineral
Zoccole	43022806	Zoccole Development Corp.	Sharpsville Borough	Mercer	Active	Small Industrial Mineral
Carbone 1 Mine	37982802	Siegel Excavating	Mahoning Township	Lawrence	Stage 1	Small Industrial Mineral
Neshannock 3 Mine	37030302	Neshannock Sand & Gravel	Neshannock/Pulaski Townships	Lawrence	Active	Large Industrial Mineral
Forbes Mine	37850806	John L. Drespling	Neshannock/ Pulaski Townships	Lawrence	Active	Small Industrial Mineral
Topsoil 1 Mine	37030804	Joseph R. Busin	Neshannock Township	Lawrence	Proposed	Small Industrial Mineral
Joseph Depola Mine	3173SM17	Joseph Depola	New Castle	Lawrence	Active	Large Industrial Mineral
James F. Hamilton Mine	3173SM16	James F. Hamilton	Pulaski Township	Lawrence	Active	Large Industrial Mineral
Osborne Mine	37002803	B&P Slag Corp.	Pulaski Township	Lawrence	Not Started	Small Industrial Mineral
Pulaski Mine	37940304	Lafarge North American, Inc.	Pulaski Township	Lawrence	Active	Large Industrial Mineral
Sikora Mine	37982803	Atlantic States Materials PA, Inc.	Pulaski Township	Lawrence	Active	Small Industrial Mineral
City Aggregates and Recycling	IM-2085	City Aggregates and Recycling	Hubbard	Trumbull	Active	Sandstone

Mine	Permit #	Permit Holder	Municipality	County	Status	Operation
<i>Neshannock/Big Run Subwatershed</i>						
Orlosky Mine	43950302	Atlantic States Materials PA, Inc.	East Lackawannock Township	Mercer	Active	Large Industrial Mineral
Wishart 1 Mine	43930801	Peter Wishart	Coolspring Township	Mercer	Active	Small Industrial Mineral
Aggregate Mine	43820309	Roger Hoffman	Findley Township	Mercer	Active	Large Industrial Mineral
Hutcheson Mine	4379306	H & H Materials, Inc.	Lake Township	Mercer	Active	Large Industrial Mineral
Steckler Mine	4395303	H & H Materials, Inc.	Lake Township	Mercer	Active	Large Industrial Mineral
Sholler Mine	37990103	Amerikohl Mining Co.	Washington Township	Lawrence	Stage 2	Coal Surface Mine

<i>Unknown Subwatershed</i>						
Mercer Cnty 1 Mine	4329305	Atlantic States Materials PA, Inc.	East Lackawannock Township	Mercer	Active	Large Industrial Mineral
Mercer Cnty 2 Mine	43040301	Atlantic States Materials PA, Inc.	East Lackawannock Township	Mercer	Proposed	Large Industrial Mineral
Atherholt Mine	43880301	Seidle Sand & Gravel, Inc.	Jefferson Township	Mercer	Reclamation completed	Large Industrial Mineral
JJ Cline 1 Mine	43992803	JJ Cline	Perry Township	Mercer	Active	Small Industrial Mineral
Neshannock 2 Mine	37920306	Neshannock Sand & Gravel	Neshannock Township	Lawrence	Active	Large Industrial Mineral
Bruce Mine	37920303	S&S Proc., Inc.	Taylor Township	Lawrence	Active	Large Industrial Mineral
Isabella Mine	37900303	Atlantic States Materials PA, Inc.	Taylor Township	Lawrence	Active	Large Industrial Mineral

APPENDIX E. CERCLA WASTE SITES

Site	Permit	NPL List	Municipality	State	County
Shenango Disposal Site	OH0000206805	No	Vernon Township	OH	Trumbull
Armco Inc. Sawhill Tubular Division	PAD045294519	No	Sharon	PA	Mercer
CG Wood Site	PAD781113558	No	Jamestown	PA	Mercer
Duferco Farrell Corporation	PAD001933175	Yes	Farrell	PA	Mercer
Henry's Landfill	PAD981105125	No	Conneaut Township	PA	Crawford
Metoca Removal Resource Group	PAD080719446	No	Pulaski Township	PA	Lawrence
River Road Landfill	PAD000439083	Deleted	Hermitage	PA	Mercer
Sharpsville Quality Sharpsville	PAD004396545	No	Sharpsville	PA	Mercer
Stanbul Ave Mystery Spill	PAN000305630	No	Sharon	PA	Mercer
US Army Engineer District Pittsburgh	OH5210090010	No	Vernon Township	OH	Trumbull
USAF 940 Airlift Wing Air Reserve	OH7570028764	No	Vienna Township	OH	Trumbull
Westinghouse Electric	PAD005000575	No	Sharon	PA	Mercer

APPENDIX F. RESOURCE CONSERVATION RECOVERY ACT SITES

Site	Permit	Type	Address	City	State
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Crawford County

Dave's Custom Body & Painting	PAR000506857	CESQG	3090 State Hwy 285	Espyville	PA
Mark's Paint & Collision	PA0000840967	CESQG	601 Penn St.	Linesville	PA
Molded Fiber Glass Tray Co.	PAD068721992	LQG	6175 US Hwy 6	Linesville	PA
Tel O Post	PAD044311504	CESQG	205 N.Pymatuning St.	Linesville	PA
Utility Constructors, Inc.	PAD048192819	Transporter	PO Box 7 Erie St. Ext.	Linesville	PA
Welcheck & Sherretts Auto	PAR000505230	SQG	5976 Wheeler Road	Linesville	PA

Lawrence County

EMIG Disposal Service, Inc.	PAD987271053	Transporter	Rt. 422	New Bedford	PA
1 Hr. Martinizing Service	PAD014457550	SQG	15 3 Washington St.	New Castle	PA
326th Quartermaster Detachment	PAD987282613	SQG	533 Taylor St.	New Castle	PA
Affiliated Metals & Minerals, Inc.	PAD981042989	CESQG	301 Mahoning Ave.	New Castle	PA
Agway Petroleum Corp.	PAD982575441	CESQG	501 Grant St. Rt. 224	New Castle	PA
AMSA 110 G	PAD982567687	SQG	2313 W. State St.	New Castle	PA
Armor Manufacturing, Inc.	PAD987320843	SQG	201 Power St.	New Castle	PA
Ashland 778-000	PAD987392677		St. Rt. 19 & 108	New Castle	PA
Atlantic Service Station	PAD987340601	CESQG	719 E. Washington Rd.Tanks	New Castle	PA
B&L Asphalt Ind., Inc.	PAD047195797		Rt. 168	New Castle	PA
Bailey Sales & Service	PAD987323367	SQG	1130 Butler Ave.	New Castle	PA
Berner International Corp.	PAD987276557		RD 3 Wilmington Rd.	New Castle	PA
	PAR000503979	CESQG	111 Progress Ave.	New Castle	PA
Blair Strip Steel Company	PAD00432915		1209 Butler Ave.	New Castle	PA
BP Oil 07073	PAD981933534	SQG	Highland & Wallace	New Castle	PA
BP Oil 07110	PAD98133716	SQG	Kenneh & Wilmington	New Castle	PA
BP Oil 07147	PAD981933658	SQG	Butler & Cascade	New Castle	PA

Site	Permit	Type	Address	City	State
<i>Lawrence County (continued)</i>					
BP Oil 07247	PAD981933591	SQG	Long & Moravia	New Castle	PA
BP Oil 07349	PAD981933773	SQG	RT 422 Bypass & S. Washington	New Castle	PA
Bridges & Towers, Inc.	PAD987349859	CESQG	923 Industrial St.	New Castle	PA
Bryan China Co.	PAD987384294	CESQG	Northgate Industrial Park	New Castle	PA
Buds Auto Body	PA0000562082	CESQG	500 Atlantic Ave.	New Castle	PA
Bump Shoppe, The	PAD048195663	CESQG	108 Mitchell Rd.	New Castle	PA
Castle Environmental, Inc.	PAR000029132		1901 Old Bulter Rd.	New Castle	PA
Chamber, Robert M. Inc.	PAD004320099		Rt. 168	New Castle	PA
Clark Stores 1982	PA0000607234	SQG	509 Highland	New Castle	PA
Commercial Printing Manufacturing	PAD987342573	SQG	2414 Wilmington Rd.	New Castle	PA
Connerly's Cleaner Service	PAD014453112	SQG	127 W. Mercer St.	New Castle	PA
Continental Packaging Corp.	PAD002570448		105 Mahoning Ave.	New Castle	PA
Copy Shop Manufacturing	PAD065640318	SQG	105 N. Mercer St.	New Castle	PA
Crivelli G O	PAD101589075	SQG	3223 Wilmington Rd.	New Castle	PA
Custom Corner	PAR000000356	CESQG	1901 New Butler Rd.	New Castle	PA
Custom Etch, Inc.	PAD987300613		1813 W. State St.	New Castle	PA
E T Motors the New Honda City	PAD987367323	CESQG	1800 W. State St.	New Castle	PA
Econo Crest Drycleaning	PAD037946068	SQG	222 Park Ave.	New Castle	PA
Ellwood Quality Steels Company	PAD981109135	LQG	700 Moravia St.	New Castle	PA
First Federal Savings & Loan	PAD052181526	SQG	25 N. Mill St.	New Castle	PA
Fish Dry Cleaner Service	PAD981733199	SQG	1614 Wilmington Rd.	New Castle	PA
Fitts Phil Ford, Inc.	PAD041740762	SQG	3250 Wilmington Rd.	New Castle	PA
Fleming Steel Co.	PAD004329223	SQG	Maitland Lane Ext.	New Castle	PA
Flowline Division Markovitz Ents, Inc.	PAD004327417	LQG	1400 New Butler Rd.	New Castle	PA
Frewmill Diecraft	PA0000199695	SQG	311 W. Grant St.	New Castle	PA
G C Suppy, Inc.	PAR0000199695	CESQG	311 W. Grant St.	New Castle	PA

Site	Permit	Type	Address	City	State
<i>Lawrence County (continued)</i>					
Giant Eagle Store 4077	PAR000016758	SQG	3230 Wilmington Rd.	New Castle	PA
Goodyear DBA EW Tire Company	PA0000200063	CESQG	2401 Wilmington Rd.	New Castle	PA
Graziani & Sons, Inc.	PAD008846354		1057 Butler Ave.	New Castle	PA
Gregs Auto Body, Inc.	PAR000020511	SQG	824 Jr. High St.	New Castle	PA
Harbor Shop, The	PAR000002899	SQG	Rt. 422 & Harbor Ter. RD 8	New Castle	PA
Hazport Transportation	PAR00050298	Transporter	222 E. Washington St.	New Castle	PA
International Specialty Alloys	PAR000501509	SQG	Northgate Industrial Park	New Castle	PA
Jameson Memorial Hospital	PAD987397296	CESQG	1211 Wilmington Ave.	New Castle	PA
		Transporter			
Kasgro Rail	PAD183231760	SQG	320 E. Cherry St.	New Castle	PA
Kasgro Rail New Castle	PAD987387560	SQG	40 Furnace St.	New Castle	PA
		Transporter			
Kenneth Ross Auto Body	PA0000360255	CESQG	306 N. Ray St.	New Castle	PA
Kings Chrysler Plymouth Dodge VW	PAD014455299	SQG	3249 Wilmington Rd.	New Castle	PA
Kings Chrysler, Inc.	PAD014452775	SQG	125 W. Grant St.	New Castle	PA
Kiwatkowski Sanitary Landfill	PAD004342051		County Line Rd.	New Castle	PA
Laidlaw Transit	PAR000504464	CESQG	905 Sampson St.	New Castle	PA
Lawrence Co. Voc. Tech.	PAR000003269	CESQG	750 Phelps Way	New Castle	PA
Lawrence Co. Government Center	PAD987337110	Transporter	Rt.65	New Castle	PA
Lindy, Inc.	PAD987397791	CESQG	Rt. 168 Eastbrook Rd.	New Castle	PA
Lockley Mfg. Co., Inc.	PAD004320149	SQG	310 Grove St.	New Castle	PA
Lombardo Auto Service	PAD987381738	CESQG	124 Oakland Ave.	New Castle	PA
LPP, Inc. Jiffy Lube 1582	PAR000022996	CESQG	3336 Wilmington Rd.	New Castle	PA
Marcos Dry Cleaners	PAD987332368	SQG	2054 State St.	New Castle	PA
Matlack, Inc.	PAD000765404		2985 New Butler Rd.	New Castle	PA

Site	Permit	Type	Address	City	State
<i>Lawrence County (continued)</i>					
Microbac Lab New Castle Div.	PAD086204195	SQG	RD 3 Pulaski Rd.	New Castle	PA
Monro Muffler Brake, No 66	PAD982577561	SQG	51 S. Beaver St.	New Castle	PA
NAPA Auto Parts	PAR000024612	SQG	426 N. Croton Ave.	New Castle	PA
NEPCO	PAD982674236	SQG	1902 New Butler Rd.	New Castle	PA
New Castle Battery Manufacturing Company	PAD004338836	LQG	3601 Wilmington Rd.	New Castle	PA
New Castle Battery Mfg. Co.	PAD004338836	LQG	3601 Wilmington Rd.	New Castle	PA
New Castle Industries	PAD987398674	SQG	1399 County Line Rd.	New Castle	PA
New Castle Industries, Inc.	PAD010466688	LQG	925 Industrial St.	New Castle	PA
New Castle News	PAD004338216	SQG	27 N. Mercer St.	New Castle	PA
Nick's Auto Body, Inc.	PAD987378601	CESQG	833 S. Mill St.	New Castle	PA
Nor Ric Dry Cleaner Service	PAD004517694	SQG	1216 Butler Ave.	New Castle	PA
North American Forge Masters	PAR000507046	SQG	710 Moravia St.	New Castle	PA
North City Motors, Inc.	PAD047206701	SQG	3239 Wilmington Rd.	New Castle	PA
OWOCS Auto Body	PAD0987387420	CESQG	825 Schenley Ave. Rear	New Castle	PA
P&G Welded Products, Inc.	PAD049679525		RD 3 Wilmington Rd.	New Castle	PA
PA Army Nat'l Guard Maint. Shop 9	PA7211890028	SQG	820 Frank Ave.	New Castle	PA
PA Dept. of Trans.-New Castle	PAD981042294	SQG	1800 Wilmington Rd.	New Castle	PA
Parente Auto Body	PA0000607713	CESQG	806 S. Jefferson	New Castle	PA
PF Environmental, Inc. Kabuta Plant	PAR000017301	SQG	1135 Butler Ave.	New Castle	PA
Praxiar Surface Technologies	PAD097133524		2300 Honeybee Ln.	New Castle	PA
	PAR000018465	SQG			
	PAD000766055	Transporter			
Precision Plating	PAD987276342		407 Summitview Dr.	New Castle	PA
Preston Motors, Inc.	PAD014459275	SQG	1500 Wilmington Ave.	New Castle	PA
Quality Rolls Division	PAD987323375	CESQG	2125 Commerce Ave	New Castle	PA

Site	Permit	Type	Address	City	State
<i>Lawrence County (continued)</i>					
Rockwell International Corporation	PAD049679061		1 Rockwell Dr.	New Castle	PA
Sears No. 2013 7313	PAD000025684	SQG	2500 W State St.	New Castle	PA
Seinkner S P Co#	PAD004386355		910 Sampson St.	New Castle	PA
Select Industries, Inc. New Castle	PAR000031195	LQG	420 N. Cascade St.	New Castle	PA
Shaw, Perkins Inc.	PAD063765432	SQG	205 W. Washington St.	New Castle	PA
Shaw Perkins of New Castle, Inc.	PAR000503789	SQG	200 Industrial St.	New Castle	PA
Sherwin Williams Co. 1177	PAD065641334		28-30 S. Mercer St.	New Castle	PA
Sherwin Williams Store 1177	PAR000035352	CESQG	1611 W. State St.	New Castle	PA
Sporting Goods, Inc.	PAR000508325	SQG	212 Elm	New Castle	PA
St. Francis Hospital	PAD068751924	SQG	1000 S. Mercer St.	New Castle	PA
St. Vitus Regulating Station	PAD987327061	SQG	Old Pittsburgh Rd.	New Castle	PA
Sunoco Service Station-New Castle	PAD987340593	CESQG	2012 E. Wash. Exit & Lakeview	New Castle	PA
Sunoco Service Station-New Castle	PAD000754911		2608 Butler Rd.	New Castle	PA
	PAD000754929		SWC Rt.18 & Clenmore Blvd.	New Castle	PA
	PAD000754937		319 N. Liberty St.	New Castle	PA
	PAD000754952		RD 2 Parkstown Corner	New Castle	PA
Syracuse China Corporation/ Shenango China Division		LQG	606 McCleary Ave.	New Castle	PA
Tony Colia Cleaner Service	PAD061783411	SQG	208 E. Wallace Ave.	New Castle	PA
U. S. Can Company Plant 45	PAD095322764	LQG	1902 Old Butler Rd.	New Castle	PA
Universal Rundle Corporation	PAD987320645	LQG	E. Cherry Street Ext.	New Castle	PA
US Postal Service Vehicle Maint. Fac., New Castle	PAD987399383	CESQG	435 S. Cascade St.	New Castle	PA
USARC Number 2	PAD987396389	SQG	533 Taylor St.	New Castle	PA

Site	Permit	Type	Address	City	State
Lawrence County (continued)					
USRC Lawrence County Veterans Memorial	PA0210022356	SQG	410 Miller Ave.	New Castle	PA
Valley Spring & Dr.	PAR000030106	SQG	1001 Harbor St.	New Castle	PA
Vortex Recycling	PAR000506485		526 S. Jefferson St.	New Castle	PA
Wal Mart Supercenter Number 2287	PAR000012831	CESQG	2501 W.State Dr.	New Castle	PA
Walmo Dry Cleaner Service	PAD089666242	SQG	2420 Wilmington Rd.	New Castle	PA
	PAR000028829	CESQG	2708 Wilmington Dr.	New Castle	PA
West Penn Plastics	PAR000505107		Route 422 W. RD 8	New Castle	PA
West Penn Printing	PAR000508549	SQG	103 River Park Dr.	New Castle	PA
Wester PA Steel Fabricating., Inc	PAD987270329	SQG	RD 3 Wilmington Rd.	New Castle	PA
Woodmere China, Inc.	PA0000562199		Rt. 422 W	New Castle	PA
Zambelli International	PAD004338828	LQG	20 S.Mercer St.	New Castle	PA
Last Minute Mart New Wilmington	PAD987323383	SQG	RD 1 Rt. 18 & 208	New Wilmington	PA
Mike's Auto Body	PAR000027664	CESQG	RD 3, Auction Rd .	New Wilmington	PA
Montgomery's, Don Auto Body	PAR000040246	CESQG	135 Bend Rd.	New Wilmington	PA
Sunoco Service Station-New Wilmington	PAD000755090		275 N. Market & Short St.	New Wilmington	PA
UPS New Castle Center	PAD987358744	CESQG	Rt. 18 & Johnson Rd.	New Wilmington	PA
Wagner, Clare E.	PAD014877849	SQG	116 E. Neshannock	New Wilmington	PA
Metco Removal Response Group	PAD987328838	LQG	Highway 551 North	Pulaski	PA
Multi Media Stripping, Inc.	PA0000088252	CESQG	3938 New Castle Rd.	Pulaski	PA
New Castle School of Trade	PAD056007842	SQG	RD 1 422 E	Pulaski	PA
Young Galvanizing, Inc.		LQG	Rt. 551	Pulaski	PA

Site	Permit	Type	Address	City	State
<i>Mercer County</i>					
Atlantic Service Station 0364 1784	PAD987340577	CESQG	1050 Division St. Tanks	Farrell	PA
Benchmark Industries	PAD113424139	SQG	11 Wallis Ave.	Farrell	PA
Bertram Tool & Mach.	PAR000012153	CESQG	1201 Broadway Ave.	Farrell	PA
Big Three Industries Gas	PAD987284452	CESQG	Roemer Blvd.	Farrell	PA
BP Oil 07270	PAD981933583	SQG	Idaho Park & New Castle	Farrell	PA
Duferco Farrell Corporation	PAD001933175	LQG	15 Roemer Blvd.	Farrell	PA
	PAD980555676				
	PAR000012161	LQG			
	PAR000039008	LQG			
Farben, Inc.	PAR000504373	Transporter	1151 Overlook Dr.	Farrell	PA
Hillcrest Cleaner Service	PAD981733256	SQG	718 Roemer Blvd.	Farrell	PA
Premier Hydraulics Inc	PAR000042382	CESQG	10 Fruit Ave.	Farrell	PA
Rick Harakals Car Company	PA0000693770	CESQG	Corner of Fruit & Roemer	Farrell	PA
Shenango Valley Osteopathic Hospital	PAD068731982		2200 Memorial Dr.	Farrell	PA
Sonoffs Cleaner Service	PA981733736	SQG	408 Idaho St.	Farrell	PA
Sunoco Service Station-Farrell	PAD000747956		700 French St.	Farrell	PA
USARC Pendel Caminiti	PA6210522011	SQG	950 New Castle Rd.	Farrell	PA
Wheaton & Sons Dry Cleaner Service	PAD106476278	SQG	1301 Idaho St.	Farrell	PA
Anderson Tours	PAR000027508	SQG	1 Anderson Plaza	Greenville	PA
Atlantic Service Station	PAR987340585	CESQG	261 Main St.Tanks	Greenville	PA
Bessener & Lake Erie Railroad Company	PAD093323442	SQG	85 Ohl St.	Greenville	PA
BP Oil 07165	PAD981933344	SQG	Main & Mercer	Greenville	PA
Branded Mktg. Ashland Oil, Inc.	PA0000754929	LQG	49 N Race. St.	Greenville	PA
Brownies Service Station	PAD987359676	SQG	113-119 Main St.	Greenville	PA

Site	Permit	Type	Address	City	State
Chet's Custom Paint	PAD000754838	CESQG	827 Mercer Rd.	Greenville	PA
	PA0000981381				
Damascus Bishop Tube Company, Inc. Plant NU	PAD065618530	LQG	795 Reynolds Industrial Park	Greenville	PA
Double K	PAD981733074	LQG	41 Shenango St.	Greenville	PA
Godfrey Phil Pontiac	PAD059080788	SQG	28 N. Water St.	Greenville	PA
Greenville Metal Litho Ent., Inc.	PAD981112949	LQG	242 Reynolds Industrial Park Dr.	Greenville	PA
Greenville Motors, Inc.	PAD014162523	CESQG	15 S. Water St.	Greenville	PA
Greenville Regional Hospital	PAD987342037	CESQG	110 N. Main St.	Greenville	PA
JLX, Inc.	PA0000484394	CESQG	406 Fourth St.	Greenville	PA
Kwik Fill S0170 296	PAD987337722	SQG	248 Main St.	Greenville	PA
Last Minute Mart Greenville	PAD987359668	SQG	62 W. Main St.	Greenville	PA
New Bishop Tube Company Plant #2	PAD981042617	LQG	175 Reynolds Industrial Park Rd.	Greenville	PA
Penntecq, Inc.	PAD987367737	SQG	106 Kuder Dr.	Greenville	PA
Performance Collision	PAR000500165	CESQG	293 Orangeville Rd.	Greenville	PA
Phil Godfrey Ford Mercury, Inc.	PA0000878967	SQG	124 Main St.	Greenville	PA
Reynolds Services, Inc.	PAR000504407	SQG	860 Brentwood Dr.	Greenville	PA
		Transporter			
Sarvas, Jim Chrysler Plymouth	PAD099526790	SQG	31 Hadley Rd.	Greenville	PA
	PAD981940042		44 Hadley Rd.	Greenville	PA
Salem Tube, Inc.	PAD044316636	LQG	951 Fourth St.	Greenville	PA
Soherbondy Clair	PAD982710345	SQG	117 Chestnut St.	Greenville	PA
Sunoco Service Station-Greenville	PAD000748574		352 N. Main St.	Greenville	PA
Svedala Grinding Hodge Foundry	PAD004323796	SQG	42 Leech Rd.	Greenville	PA
Trinity Industries, Inc.	PAD004334181		60 Union St.	Greenville	PA
	PAD004342556		100 York St.	Greenville	PA
VEC Tech, Inc.	PAR000013938	LQG	639 Keystone Rd.	Greenville	PA

Site	Permit	Type	Address	City	State
Mercer County (continued)					
Wagners Wheel Alignment, Inc.	PAD014163711	SQG	179 S. Mercer St.	Greenville	PA
Wal Mart Supercenter Number 2614	PAR000039560	CESQG	45 Williamson Rd.	Greenville	PA
Werner Company Greenville Division	PAD004329520	LQG	93 Werner Rd.	Greenville	PA
Westinghouse Elec. Corp.	PAD005000633		Reynolds Development	Greenville	PA
Componet Inter Technologies, Inc.	PAD004510848		2426 Perry Hwy.	Hadley	PA
Alpont Transp, LLC	PAR000504944	Transporter	2797 Freedland Rd.	Hermitage	PA
10 Minute Oil Change	PAR000019349	CESQG	3229 E. State St.	Hermitage	PA
Amcan Specialty Steels	PAD987318722	SQG	303 Llodio Dr.	Hermitage	PA
Atlantic Service Station 0363 9887	PAD987340940	CESQG	1726 Valley View Rd.	Hermitage	PA
Biorededial Technologies, Inc.	PARE000504563	CESQG	2700 Kirila Dr.	Hermitage	PA
BP Oil 07134	PAD981934417	SQG	Highland & North Buhl Farm	Hermitage	PA
BP Pil 07381	PAD981934474	SQG	Hermitage & Lamar	Hermitage	PA
CCI Container Advanced Monobloc Aerosol Division	PAD981739204	LQG	1 Llodio Dr.	Hermitage	PA
Champion Carrier	PAD987364684	CESQG	2755 Kirila Rd.	Hermitage	PA
Compass Enterprises, Inc.	PA987398666	SQG	3035 Lynnwood Dr.	Hermitage	PA
Flickinger AB	PAR000032771	CESQG	3710 David Dr.	Hermitage	PA
Forney, Inc.	PA0000918516	CESQG	1565 Broadway Ave.	Hermitage	PA
Gearhart Service	PA0000756643	CESQG	2500 Walnut St.	Hermitage	PA
Giant Eagle 4012	PAR000031245	SQG	2357 E. State St.	Hermitage	PA
Gordys Truck & Auto Body	PA0000562058	CESQG	156 N. Keel Ridge	Hermitage	PA
Hermitage Armory		CESQG	740 N. Hermitage Rd.	Hermitage	PA
Interstate Chemical Company, Inc.	PAD044313443	LQG	2797 Freedland Rd.	Hermitage	PA
		Transporter			
Kenco Hermitage	PAR000041400		2650 Kirkla Rd.	Hermitage	PA

Site	Permit	Type	Address	City	State
Mercer County (continued)					
Kwik Fill S007 267	PAD987337383	SQG	3915 E. State St.	Hermitage	PA
Lou Wollam Lincoln Mercury	PAD987336005	SQG	1520 Hermitage Rd. N.	Hermitage	PA
Maaco Auto Painting & Body Works	PAR000038141	SQG	2125 Broadway Ave.	Hermitage	PA
Maint. for Industries	PAD987336005	CESQG	2575 Freedland Rd.	Hermitage	PA
Martuccio Frank Enterprises, Inc.	PAD987283819		1059 Mercer Ave.	Hermitage	PA
Monro Muffler Brake Number 69	PAD982577926	SQG	2976 E. State St.	Hermitage	PA
River Rd. Enterprises	PAD000439083		Rt. 846	Hermitage	PA
Shenango Honda Nissan	PAD987371309	CESQG	3965 E. State St.	Hermitage	PA
* Tri City Collision	PAR0000790618	CESQG	1643 Rhoda St.	Hermitage	PA
	PAR000027169	SQG	1539 E. State St.	Hermitage	PA
		Transporter			
Wal Mart Store 1568	PAR000502039	CESQG	3300 Shenango Valley Freeway	Hermitage	PA
Wheatland Steel Processing	PAD092811413		1700 Broadway Ave.	Hermitage	PA
Interstate Auto Auction	PAD063766018	SQG	Rt. 62	Jackson Center	PA
Combined Tactical Sys.	PAR000039875	LQG	388 Kinsman Rd.	Jamestown	PA
		Transporter			
Cosonkas Auto Service	PA0000747733	CESQG	401 Liberty St.	Jamestown	PA
Hollers Auto Body	PA0000815753	CESQG	West Greenville Rd.	Jamestown	PA
Jamestown Paint Company	PAD004323788	LQG	108 Main St.	Jamestown	PA
Last Minute Mart Jamestown	PAD987359684	SQG	Liberty St.	Jamestown	PA
Rodgers Auto Body	PAD174207753	SQG	998 E. Jamestown Rd.	Jamestown	PA
Adesa Pittsburgh Auto Auction	PAR00003136	SQG	758 Franklin Road.	Mercer	PA
Agway Energy Prod Mercer	PAR000013086	CESQG	518 S. Erie St.	Mercer	PA
AT&T London	PAD980692552	CESQG	2 Mi. SW London	Mercer	PA
Bissett Chevrolet, Inc.	PAD014392161	SQG	130 N. Pitt St.	Mercer	PA

Site	Permit	Type	Address	City	State
<i>Mercer County (continued)</i>					
Bob's Auto Body	PA000047261	CESQG	245 N. Perry Highway Rt. 19	Mercer	PA
BP Oil 07072	PAD981933609	SQG	Erie & Market	Mercer	PA
BP Oil 07199	PAD981933666	SQG	I 80 & Rt. 19	Mercer	PA
Centerprizes West, Inc.	PAD980706881	Transporter	407 S. Pitt St.	Mercer	PA
Cevron, Inc.	PAD004369807	SQG	7320 W Market St.	Mercer	PA
Classic Auto Restoration	PA0000607374	CESQG	553 Fairgrounds Rd.	Mercer	PA
Cummins Diesel Engines, Inc.	PAD987345980		RD 5 Rt. 58	Mercer	PA
Gabany Engine Rebuilding	PAD982700965	SQG	355 S. Perry Hwy.	Mercer	PA
Hydrair Balance Co.	PAD055525554		115 N. Diamond	Mercer	PA
McCandless Ford Mercury	PAD982569055	SQG	8416 Sharon-Mercer Rd.	Mercer	PA
Mercer Area School District Mercer Jr-Sr High School	PAD100477595	SQG	545 W. Butler St.	Mercer	PA
Mercer Co. Voc. Tech. School Water Systems	PAD074997644	Transporter	776 Greenville Rd.	Mercer	PA
Miller, J. Express, Inc	PAD055532378	Transporter	RFD 4	Mercer	PA
Pennsylvania Department of Transportation	PAD982574162	SQG	North and Maple Streets	Mercer	PA
Russell STD Corporation Rt. 19 Mercer Plant	PAR000014530	SQG	1210 Perry Hwy.	Mercer	PA
Sharon Mercer Auto Body	PAR000010397	CESQG	5 Charleston Rd.	Mercer	PA
Snyder Pontiac Buick GMC	PA0000786210	CESQG	555 N. Perry Highway	Mercer	PA
Sunoco Service Station-Mercer	PAD000754440		Rt 19 & I80 E. RD 6	Mercer	PA
Tajon, Inc.	PAD 047207766	Transporter	RD 5 Rt. 58	Mercer	PA
Tennessee Gas Pipeline Station 219	PAD049672389	CESQG	1211 Greenville Mercer Rd.	Mercer	PA
Thomas & Betts Reznor	PAD981102387	CESQG	150 McKinley Ave.	Mercer	PA
Advanced Auto Body	PAD987346533	CESQG	227 W. Budd St.	Sharon	PA

Site	Permit	Type	Address	City	State
Mercer County (continued)					
Armco, Inc. Sawhill Tubular Division	PAD004328548	LQG	200 Clark St.	Sharon	PA
Automotive Maint, Inc.-Hertz	PAD055537690	SQG	Bud Ave.	Sharon	PA
Baglier John Buick Cadillac	PAD014566194	SQG	1300 E. State St.	Sharon	PA
BP Oil 07113	PAD981934573	SQG	Silver & Water	Sharon	PA
BP Oil 07148	PAD981934581	SQG	Forker & State	Sharon	PA
CBS Corporation	PAD005000575	LQG	469 Sharpsville Rd.	Sharon	PA
	PAD982681694	SQG			
Chadderton Trucking	PAD987398856	SQG	Stewart Ave.	Sharon	PA
City of Sharon, WWTP	PAD000868570	SQG	Riverside Dr.	Sharon	PA
Claffey Dental Lab	PAD014565923		3364 E. State St.	Sharon	PA
Conrail Ferrona Diesel Facility	PAD000799809		Clark St.	Sharon	PA
Consumers PA Water Company Shenango Valley	PAR000504308	LQG	644 N. Water Ave.	Sharon	PA
Consumers PA Water Company Shenango Valley Division	PAD987355682	LQG	665 S. Dock St.	Sharon	PA
D&T Co.	PA000650820	Transporter	Hall Furance Rd.	Sharon	PA
Fessler's Machine Co.	PAD987367380	CESQG	800 N. Water Ave.	Sharon	PA
Flash Cleaner Service	PAD044312767	SQG	455 E. State St.	Sharon	PA
George & Thomas Cone Company	PA0000108001	SQG	3435 Lamor Rd.	Sharon	PA
Goodyear DBA EW Tire Company	PA0000277798	CESQG	1535 E. State St.	Sharon	PA
Grata Mel Cevrolet Toyota Geo, Inc.	PAD014568554	SQG	2757 E. State St.	Sharon	PA
HI Tech Processing	PAD082243197		700 S. Dock St.	Sharon	PA
Ivans Auto Body	PAR000000760	CESQG	1178 Stambaugh St.	Sharon	PA
Ivor J Lee, Inc.	PAD987380540	CESQG	Blue Building N. Water Ave.	Sharon	PA

Site	Permit	Type	Address	City	State
<i>Mercer County (continued)</i>					
Jack's Auto Painting & Car Care	PAD981739865	SQG	240 Shenango Valley Freeway	Sharon	PA
Lil Shopper	PAD055533210		811 E. State Rm. 204	Sharon	PA
Mark Crane Corporation	PAD987332467	SQG	680 S. Dock St.	Sharon	PA
McDonnell Douglas, Inc. Service	PAD987318714		Budd St.	Sharon	PA
Mico Inds., Inc.	PAD987398096	SQG	251 Wheeler St.	Sharon	PA
Midas Muffler 7	PAR000004994	CESQG	2080 E. State St.	Sharon	PA
Mitches Coin Laundry & Dry Cleaner Service	PAD107322844	SQG	3340 E. State St.	Sharon	PA
Newell Cleaner Service	PAD014568166	SQG	1073 Griswold St.	Sharon	PA
Nugent Convalescent Home, Inc.	PAD083966200		500 Clarsville Rd.	Sharon	PA
PA Auto Body Works	PAD981945496	SQG	422 E. Budd St.	Sharon	PA
Penn State Shenango Sharon	PAD980829865	SQG	147 Shenango Ave.	Sharon	PA
Pennsak, Inc.	PAD982569980	SQG	534 Vine Ave.	Sharon	PA
Peoples Dry Cleaner Service	PAD045292703	CESQG	156 W. State St.	Sharon	PA
Preston Ford, Inc.	PAD042499848	SQG	1251 E. State St.	Sharon	PA
Roemer Ind., Inc.	PAD042499848	SQG	161 Mill St.	Sharon	PA
Sears Roebuck and Co. 2544	PAD0000993261	SQG	3245 E. State St.	Sharon	PA
Sharon Auto Body	PAD014568968	SQG	209 Bridge St.	Sharon	PA
Sharon Fitness Products	PAD114918451	CESQG	54 Phillips Way	Sharon	PA
Sharon Tuve Company	PAD004322863	LQG	134 Mill St.	Sharon	PA
Sherwin-Williams Co.	PAD072174345		Sharon-Mercer Rd.	Sharon	PA
Stupka Pontiac	PAD014569545	SQG	1361 E. State St.	Sharon	PA
Sunbelt Transformer, Inc.	PAR000035899	SQG	670 S. Dock St.	Sharon	PA
Sunoco Service Station-Sharon	PAD000794990		3156 E. State St.	Sharon	PA
Watsons, Inc.	PAD014569966	CESQG	7130 E. State St.	Sharon	PA
Winner Steel SVCS, Inc.	PAR000019448	CESQG	277 Sharpsville Ave.	Sharon	PA
Cattron, Inc.	PAD987324894	CESQG	58 Shenango St.	Sharpsville	PA
Chautauqua Fiberglass & Plastics, Inc.	PAD987364312	CESQG	80 Canal St.	Sharpsville	PA

Site	Permit	Type	Address	City	State
<i>Mercer County (continued)</i>					
Crossfire	PA0000755702	CESQG	220 Hickory St.	Sharpsville	PA
Dean Dairy Products Company	PAD101589067	SQG	1858 Oneida Ln.	Sharpsville	PA
Gen Woodcraft	PA0000074633	CESQG	110 High St.	Sharpsville	PA
Gregory's Auto Body	PAD982577041	SQG	22 North St.	Sharpsville	PA
Integrated Fabrication & Machine, Inc.	PAR000005694	CESQG	295 High St.	Sharpsville	PA
Ken's Auto Body	PAR000000661	CESQG	2166 Buckeye Rd.	Sharpsville	PA
Pyramid Enterprises	PAD982678278		115 High St.	Sharpsville	PA
Pyramid Plastics Fabricators	PAD987359122		1872 Oneida Ln.	Sharpsville	PA
Sharpsville Container, Inc.	PAR000043984	SQG	600 N. Main St	Sharpsville	PA
Sharpsville Quality Sharpsville	PAD004396545		2 N. 6th St	Sharpsville	PA
Shenango Auto Body	PAD982568024	SQG	2705 N. Hermitage Rd	Sharpsville	PA
Valley Silk Screening	PAD982673832		412 Main St.	Sharpsville	PA
Baily William Engerprises	PAD980714653	Transporter	2977 S. Hermitage Rd.	West Middlesex	PA
Conway Ctl. Express	PAR000025783	SQG	1615 Victor Posner Blvd.	West Middlesex	PA
Dow Jones & Company, Inc.	PAD980830756	SQG	1 Jones Way	West Middlesex	PA
Pitt Ohio Express, Inc.	PA0000045401	SQG	2908 Mercer West Middlesex Rd.	West Middlesex	PA
Preston Trucking Co, Inc.	PAD123060626	SQG	RD 2 Stefanak Dr.	West Middlesex	PA
Specialty Metal Products Co.	PAD981109010	SQG	PO Box 246 Main St.	West Middlesex	PA
Staffords Auto Body	PA0000846683	CESQG	3471 Sharon Rd.	West Middlesex	PA
Sunoco Service Station/W. Middlesex	PAD000762815		Rt. 18	West Middlesex	PA
Dunbar Slag Co., Inc	PAD980199871		Ohio St. Ext.	Wheatland	PA
Keystone Rolls Steel Plant	PAR000503839	SQG	40 Council Ave.	Wheatland	PA
Paramount Games	PAR000505388	CESQG	30 Mill St.	Wheatland	PA
Sharon Tube Co. Cold Draw Fac.	PAR000038067	LQG	20 Church St.	Wheatland	PA

Site	Permit	Type	Address	City	State
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Mercer County (continued)

Wheatland Tube Company	PAD004338091	LQG	1 Council Ave.	Wheatland	PA
Wheatland Tube Company Cold Draw Plant	PAD045874138	LQG	200 Clinton St.	Wheatland	PA

Ashtabula

* Andover Fast Check Amoco	OHR000015487	CESQG	150 W. Main St.	Andover	OH
* Andover Industries BMPI	OHD068896778	LQG	205 Maple St.	Andover	OH
BP Oil Company Site 6102	OHD987036589	SQG	91 Public Square	Andover	OH
Bruce Haynum	OHR000042606		240 Center St.	Andover	OH
General Electric Company Andover Bulb	OHD004172516		134 Maple St.	Andover	OH
John Regala Chevy Buick Olds	OHD011559325	SQG	6209 E.Main St.	Andover	OH
Parker Hannifin Corporation	OHD980995237	SQG	101 Parker Dr.	Andover	OH
Regala, John Chevrolet	OHD981792815	SQG	187 E. Main St.	Andover	OH
Village of Andover Water Tower	OHR000008060		Across from 184 Maple St.	Andover	OH
Sunoco Service Station	OHD000667931		RD 1	Williamsfield	OH

Mahoning County

No Facilities

Trumbull County

Acheson Colloids Company	OHR000002139	SQG	6315 Warren Sharon Rd	Brookfield	OH
AT&T Long Lines	OHT400015129		Jct. of Pymont & Johnsonville Road	Brookfield	OH
BP Oil Company Site 6130	OHD987036704		6743 Sharon Rd.	Brookfield	OH
Brookco, Inc.	OHR000032003		7186 Warren Sharon Rd.	Brookfield	OH
Graphite Products Company	OHD004201406	SQG	5756 Warren Sharon Rd.	Brookfield	OH
		TSD			

Site	Permit	Type	Address	City	State
H&R Plating, Inc.	OHD053145835	SQG	1266 State Rt. 7 N	Brookfield	OH
		TSD			
Logan & Company	OHR000027664	CESQG	425 State Rt. 7 SE	Brookfield	OH
Speedway No. 3546	OHD987004967	CESQG	7257 Warren Sharon Rd.	Brookfield	OH
US Can of Brookfield	OHD987019742	SQG	6880 Parkway Dr. SE	Brookfield	OH
Richard Unangst BP	OHR000015693	LQG	8430 St. Rt.305	Burghill	OH
BP Oil Company Williamsfield	OHD000723213	CESQG	2091 St. Rt. 322	Farmdale	OH
Kraft Foods, Inc.	OHD986779730	CESQG	5915 Burnett Rd.	Farmdale	OH
Charlies Auto Body, Inc.	OHD986983146		3291 St. Rt. 7	Hartford	OH
Stanwade Metal Products	OHD986999563	SQG	6868 St. Rt. 305	Hartford	OH
Auto Magic Auto Body	OHD982639437	SQG	5972 Youngstown Hubbard Rd.	Hubbard	OH
B&T Caliber Car Care	OHD987051562	CESQG	6223 Youngstown Hubbard Road	Hubbard	OH
BP Oil Company Site 6205	OHD987036902		2591 N.Main St.	Hubbard	OH
Bridge Terminal Transport, Inc.	OHR000107722	LQG	Mile Marker 235 on I-80	Hubbard	OH
C&C Towing, Inc.	OHD987054533	CESQG	3083 Maplewood	Hubbard	OH
Cerni Motor Sales, Inc.	OHD987042124	SQG	8008 Truckworld Blvd.	Hubbard	OH
Clark Stores 1945	OH0000866020		1003 N.Main St.	Hubbard	OH
Cummins Diesel of North Ohio	OHD131735847	SQG	7145 Masury Rd.	Hubbard	OH
Delphi Packard Electrical System Plant 42	OHD981783954	SQG	400 Myron St.	Hubbard	OH
Eagle Chevrolet & Oldsmobile	OHD018082727	SQG	125 E. Liberty St.	Hubbard	OH
Ellwood Engineers Castings Company	OHD004169199	CESQG	7158 Masury Rd. SE	Hubbard	OH
Federal Wholesale Company	OHD986998193	SQG	734 Myron St.	Hubbard	OH
Frito Lay, Inc.	OHD987053436	SQG	7143 Truckworld Blvd.	Hubbard	OH
Heydle Auto Body	OHD098915051	SQG	943 E.Liberty St.	Hubbard	OH
Hubbard Amoco	OHR000030973	CESQG	204 Liberty St.	Hubbard	OH

Site	Permit	Type	Address	City	State
Trumbull County (continued)					
J&J Baghouse Maintenance Inc	OHD087701892	Transporter	7080 Truckworld Blvd.	Hubbard	OH
Kilar, Inc.	OHD981950694	SQG	2616 N. Main St.	Hubbard	OH
Mark 4 Builders	OHR000107284		844 E. Liberty St.	Hubbard	OH
Merriman Metals	OHR000028779		2435 N. Main St. Ext.	Hubbard	OH
Ohio Bell Tel. Co. Hubbard 534CE Office	OHD000676684		45 Liberty St.	Hubbard	OH
Penske Truck Leasing Co., LP	OHD982061749		2353 N. Main St.	Hubbard	OH
Powell Systems, Inc.	OHR000024000	LQG	500 Erie St.	Hubbard	OH
Roadway Express, Inc.	OHD987051273	CESQG	3020 Gale St.	Hubbard	OH
Rockys Auto Body	OHD982629024	SQG	2325 N. Main St.	Hubbard	OH
Sharon Tube Company	OHR000022293		500 Erie St.	Hubbard	OH
Speedway No. 3377	OHD987004967	CESQG	806 W. Liberty St.	Hubbard	OH
TW Oil Products	OHR00006544	CESQG	7024 Truckworld Blvd.	Hubbard	OH
Trans Gear, Inc.	OHD987048592	CESQG	2644 N. Main St	Hubbard	OH
Truckworld Truck Stop	OHR000023812	CESQG	6995 Truckworld Blvd.	Hubbard	OH
Truckworld Hubbard Foodmart	OHR000023788	CESQG	6965 Truckworld Blvd.	Hubbard	OH
* US Can Co. Plant #2 Hubbard	OHD093928968	SQG	644 Myron St.	Hubbard	OH
Valley Bulcan Mold Company	OHD986970267	SQG	7158 Masury Rd. SE	Hubbard	OH
Warren Fabrications Corp.	OHR000030411	SQG	7845 Chestnut Ridge Rd.	Hubbard	OH
Williams Detroit Diesel	OHD981797558	SQG	7125 Masury Road SE	Hubbard	OH
Yellow Freight System, Inc.	OHD137671699	SQG	6990 Hubbard Masury	Hubbard	OH
Youngstown Kenworth, Inc.	OHD987021078	SQG	7255 Masury Rd. SE	Hubbard	OH
A.G. Birrell Company	OHD987042405	CESQG	8211 Main St.	Kinsman	OH
Fast Check Food Mart	OHR000031047		8507 Main St.	Kinsman	OH
Harmon Terry Motors	OHD060411683	SQG	State Rt. 5	Kinsman	OH
LT Hartnet Trucking, Inc.	OHR000104570	Transporter	7431 St. Rt. 7	Kinsman	OH
Target Stamped Products Corp.	OHR000040493		8091 St. Rt. 5 SE	Kinsman	OH
Vickers Auto & Truck Repair	OH0000443952		7685 St. Rt. 7	Kinsman	OH

Site	Permit	Type	Address	City	State
Trumbull County (continued)					
* Berenfield Containers Limited	OHD018171702		7838 Iron St.	Masury	OH
Fuel Mart #759	OHR000020263	SQG	920 Irvine Ave.	Masury	OH
General American Transportation Corporation	OHT400010484		Standard Ave. & Iron St.	Masury	OH
Howell Industries, Inc.	OHD980681704	CESQG	County Road 26	Masury	OH
Ivor J Lee, Inc.	OHD987043833	CESQG	7799 Locust St.	Masury	OH
Koppers Company, Inc. Mineral Process	OHD004169546		70 Locust St.	Masury	OH
Mitchell Sales Co.	OHD986978153	SQG	1014 Countyline Rd.	Masury	OH
Overnite Transportation Company	OHR000118323	CESQG	7945 Third St.	Masury	OH
		Transporter			
* Roemer Industries, Inc.	OHD099526774	LQG	1555 Masury Rd.	Masury	OH
TK Autobody	OHD982221293	SQG	7817 Addison Rd. SE	Masury	OH
Valley Lining, Inc.	OHD986966281		1555 Standard Rd.	Masury	OH
VEC Technology	OHR000115808	SQG	1585 Masury Rd.	Masury	OH
US Army Engineer District Pittsburgh	OH5210090010	LQG	OH Rt. 88 Co. Rd. 255	Vernon	OH
* USAF 910 Airlift Wing Air Reserve	OH8570028764	SQG	King Graves Rd.	Vienna	OH
PG & Associates	OHD987048717	CESQG	812 Youngstown Kingsville Rd.	Vienna	OH
Delphi Automotive Systems, LLC	OHR000109744	SQG	3400 Aero-Park Dr.	Vienna	OH
Delphi Packard Electrical System Plant 47	OHD982423444	SQG	1330 Ridge Rd.	Vienna	OH
LCI, Inc.	OHD987013752	SQG	1510 Ridge Rd.	Vienna	OH
Mathews High School	IHR000006361		4429 Warren Sharon Rd.	Vienna	OH
Mickey's Collision	OHD057256901	SQG	856 Youngstown Kingsville Rd.	Vienna	OH

Site	Permit	Type	Address	City	State
<i>Trumbull County (continued)</i>					
Starr Fabricating	OHD986971661	SQG	4175 Warren Sharon Rd.	Vienna	OH
		Transporter			
Sunoco Service Station	OHD000681858		Rt. 193 & Old 82	Vienna	OH
Trans Security Admin. Youngstown & Warren Rd.	OHR000120790	CESQG	1453 Youngstown Kingsville Rd.	Vienna	OH
Viets Motor Company	OHD144229515	SQG	4363 Warren Sharon Rd.	Vienna	OH
Winner Aviation Corp.	OHD987032042	SQG	1453 Youngstown Kingsville Rd.	Vienna	OH

* Multiple sites at the facility with the same permit number and type

Descriptions of Waste Site Types

- SQG - Small Quality Generators
- LQG - Large Quality Generators
- CESQG - Conditionally Exempt Small Quality Generators
- Transporter

APPENDIX G. NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM PERMITS

Site/Facility Name	Permit #	Permit Type	Issue Date	Expire Date	Municipality	County	Latitude	Longitude
<i>Upper Shenango River Subwatershed</i>								
Ashtabula County Sanitary Eng.	OH0043770	N/A	05/26/00	06/30/05	Andover Township	Ashtabula	+4137240	-08032320
Daniel J. Cowher 1 SRSTP	PAG048880	PAG-04 Small Flow Treatment Facility	03/11/03	03/10/08	South Shenango Township	Crawford	+4131160	-08026180
Daniel J. Cowher 2 SRSTP	PAG048881	PAG-04 Small Flow Treatment Facility	03/11/03	03/10/08	South Shenango Township	Crawford	+4131160	-08026180
David Jesse SRSTP	PAG048819	PAG-04 Small Flow Treatment Facility	07/11/02	07/10/07	Conneaut Township	Crawford	+4144180	-08028540
Denise Seman SRSTP	PAG048737	PAG-04 Small Flow Treatment Facility	05/30/01	05/29/06	Beaver Township	Crawford	+4145400	-08027110
Marcus Schwartz SRSTP	PAG048947	PAG-04 Small Flow Treatment Facility	03/09/04	02/04/09	Conneaut Township	Crawford	+4145080	-08028124
Mose Schwartz SRSTP	PAG048948	PAG-04 Small Flow Treatment Facility	03/09/04	02/04/09	Conneaut Township	Crawford	+4145066	-08028124
Pymatuning Valley Resort	OH0125989	N/A	02/07/00	02/28/05	N/A	Ashtabula	N/A	N/A
Robert L. Henry SRSTP	PAG048912	PAG-04 Small Flow Treatment Facility	08/11/03	08/10/08	North Shenango Township	Crawford	+4136578	-08026384
Tel O Post Manufacturing	PA0221589	NPDES Permit Industrial Wastewater Discharge, Minor	09/11/00	09/10/05	Linesville Borough	Crawford	+4139270	-08025370
Terrance D. Rager SRSTP	PAG048547	PAG-04 Small Flow Treatment Facility	10/15/03	10/14/08	North Shenango Township	Crawford	+4134390	-08026390
Whitehaven Campground	PA0034215	NPDES Permit Sewage Discharges, Non-Municipal, Minor	12/11/03	12/10/08	South Shenango Township	Crawford	+4133120	-08026370

Site/Facility Name	Permit #	Permit Type	Issue Date	Expire Date	Municipality	County	Latitude	Longitude
<i>Middle Shenango River Subwatershed</i>								
10 Minute Oil Change	PAG058323	PAG-05 Discharge from Gasoline Contaminated Ground Water Remediation Systems	01/05/04	12/12/07	Pine Township	Mercer	+4113580	-08027100
Alberta Slosky SRSTP	PAG048464	PAG-04 Small Flow Treatment Facility	07/18/02	07/17/07	Jefferson Township	Mercer	+0419000	-08900000
Anderson Mobile Home Park	PA0104078	NPDES Permit Sewage Discharges, Non-Municipal, Minor	01/04/00	01/03/05	West Salem Township	Mercer	+4123580	-08025270
Angela L. Fuchs & Jeremy M. Gaus SRSTP	PAG048785	PAG-04 Small Flow Treatment Facility	02/15/02	02/14/07	West Salem Township	Mercer	+4125190	-08026540
Anita L. Kammerdiener SRSTP	PAG048657	PAG-04 Small Flow Treatment Facility	04/18/00	04/17/05	Lackawannock Township	Mercer	+4114010	-08022220
Anthony M. Johnson SRSTP	PAG048756	PAG-04 Small Flow Treatment Facility	10/23/01	10/22/06	Clark Borough	Mercer	+4116320	-08024010
Bessemer & Lake Erie Railroad South Race Street	PA0005622	NPDES Permit Industrial Wastewater Discharge, Minor	09/11/96	12/09/06	Hempfield Township	Mercer	+4123530	-08023270
Brenda K. & Mark J. Delmaramo SRSTP	PAG048944	PAG-04 Small Flow Treatment Facility	02/17/04	02/04/09	Perry Township	Mercer	+4122487	-08013219
Brian R. Luba SRSTP	PAG048318	PAG-04 Small Flow Treatment Facility	01/22/04	01/21/09	Lackawannock Township	Mercer	+4113480	-08021350
Bruce E. & Christine S. Henderson SRSTP	PAG048647	PAG-04 Small Flow Treatment Facility	01/20/00	01/19/05	Lake Township	Mercer	+4119560	-08008130

Site/Facility Name	Permit #	Permit Type	Issue Date	Expire Date	Municipality	County	Latitude	Longitude
<i>Middle Shenango River Subwatershed (continued)</i>								
Camp Nazareth	PA0103942	NPDES Permit Sewage Discharges, Non-Municipal, Minor	12/07/01	12/06/06	Delaware Township	Mercer	+4118259	-08019212
Campbells Camp Perry	PAG058353	PAG-05 Discharge from Gasoline Contaminated Ground Water Remediation Systems	08/27/03	12/12/07	Perry Township	Mercer	+4123470	-08012530
Charles Jr. & Paula Ference SRSTP	PAG048740	PAG-04 Small Flow Treatment Facility	06/29/01	06/28/06	Jefferson Township	Mercer	+4114330	-08022150
Chester M. Miller SRSTP	PAG048835	PAG-04 Small Flow Treatment Facility	10/23/02	10/22/07	Otter Creek Township	Mercer	+4123570	-08016530
Chris Kirkland SRSTP	PAG048641	PAG-04 Small Flow Treatment Facility	01/05/00	01/04/05	West Salem Township	Mercer	+4122050	-08027300
Christopher S. Durniok SRSTP	PAG048747	PAG-04 Small Flow Treatment Facility	08/02/01	08/01/06	West Salem Township	Mercer	+4126230	-08023400
Colonial Tea Room	OH0134406	N/A	12/10/03	12/31/08	N/A	Trumbull	N/A	N/A
Component Intertechonologies, Inc.	PA0103926	NPDES Permit Industrial Wastewater Discharge, Minor	02/27/02	02/26/07	Perry Township	Mercer	+4123130	-08013000
Damascus Tube	PA0001481	NPDES Permit Industrial Wastewater Discharge, Minor	12/06/00	12/05/05	Pymatuning Township	Mercer	+4121020	-08024360
Dana Shaffer SRSTP	PAG048432	NPDES Permit Sewage Discharges, Non-Municipal, Minor	08/16/02	08/15/07	West Salem Township	Mercer	+4124302	-08029016
Daniel P. Wallace SRSTP	PAG048534	PAG-04 Small Flow Treatment Facility	05/22/03	05/21/08	West Salem Township	Mercer	+4123500	-08028050

Site/Facility Name	Permit #	Permit Type	Issue Date	Expire Date	Municipality	County	Latitude	Longitude
<i>Middle Shenango River Subwatershed (continued)</i>								
David F. Buchanan SRSTP	PA0239151	NPDES Permit Sewage Discharges, Non-Municipal, Minor	08/15/03	08/14/08	West Shenango Township	Crawford	+4129260	-08030400
David S. Reimold SRSTP	PAG048956	PAG-04 Small Flow Treatment Facility	05/12/04	02/04/09	Delaware Township	Mercer	+4120215	-08019525
David W. & Shirley A. McGranahan SRSTP	PAG048503	PAG-04 Small Flow Treatment Facility	10/24/02	10/23/07	West Salem Township	Mercer	+4122120	-08026520
Dean C. Gosnell SRSTP	PAG048706	PAG-04 Small Flow Treatment Facility	01/22/01	01/21/06	Sugar Grove Township	Mercer	+4125540	-08021430
Deborah L. Smith SRSTP	PAG048879	PAG-04 Small Flow Treatment Facility	02/18/03	02/17/08	Greene Township	Mercer	+4127070	-08026260
Denise M. & Patrick V. Stadtfeld SRSTP	PAG048742	PAG-04 Small Flow Treatment Facility	07/20/01	07/19/06	Jefferson Township	Mercer	+4114504	-08020452
Donald Warner SRSTP	PAG048794	PAG-04 Small Flow Treatment Facility	07/02/02	07/01/07	Lackawannock Township	Mercer	+4114020	-08019570
Eileen Hanson SRSTP	PAG048883	PAG-04 Small Flow Treatment Facility	04/07/03	04/06/08	Lackawannock Township	Mercer	+4113530	-08021330
ELG Metals	PAR608322	PAG-03 Discharge of Stormwater Associated with Industrial Activities	05/07/01	05/06/06	Pymatuning Township	Mercer	+4121000	-08024000
Eugene N. Cianci SRSTP	PAG048452	PAG-04 Small Flow Treatment Facility	05/24/02	05/23/07	Sugar Grove Township	Mercer	+4116320	-08010530
Evelyn & Seth Johnson SRSTP	PAG048486	PAG-04 Small Flow Treatment Facility	03/11/98	03/10/05	West Salem Township	Mercer	+4126300	-08022540
Fassett & Associates	PA0238660	NPDES Permit Sewage Discharges, Non-Municipal, Minor	12/11/01	12/10/06	Otter Creek Township	Mercer	+4125160	-08018460

Site/Facility Name	Permit #	Permit Type	Issue Date	Expire Date	Municipality	County	Latitude	Longitude
<i>Middle Shenango River Subwatershed (continued)</i>								
Forest Brooke Mobile Home Park	PA0100650	NPDES Permit Sewage Discharges, Non-Municipal, Minor	01/10/03	01/09/08	Lackawannock Township	Mercer	+4114016	-08021066
Frank Crash Auto Wrecking - Conneaut Lake Road	PAR608339	PAG-03 Discharge of Stormwater Associated with Industrial Activities	05/30/02	05/29/07	Hempfield Township	Mercer	+4125100	-08022450
Frank Crash Auto Wrecking - Mercer Road	PAR608338	PAG-03 Discharge of Stormwater Associated with Industrial Activities	05/30/02	05/29/07	Hempfield Township	Mercer	+4122350	-08021400
Frederick C. Callahan SRSTP	PAG048807	PAG-04 Small Flow Treatment Facility	07/02/02	07/01/07	Hempfield Township	Mercer	+4122580	-08019220
Gale L. Klingler SRSTP	PAG048649	PAG-04 Small Flow Treatment Facility	02/18/00	02/17/05	West Salem Township	Mercer	+4122080	-08027100
Garnet L. & Thomas E. Johnson SRSTP	PAG048782	PAG-04 Small Flow Treatment Facility	05/24/02	05/23/07	Greene Township	Mercer	+4129030	-08025080
Gary K. Segall SRSTP	PAG048741	PAG-04 Small Flow Treatment Facility	06/25/01	06/24/06	Hempfield Township	Mercer	+4123050	-08020460
Gerald S. Pacifico SRSTP	PAG048507	PAG-04 Small Flow Treatment Facility	10/21/03	10/20/08	Pymatuning Township	Mercer	+4118306	-08026020
Glenn E. Green SRSTP	PAG048607	PAG-04 Small Flow Treatment Facility	03/17/04	02/04/09	Greenville Borough	Mercer	+4127379	-08018199
Greenville Borough Water Treatment Plant	PA0221970	NPDES Permit Industrial Wastewater Discharge, Minor	05/17/01	05/31/06	Greenville Borough	Mercer	+4124080	-08023280
Greenville Mobile Home Park	PA0103870	NPDES Permit Sewage Discharges, Non-Municipal, Minor	08/23/02	08/22/07	Hempfield Township	Mercer	+4125020	-08020000

Site/Facility Name	Permit #	Permit Type	Issue Date	Expire Date	Municipality	County	Latitude	Longitude
<i>Middle Shenango River Subwatershed (continued)</i>								
Greenville Municipal Airport	PAR808350	PAG-03 Discharge of Stormwater Associated with Industrial Activities	04/25/00	04/24/05	Greene Township	Mercer	+4126490	-08023300
Greenville Sanitation Authority Sewage Treatment Plant	PA0027367	NPDES Permit for New & Existing Sewage Discharge, Municipal, Minor	08/31/01	08/30/06	Hempfield Township	Mercer	+4121590	-08023320
Gregory F. Shaw SRSTP	PAG048378	NPDES Permit Sewage Discharges, Non-Municipal, Minor	09/29/00	09/28/05	Otter Creek Township	Mercer	+412251	-08018489
Hadley Heights Apartments SFTF	PAG048963	PAG-04 Small Flow Treatment Facility	06/07/04	02/04/09	Perry Township	Mercer	+4124380	-08014100
Hodge Foundry	PAR208317	PAG-03 Discharge of Stormwater Associated with Industrial Activities	08/29/02	08/28/07	Greenville Borough	Mercer	+4125000	-08022300
Howard B. Brittner SRSTP	PAG048488	PAG-04 Small Flow Treatment Facility	12/23/02	12/22/07	Fairview Township	Mercer	+4121400	-08011130
Jack Grandy SRSTP	PAG048406	PAG-04 Small Flow Treatment Facility	05/09/01	05/08/06	Delaware Township	Mercer	+4117500	-08018460
James & Laura Calson SRSTP	PAG048559	PAG-04 Small Flow Treatment Facility	09/17/03	09/16/08	West Salem Township	Mercer	+4124040	-08025320
James A. Pumphrey SRSTP	PAG048684	PAG-04 Small Flow Treatment Facility	08/16/00	08/15/05	Jefferson Township	Mercer	+4115040	-08021460
James D. Gainor SRSTP	PAG048644	PAG-04 Small Flow Treatment Facility	01/05/00	01/04/05	West Salem Township	Mercer	+4123550	-08025520
James L. Powell SRSTP	PAG048716	PAG-04 Small Flow Treatment Facility	03/07/01	03/06/06	Greenville Borough	Mercer	+4123540	-08015550
James R. Ondo SRSTP	PAG048683	PAG-04 Small Flow Treatment Facility	08/22/00	08/21/05	West Salem Township	Mercer	+4125000	-08028570

Site/Facility Name	Permit #	Permit Type	Issue Date	Expire Date	Municipality	County	Latitude	Longitude
<i>Middle Shenango River Subwatershed (continued)</i>								
James Stevenson SRSTP	PAG048662	PAG-04 Small Flow Treatment Facility	04/26/00	04/25/05	Salem Township	Mercer	+4126030	-08018090
Jamestown Paint	PAR158301	PAG-03 Discharge of Stormwater Associated with Industrial Activities	05/14/02	05/13/07	Jamestown Borough	Mercer	+4128430	-08026180
Jay C. Lynch SRSTP	PAG048642	PAG-04 Small Flow Treatment Facility	01/05/00	01/04/05	West Salem Township	Mercer	+4122090	-08029020
Jeremy McCartney SRSTP	PAG048675	PAG-04 Small Flow Treatment Facility	07/19/00	07/18/05	Delaware Township	Mercer	+4119050	-08019120
Jill A. Rock SRSTP	PAG048821	PAG-04 Small Flow Treatment Facility	08/26/02	08/25/07	Delaware Township	Mercer	+4120510	-08119350
John A. Reimold, Jr. SRSTP	PAG048453	PAG-04 Small Flow Treatment Facility	06/13/02	06/12/07	Greenville Borough	Mercer	+4123050	-08019090
John C. Janoski SRSTP	PAG048849	PAG-04 Small Flow Treatment Facility	11/14/02	11/13/07	West Shenango Township	Crawford	+4129463	-08030416
Johnson Industries Sharpsville Manufacturing Facility	PAR228326	PAG-03 Discharge of Stormwater Associated with Industrial Activities	04/26/01	04/25/06	South Pymatuning Township	Mercer	+4119440	-08030060
Keystone Charter School	PA0239224	NPDES Permit for New & Existing Sewage Discharge, Municipal, Minor	08/20/03	08/19/08	West Salem Township	Mercer	+4123357	-08026369
Kinsman IGA Supermarket	OH0128431	N/A	07/25/00	08/31/05	Kinsman Township	Trumbull	+4126450	-08035200
Kinsman Pizza	OH0133116	N/A	08/19/02	09/30/07	Kinsman Township	Trumbull	N/A	N/A
Lauri Bowen SRSTP	PAG048692	PAG-04 Small Flow Treatment Facility	10/18/00	10/17/05	Hempfield Township	Mercer	+4122000	-08021460

Site/Facility Name	Permit #	Permit Type	Issue Date	Expire Date	Municipality	County	Latitude	Longitude
<i>Middle Shenango River Subwatershed (continued)</i>								
Lemoyne E. Moffet SRSTP	PAG048860	PAG-04 Small Flow Treatment Facility	01/08/03	01/07/08	West Salem Township	Mercer	+4126250	-08023250
Lester Schmucker SRSTP	PAG048863	PAG-04 Small Flow Treatment Facility	01/08/03	01/07/08	Otter Creek Township	Mercer	+4123030	-08017010
Linwood Y. Ecker SRSTP	PAG048760	PAG-04 Small Flow Treatment Facility	10/26/01	10/25/06	Perry Township	Mercer	+4122440	-08012270
Marc L. Hawks SRSTP	PAG048407	PAG-04 Small Flow Treatment Facility	05/30/01	05/29/06	West Salem Township	Mercer	+4120020	-08028270
Mark E. & Steffanie L. Wyant SRSTP	PAG048473	PAG-04 Small Flow Treatment Facility	09/13/02	10/16/07	Pymatuning Township	Mercer	+4118041	-08024266
Mark E. Gilmore SRSTP	PAG048911	PAG-04 Small Flow Treatment Facility	08/11/03	08/10/08	Jefferson Township	Mercer	+4113190	-08020130
Mark McCann SRSTP	PAG048920	PAG-04 Small Flow Treatment Facility	09/03/03	09/02/08	West Salem Township	Mercer	+4122240	-08027280
Mark Simons SRSTP	PAG048617	PAG-04 Small Flow Treatment Facility	03/02/04	02/04/09	Otter Creek Township	Mercer	+4123420	-08018290
Mary L. & Rickey L. Wheny SRSTP	PAG048466	PAG-04 Small Flow Treatment Facility	06/13/02	06/12/07	Jefferson Township	Mercer	+4115400	-08020290
Matthew E. Gentile SRSTP	PAG048717	PAG-04 Small Flow Treatment Facility	03/14/01	03/13/06	Greenville Borough	Mercer	+4123400	-08016060
McQuiston Truckstop	PAG058324	PAG-05 Discharge from Gasoline Contaminated Ground Water Remediation Systems	01/09/04	12/12/07	New Vernon Township	Mercer	+4123000	-08009000
Michael A. Sloan SRSTP	PAG048839	PAG-04 Small Flow Treatment Facility	10/25/02	10/24/07	Lackawannock Township	Mercer	+4113230	-08022510
Nancy E. Griffin SRSTP	PAG048446	PAG-04 Small Flow Treatment Facility	02/12/02	02/11/07	West Salem Township	Mercer	+4125184	-08024590

Site/Facility Name	Permit #	Permit Type	Issue Date	Expire Date	Municipality	County	Latitude	Longitude
<i>Middle Shenango River Subwatershed (continued)</i>								
Nicholas Barbosa, Jr. SRSTP	PAG048353	PAG-04 Small Flow Treatment Facility	04/18/00	04/17/05	Hempfield Township	Mercer	+4122450	-08020160
Norman W. Eddy SRSTP	PAG048356	NPDES Permit Sewage Discharges, Non-Municipal, Minor	06/23/00	06/22/05	Delaware Township	Mercer	+4120360	-08018480
North & South Shenango Joint Sewage Treatment Plant	PA0100277	NPDES Permit for New & Existing Sewage Discharge, Municipal, Minor	05/28/03	05/27/08	South Shenango Township	Crawford	+4129510	-08027270
ODNR Pymatuning State Park	OH0128694	N/A	02/14/00	02/28/05	N/A	Ashtabula	+4133480	-08031440
Paul M. Miller SRSTP	PAG048751	PAG-04 Small Flow Treatment Facility	08/16/01	08/15/06	Otter Creek Township	Mercer	+4123470	-08017100
Paul R. Goda SRSTP	PA0210013	PAG-04 Small Flow Treatment Facility	02/22/01	02/21/06	Pymatuning Township	Mercer	+4118115	-08025100
Randall Ferrence SRSTP	PAG048567	PAG-04 Small Flow Treatment Facility	02/17/04	02/04/09	South Pymatuning Township	Mercer	+4120580	-08029270
Randall L. Carroll SRSTP	PAG048480	PAG-04 Small Flow Treatment Facility	06/19/03	06/18/08	Jefferson Township	Mercer	+4116500	-08022000
Randy L. Huntington SFTF	PA0239402	NPDES Permit Sewage Discharges, Non-Municipal, Minor	03/15/04	03/14/09	West Shenango Township	Crawford	+4130354	-08028450
Richard A. Pearce SRSTP	PAG048523	PAG-04 Small Flow Treatment Facility	03/10/03	03/09/08	Delaware Township	Mercer	+4121080	-08018330
Richard D. Story SRSTP	PAG048719	PAG-04 Small Flow Treatment Facility	04/12/01	04/11/06	West Salem Township	Mercer	+4123250	-08029010
Richard Lee Weber SRSTP	PAG048861	PAG-04 Small Flow Treatment Facility	12/23/02	12/22/07	West Salem Township	Mercer	+4123240	-08025290

Site/Facility Name	Permit #	Permit Type	Issue Date	Expire Date	Municipality	County	Latitude	Longitude
<i>Middle Shenango River Subwatershed (continued)</i>								
RMM's Food Mart	PAG058358	PAG-05 Discharge from Gasoline Contaminated Ground Water Remediation Systems	02/05/04	12/12/07	Hermitage City	Mercer	+4114150	-08023520
Robert A. Bain SRSTP	PAG048483	PAG-04 Small Flow Treatment Facility	05/21/03	05/20/08	Jefferson Township	Mercer	+4114229	08023057
Robert G. Grisetti SRSTP	PAG048959	PAG-04 Small Flow Treatment Facility	05/12/04	02/04/09	Delaware Township	Mercer	+4119180	-08018200
Robert H. Jama SRSTP	PAG048705	PAG-04 Small Flow Treatment Facility	01/22/01	01/21/06	Pymatuning Township	Mercer	+4118040	-08024170
Roger A. Kwiatkowski SRSTP	PAG048836	PAG-04 Small Flow Treatment Facility	10/23/02	10/22/07	Clark Borough	Mercer	+4116340	-08024010
Roger L. Struthers SRSTP	PAG048419	NPDES Permit for Sewage Discharges, Municipal, Major	08/16/01	08/15/06	Delaware Township	Mercer	+4120080	-08017510
Salem Tube Manufacturing	PA0221244	NPDES Permit Industrial Wastewater Discharge, Minor	06/04/01	06/03/06	Greenville Borough	Mercer	+4121210	-08024340
Scenic Mobile Home Park	PA0032913	NPDES Permit Sewage Discharges, Non-Municipal, Minor	10/13/00	10/12/05	Pymatuning Township	Mercer	+4118289	-08025589
SNPJ Recreation Center	PA0101478	NPDES Permit Sewage Discharges, Non-Municipal, Minor	04/26/00	04/25/05	North Beaver Township	Lawrence	+4055410	-08029550
Sperry Poultry Farm	PA0239127	NPDES Permit for Concentrated Animal Feed Operations, Individual	10/01/03	09/30/08	East Fallowfield Township	Crawford	N/A	N/A

Site/Facility Name	Permit #	Permit Type	Issue Date	Expire Date	Municipality	County	Latitude	Longitude
<i>Middle Shenango River Subwatershed (continued)</i>								
Sunnyview Mobile Home Park	PA0032905	NPDES Permit Sewage Discharges, Non-Municipal, Minor	02/06/01	02/05/06	Pymatuning Township	Mercer	+4118120	-08025578
Susan I. Booth & James E. Leskovac SRSTP	PAG048518	PAG-04 Small Flow Treatment Facility	08/20/03	08/19/08	Hempfield Township	Mercer	+4122220	-08020260
Tammy L. Xander SRSTP	PAG048550	PAG-04 Small Flow Treatment Facility	07/10/03	07/09/08	West Salem Township	Mercer	+4124090	-08029010
Target Stamped Products Corp.	OH0131377	N/A	01/17/02	02/28/07	Kinsman Township	Trumbull	N/A	N/A
Terrence J. & Patricia A. Collings SRSTP	PAG048494	PAG-04 Small Flow Treatment Facility	01/28/03	01/27/08	Jefferson Township	Mercer	+4115420	-08022040
Terry Mariacher SRSTP	PAG048605	PAG-04 Small Flow Treatment Facility	03/02/04	02/04/09	West Salem Township	Mercer	+4126306	-08023544
Terry S. Sanner SRSTP	PAG048380	PAG-04 Small Flow Treatment Facility	08/28/01	08/27/06	Perry Township	Mercer	+4124050	-08012530
Thomas G. Hermann SRSTP	PAG048809	PAG-04 Small Flow Treatment Facility	05/22/02	05/21/07	South Shenango Township	Crawford	+4133229	-08025402
Thomas H. Fenton SRSTP	PAG048934	PAG-04 Small Flow Treatment Facility	01/13/04	01/12/09	West Salem Township	Mercer	+4125180	-08026510
Times Square Restaurant	OH0129950	N/A	08/15/01	08/31/06	Kinsman Township	Trumbull	+4126240	-08035050
Travis M. Young SRSTP	PAG048576	PAG-04 Small Flow Treatment Facility	08/14/03	08/13/08	South Pymatuning Township	Mercer	+4119189	-08028093
VEC Tech	PAR808375	PAG-03 Discharge of Stormwater Associated with Industrial Activities	12/07/01	12/06/06	Hempfield Township	Mercer	+4122026	-08022448

Site/Facility Name	Permit #	Permit Type	Issue Date	Expire Date	Municipality	County	Latitude	Longitude
<i>Middle Shenango River Subwatershed (continued)</i>								
Vicki L. Vandergrift SRSTP	PAG048349	PAG-04 Small Flow Treatment Facility	02/13/01	02/12/06	Greene Township	Mercer	+4126360	-08031050
Werner Company Greenville Division	PA0034916	NPDES Permit Industrial Wastewater Discharge, Minor	03/13/01	03/12/06	Sugar Grove Township	Mercer	+4126180	-08021570
William G. Schellenger, Jr. SRSTP	PAG048528	PAG-04 Small Flow Treatment Facility	03/24/03	03/23/08	West Salem Township	Mercer	+4123200	-08029000
<i>Lower Shenango River Subwatershed</i>								
Aqua PA Shenango Valley Water Treatment Plant	PA0000809	NPDES Permit Industrial Wastewater Discharge, Minor	01/30/02	01/29/07	Sharon City	Mercer	+4114300	-08039450
Brett C. Gassner SRSTP	PA0210102	PAG-04 Small Flow Treatment Facility	03/28/02	03/27/07	Shenango Township	Mercer	+4110035	-08024579
Brian K. Ruffo SRSTP	PAG048493	PAG-04 Small Flow Treatment Facility	01/06/03	01/05/08	Shenango Township	Mercer	+4109030	-08029390
Brookfield Acres	OH0101362	N/A	04/02/03	04/30/08	N/A	Trumbull	N/A	N/A
Castle Builders Supply Hermitage	PAR218320	PAG-03 Discharge of Stormwater Associated with Industrial Activities	02/17/04	02/16/09	Hermitage City	Mercer	+4111560	-08029020
CCL Container Mfg. Hermitage	PAR208336	PAG-03 Discharge of Stormwater Associated with Industrial Activities	04/12/02	04/11/07	Hermitage City	Mercer	+4111450	-08028300
Champion Carrier	PAR808372	PAG-03 Discharge of Stormwater Associated with Industrial Activities	06/23/00	06/22/05	Hermitage City	Mercer	N/A	N/A

Site/Facility Name	Permit #	Permit Type	Issue Date	Expire Date	Municipality	County	Latitude	Longitude
<i>Lower Shenango River Subwatershed (continued)</i>								
City of Hubbard Light Water and Sewer Department	OH0025810	N/A	06/29/01	10/31/05	Hubbard City	Trumbull	+4110170	-08033120
Commonwealth of Pennsylvania - PA DOT Welcome Center - Site E	PA0035513	NPDES Permit Sewage Discharges, Non-Municipal, Minor	09/13/02	09/12/07	Shenango Township	Mercer	+4110540	-08030160
Con-Way Central Express	PAR808336	PAG-03 Discharge of Stormwater Associated with Industrial Activities	09/05/02	09/04/07	Hermitage City	Mercer	+4111550	-08028450
Crash Bros. Auto Wrecking	PAR608337	PAG-03 Discharge of Stormwater Associated with Industrial Activities	05/14/02	05/13/07	Sharon City	Mercer	+4113400	-08030250
Cross Roads Food Market #45	PAG058329	PAG-05 Discharge from Gasoline Contaminated Ground Water Remediation Systems	10/09/03	12/12/07	Union Township	Lawrence	+4100390	-08022120
CSX Transportation New Castle Railyard	PA0222623	NPDES Permit Sewage Discharges, Non-Municipal, Minor	02/05/04	02/04/09	Taylor Township	Lawrence	+4058050	-08022140
Daniel W. Daliman SRSTP	PA0210005	PAG-04 Small Flow Treatment Facility	08/01/01	10/22/06	Shenango Township	Mercer	+4109528	-08030582
David Williams	PA0210048	N/A	06/12/92	06/11/97	South Pymatuning Township	Mercer	+4116480	-08030310
Dean Dairy Products	PAR128304	PAG-03 Discharge of Stormwater Associated with Industrial Activities	01/08/03	01/07/03	South Pymatuning Township	Mercer	+4117190	-08030350

Site/Facility Name	Permit #	Permit Type	Issue Date	Expire Date	Municipality	County	Latitude	Longitude
<i>Lower Shenango River Subwatershed (continued)</i>								
Dennis Stefanak SRSTP	PA0209929	PAG-04 Small Flow Treatment Facility	02/14/01	02/13/06	Shenango Township	Mercer	+4109210	-08025449
Duferco Farrell Steel	PA0002429	NPDES Permit for New & Existing Industrial Discharger, Major	03/08/01	03/07/06	Farrell City	Mercer	+4112430	-08030430
Earl G. Willey SRSTP	PA0210501	NPDES Permit Sewage Discharges, Non-Municipal, Minor	04/28/03	04/27/08	Shenango Township	Mercer	+4111100	-08026130
Edgewood Group Home	PA0239437	NPDES Permit Sewage Discharges, Non-Municipal, Minor	03/15/04	03/14/09	Pulaski Township	Lawrence	+4106179	-08025051
Ellwood Engineered Castings	OH0011801	N/A	04/05/02	04/30/07	Hubbard City	Trumbull	+4110397	-08033266
Ellwood Quality Steels	PA0103411	NPDES Permit Industrial Wastewater Discharge, Minor	08/01/01	07/31/06	New Castle City	Lawrence	+4059230	-08021130
Eva Tataseo SRSTP	PA0239372	NPDES Permit Sewage Discharges, Non-Municipal, Minor	12/19/03	12/18/08	South Pymatuning Township	Mercer	+4117440	-08030230
Falcon Transportation	PAR808302	PAG-03 Discharge of Stormwater Associated with Industrial Activities	09/17/03	09/16/08	Hermitage City	Mercer	+4111360	-08028000
Farrell City Wastewater Treatment Plant	PA0027227	NPDES Permit for Sewage Discharges, Municipal, Major	12/31/01	12/30/06	Farrell City	Mercer	+4112030	-08030200
Floyd E. Aarow SRSTP	PAG048744	PAG-04 Small Flow Treatment Facility	08/16/01	08/15/06	Shenango Township	Mercer	+4110330	-08025330

Site/Facility Name	Permit #	Permit Type	Issue Date	Expire Date	Municipality	County	Latitude	Longitude
<i>Lower Shenango River Subwatershed (continued)</i>								
Gary Blakely SRSTP	PAG048418	NPDES Permit Sewage Discharges, Non-Municipal, Minor	01/18/02	01/17/07	Shenango Township	Mercer	+4110454	-08029367
George L. Johnson SRSTP	PAG048604	PAG-04 Small Flow Treatment Facility	04/23/04	02/04/09	South Pymatuning Township	Mercer	+4118250	-08030500
Heritage Hills Mobile Home Park	PA0036056	NPDES Permit Sewage Discharges, Non-Municipal, Minor	03/13/03	03/12/08	Pulaski Township	Lawrence	+4004230	-08027110
Hermitage Municipal Authority - Bobby Run WPCP	PAP028487	N/A	N/A	N/A	N/A	Mercer	N/A	N/A
Hermitage Municipal Authority Sewage Treatment Plant	PA0028487	NPDES Permit for Sewage Discharges, Municipal, Major	04/14/03	04/13/08	Hermitage City	Mercer	+4111320	-08028020
Human Services Center Adult Housing	PA0210897	NPDES Permit Sewage Discharges, Non-Municipal, Minor	04/17/03	04/16/08	Pulaski Township	Lawrence	+4106210	-08025410
Hyland Mobile Home Park	PA0210811	NPDES Permit Sewage Discharges, Non-Municipal, Minor	10/16/02	10/15/07	Pulaski Township	Lawrence	+4105370	-08030390
Interchange Specialty Services	PAR808315	PAG-03 Discharge of Stormwater Associated with Industrial Activities	01/29/03	01/28/08	New Castle City	Lawrence	N/A	N/A
James D. Welker SRSTP	PAG048804	PAG-04 Small Flow Treatment Facility	06/03/02	06/02/07	Neshannock Township	Lawrence	+4102150	-08023060

Site/Facility Name	Permit #	Permit Type	Issue Date	Expire Date	Municipality	County	Latitude	Longitude
<i>Lower Shenango River Subwatershed (continued)</i>								
Jerry Novosel SRSTP	PA0209783	PAG-04 Small Flow Treatment Facility	04/27/01	04/26/06	Shenango Township	Mercer	+4108144	-08024471
John E. & Mary A. Daley SRSTP	PAG048903	PAG-04 Small Flow Treatment Facility	08/29/03	08/28/08	Shenango Township	Mercer	+4108520	-08023280
Joy Cone Manufacturing	PAR128302	PAG-03 Discharge of Stormwater Associated with Industrial Activities	10/10/02	10/09/07	Sharon City	Mercer	+4015300	-08026450
Kasgro Rail - Rundle Road Plant	PAR328302	PAG-03 Discharge of Stormwater Associated with Industrial Activities	07/23/02	07/22/07	Taylor Township	Lawrence	+4058050	-08022150
Keith Palumbo SRSTP	PA0104507	PAG-04 Small Flow Treatment Facility	10/24/01	10/23/06	Shenango Township	Mercer	+4110100	-08029450
Kenneth J. & Janice M. DeMaria SRSTP	PAG048364	PAG-04 Small Flow Treatment Facility	07/12/00	07/11/05	Shenango Township	Mercer	+4110350	-08029040
Keystone Rolls Steel Plant	PAR208346	PAG-03 Discharge of Stormwater Associated with Industrial Activities	08/30/00	08/29/05	Wheatland Borough	Mercer	+4111500	-08030260
Lane Enterprises Pulaski	PAR208305	PAG-03 Discharge of Stormwater Associated with Industrial Activities	09/27/02	09/26/07	Pulaski Township	Lawrence	+4107000	-08025500
Melvin Webb SRSTP	PAG048448	NPDES Permit Sewage Discharges, Non-Municipal, Minor	03/12/02	03/11/07	Shenango Township	Mercer	+4107557	-08027326
Mitchell 4-Plex Apartments	OH0128481	N/A	01/20/00	02/28/05	Hubbard City	Trumbull	N/A	N/A
New Castle Foundry	PAR208337	PAG-03 Discharge of Stormwater Associated with Industrial Activities	04/23/04	04/22/09	North Beaver Township	Lawrence	+4058540	-08021150

Site/Facility Name	Permit #	Permit Type	Issue Date	Expire Date	Municipality	County	Latitude	Longitude
<i>Lower Shenango River Subwatershed (continued)</i>								
New Castle Industries - Tanner Plating Division	PAR208362	PAG-03 Discharge of Stormwater Associated with Industrial Activities	07/11/02	07/10/07	New Castle City	Lawrence	+4058440	-08021370
North Memorial Animal Hospital	PA0221988	NPDES Permit for New & Existing Sewage Discharge, Municipal, Minor	02/06/01	02/05/06	Wilmington Township	Lawrence	+4105139	-08021301
Oakleaf Estates Mobile Home Park	PA0104353	NPDES Permit Sewage Discharges, Non-Municipal, Minor	02/26/02	02/25/07	Shenango Township	Mercer	+4109540	-08024310
PA American Water Company - New Castle Disposal Site	PAR408302	PAG-03 Discharge of Stormwater Associated with Industrial Activities	05/17/00	05/16/05	Neshannock Township	Lawrence	+4101250	-08022240
Peter M. & Emily J. Daloni SFTF	PA0238511	NPDES Permit Sewage Discharges, Non-Municipal, Minor	05/30/01	05/29/06	Shenango Township	Mercer	+4111119	-08025049
Pitt Ohio Express West Middlesex Terminal	PAR808311	PAG-03 Discharge of Stormwater Associated with Industrial Activities	04/14/03	04/13/08	Shenango Township	Mercer	+4210320	-08026140
Pulaski Township Sewage Treatment Plant	PA0238945	NPDES Permit for New & Existing Sewage Discharge, Municipal, Minor	03/21/03	03/20/08	Pulaski Township	Lawrence	+4106210	-08028070
Pulaski Elementary School	PA0030325	NPDES Permit Sewage Discharges, Non-Municipal, Minor	06/10/03	06/09/08	Pulaski Township	Lawrence	+4106450	-08025580
Robert W. Cheney SRSTP	PAG048510	PAG-04 Small Flow Treatment Facility	02/26/03	02/25/08	Shenango Township	Mercer	+4107300	-08022300
Roma Manor	OH0129861	N/A	06/21/01	07/31/06	Hubbard City	Trumbull	+4109280	-08036010

Site/Facility Name	Permit #	Permit Type	Issue Date	Expire Date	Municipality	County	Latitude	Longitude
<i>Lower Shenango River Subwatershed (continued)</i>								
Route 18 Auto Wrecking	PAR608327	PAG-03 Discharge of Stormwater Associated with Industrial Activities	01/21/00	01/20/05	Shenango Township	Mercer	+4109250	-08023500
Sharon City	PAP027138	N/A	N/A	N/A	Sharon City	Mercer	N/A	N/A
Sharon Sewage Treatment Plant	PA0027138	NPDES Permit for Sewage Discharges, Municipal, Major	07/02/03	07/01/08	Sharon City	Mercer	+4113220	-08030530
Sharon Tube	PA0103781	NPDES Permit Industrial Wastewater Discharge, Minor	07/17/03	07/16/08	Sharon City	Mercer	+4114270	-08030500
Sharon Tube Cold Draw Facility	PA0222933	NPDES Permit Industrial Wastewater Discharge, Minor	03/08/00	03/07/05	Wheatland Borough	Mercer	+4112100	-08030210
Sharpsville Quality Products	PA0002453	NPDES Permit Industrial Wastewater Discharge, Minor	12/05/00	12/04/05	Sharpsville Borough	Mercer	+4115500	-08029300
Shenango Township Sewage Treatment Plant	PA0103471	NPDES Permit for New & Existing Sewage Discharge, Municipal, Minor	03/07/02	03/06/07	Shenango Township	Mercer	+4110070	-08027030
Shenango Valley Commercial Ins	PA0030333	NPDES Permit Sewage Discharges, Non-Municipal, Minor	03/13/03	03/12/08	Pulaski Township	Lawrence	+4105430	-08030050
Tri-City Mobile Homes	OH0045101	N/A	04/02/03	04/30/08	Vienna Township	Trumbull	+4115200	-08039210
Trumbull County Board of Commissioners	OHL036285	N/A	N/A	N/A	N/A	Trumbull	+4113020	-08031360

Site/Facility Name	Permit #	Permit Type	Issue Date	Expire Date	Municipality	County	Latitude	Longitude
<i>Lower Shenango River Subwatershed (continued)</i>								
Universal Rundle Corporation	PA0005321	NPDES Permit Industrial Wastewater Discharge, Minor	02/02/04	02/01/09	Taylor Township	Lawrence	+4057249	-08022320
Wayne Dick SRSTP	PAG048696	PAG-04 Small Flow Treatment Facility	10/18/00	10/17/05	Shenango Township	Mercer	+4110500	-08029340
West Penn Plastic	PA0210790	NPDES Permit Industrial Wastewater Discharge, Minor	05/17/04	05/16/09	Union Township	Lawrence	+4102060	-08024020
Wheatland Tube Cold Draw Plant	PA0006351	NPDES Permit Industrial Wastewater Discharge, Minor	03/29/02	03/28/07	Wheatland Borough	Mercer	+4112000	-08029300
Wheatland Tube Company - Division of John Maneely Company	PA0000868	NPDES Permit for New & Existing Industrial Discharger, Major	07/01/03	06/30/08	Wheatland Borough	Mercer	+4111350	-08029330
Wheatland Tube Sharon Plant	PA0006378	NPDES Permit for New & Existing Industrial Discharger, Major	07/29/03	07/28/08	Wheatland Borough	Mercer	+4114400	-08030200
Zoccoli's Mobile Home Park	PA0103861	NPDES Permit Sewage Discharges, Non-Municipal, Minor	01/24/01	01/23/06	Mahoning Township	Lawrence	+4102410	-08025440

Neshannock Creek/Big Run Subwatershed

Barry J. Kaminske SRSTP	PAG048362	NPDES Permit Sewage Discharges, Non-Municipal, Minor	08/22/00	08/21/05	Wilmington Township	Lawrence	+4106575	-08020491
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Site/Facility Name	Permit #	Permit Type	Issue Date	Expire Date	Municipality	County	Latitude	Longitude
<i>Neshannock Creek/Big Run Subwatershed (continued)</i>								
Brian David SRSTP	PA0238902	NPDES Permit Sewage Discharges, Non-Municipal, Minor	10/22/02	10/21/07	Hickory Township	Lawrence	+4102380	-08015310
Carol E. Hones SRSTP	PAG048884	PAG-04 Small Flow Treatment Facility	04/07/03	04/06/08	Slippery Rock Township	Lawrence	+4059540	-08015510
Castle Builders Supply New Castle	PAR218312	PAG-03 Discharge of Stormwater Associated with Industrial Activities	01/17/02	01/16/07	New Castle City	Lawrence	+4059050	-08021000
Christine & Christopher Wiesen SRSTP	PAG048940	PAG-04 Small Flow Treatment Facility	02/26/04	02/04/09	Hermitage City	Mercer	+4111520	-08023580
Coolspring-Jackson Lake Latonka Sewage Treatment Plant	PA0223069	NPDES Permit for New & Existing Sewage Discharge, Municipal, Minor	06/06/00	06/05/05	Coolspring Township	Mercer	+4115280	-08011080
Countryside Convalescent Home	PA0033146	NPDES Permit Sewage Discharges, Non-Municipal, Minor	05/14/02	05/13/07	East Lackawannock Township	Mercer	+4114037	-08015577
Craig P. Mild SRSTP	PAG048743	PAG-04 Small Flow Treatment Facility	08/16/01	08/15/06	Lackawannock Township	Mercer	+4113010	-08022590
Daniel E. Long SRSTP	PA0221031	NPDES Permit Sewage Discharges, Non-Municipal, Minor	05/28/04	05/27/09	East Lackawannock Township	Mercer	+4109340	-08017560
David G. Dawson SRSTP	PAG048467	PAG-04 Small Flow Treatment Facility	06/02/03	06/01/08	Wilmington Township	Mercer	N/A	N/A
David M. McCoy SRSTP	PAG048840	PAG-04 Small Flow Treatment Facility	03/10/03	03/09/08	Findley Township	Mercer	+4112550	-08007470
Dennis Shadron SRSTP	PAG048710	PAG-04 Small Flow Treatment Facility	03/07/01	03/06/06	Springfield Township	Mercer	+4110060	-08013500

Site/Facility Name	Permit #	Permit Type	Issue Date	Expire Date	Municipality	County	Latitude	Longitude
<i>Neshannock Creek/Big Run Subwatershed (continued)</i>								
Double R Plastics	PAR238330	PAG-03 Discharge of Stormwater Associated with Industrial Activities	05/30/02	05/29/07	New Castle City	Lawrence	N/A	N/A
Ergon Trucking	PAR808374	PAG-03 Discharge of Stormwater Associated with Industrial Activities	05/10/01	05/09/06	East Lackawannock Township	Mercer	+4010095	-08014064
Eric D. & Lori A. Gaus	PAG048779	PAG-04 Small Flow Treatment Facility	01/30/02	01/29/07	Greenville Borough	Mercer	+4122430	-08016280
Fairview Swiss Cheese	PA0035718	NPDES Permit Industrial Wastewater Discharge, Minor	06/19/02	06/18/07	Fredonia Borough	Mercer	+4120020	-08013380
Flowline Manufacturing	PAR208338	PAG-03 Discharge of Stormwater Associated with Industrial Activities	07/18/02	07/17/07	Shenango Township	Lawrence	+4059070	-08018580
Flynn's Tire Sales	PA0238783	NPDES Permit Sewage Discharges, Non-Municipal, Minor	08/06/02	08/05/07	Lackawannock Township	Mercer	+4114030	-08020080
Fredonia Wastewater Treatment Plant	PA0020044	NPDES Permit for New & Existing Sewage Discharge, Municipal, Minor	05/11/01	05/10/06	Fredonia Borough	Mercer	+4119320	-08015080
George Junior Republic SRSTP	PAG048346	PAG-04 Small Flow Treatment Facility	03/31/00	03/30/05	Wilmington Township	Mercer	+4108460	-08018370
Howard Johnson Motor Lodge	PA0034738	NPDES Permit Sewage Discharges, Non-Municipal, Minor	05/08/02	05/07/07	East Lackawannock Township	Mercer	+4111340	-08014140
Jackson Center Borough Sewage Treatment Plant	PA0103331	NPDES Permit for New & Existing Sewage Discharge, Municipal, Minor	09/02/03	09/01/08	Jackson Center Borough	Mercer	+4116080	-08009070

Site/Facility Name	Permit #	Permit Type	Issue Date	Expire Date	Municipality	County	Latitude	Longitude
<i>Neshannock Creek/Big Run Subwatershed (continued)</i>								
James R. Sarson SRSTP	PAG048713	PAG-04 Small Flow Treatment Facility	02/20/01	02/19/06	Perry Township	Mercer	+4122340	-08014420
Joe's Service Station	PAG058333	PAG-05 Discharge from Gasoline Contaminated Ground Water Remediation Systems	10/09/03	12/12/07	Volant Borough	Lawrence	+4107450	-08014300
John H. Miller SRSTP	PAG048409	NPDES Permit Sewage Discharges, Non-Municipal, Minor	05/11/01	05/10/06	Stoneboro Borough	Mercer	+4120420	-08015130
John P., Jr. & Melinda J. Holfelder SRSTP	PAG048478	PAG-04 Small Flow Treatment Facility	11/18/02	11/17/07	Wilmington Township	Mercer	+4108280	-08023000
Kenneth L. Miller SRSTP	PAG048750	PAG-04 Small Flow Treatment Facility	08/02/01	08/01/06	Lackawannock Township	Mercer	+4112400	-08021300
Last Minit Mart New Castle	PA0222992	NPDES Permit Sewage Discharges, Non-Municipal, Minor	01/04/00	01/03/05	East Lackawannock Township	Mercer	+4111480	-08008030
Laurel Jr.-Sr. High School	PA0034592	NPDES Permit Sewage Discharges, Non-Municipal, Minor	07/29/03	07/28/08	Hickory Township	Lawrence	+4100560	-08015310
Mary M. Imler SRSTP	PAG048377	NPDES Permit Sewage Discharges, Non-Municipal, Minor	01/31/01	01/30/06	Hickory Township	Lawrence	+4104390	-08015460
Mercer Auto Wreckers	PAR608332	PAG-03 Discharge of Stormwater Associated with Industrial Activities	11/28/00	11/27/05	Mercer Borough	Mercer	+4113200	-08013250
Mercer Baptist Church	PA0239429	NPDES Permit Sewage Discharges, Non-Municipal, Minor	06/08/04	06/07/09	Findley Township	Mercer	+1156360	-08012492

Site/Facility Name	Permit #	Permit Type	Issue Date	Expire Date	Municipality	County	Latitude	Longitude
<i>Neshannock Creek/Big Run Subwatershed (continued)</i>								
Mercer Borough Wastewater Treatment Plant	PA0025356	NPDES Permit for New & Existing Sewage Discharge, Municipal, Minor	07/25/00	07/24/05	Mercer Borough	Mercer	+4113210	-08013480
Mercer Forge	PA0104086	NPDES Permit Industrial Wastewater Discharge, Minor	01/09/01	01/08/06	Mercer Borough	Mercer	+4113400	-08013230
Mercer/Grove City KOA Campground	PA0033421	NPDES Permit Sewage Discharges, Non-Municipal, Minor	12/06/01	12/05/06	Findley Township	Mercer	+4111150	-08010585
Mercer/Grove City KOA Campground	PA0033421	NPDES Permit Sewage Discharges, Non-Municipal, Minor	12/06/01	12/05/06	Findley Township	Mercer	+4111150	-08010585
New Castle Auto Wrecking	PAR608335	PAG-03 Discharge of Stormwater Associated with Industrial Activities	06/21/01	06/20/06	Shenango Township	Lawrence	+4058100	-08018300
New Wilmington Borough Sewage Treatment Plant	PA0028274	NPDES Permit for New & Existing Sewage Discharge, Municipal, Minor	07/03/02	07/02/07	New Wilmington Borough	Lawrence	+4007100	-08019260
Norma J. Flickinger SRSTP	PAG048795	PAG-04 Small Flow Treatment Facility	05/06/02	05/05/07	Hermitage City	Mercer	+4111470	-08023500
Oak Grove Wesleyan Methodist Church	PA0238961	NPDES Permit Sewage Discharges, Non-Municipal, Minor	03/06/03	03/05/08	Fairview Township	Mercer	+4119350	-08012217
PA Department of Corrections - State Correctional Facility at Mercer	PA0102326	NPDES Permit Sewage Discharges, Non-Municipal, Minor	02/26/02	02/25/07	Findley Township	Mercer	+4113580	-08013390

Site/Facility Name	Permit #	Permit Type	Issue Date	Expire Date	Municipality	County	Latitude	Longitude
<i>Neshannock Creek/Big Run Subwatershed (continued)</i>								
Pine Grove Mobile Home Park	PA0210331	NPDES Permit Sewage Discharges, Non-Municipal, Minor	02/06/03	02/05/08	Coolspring Township	Mercer	+4114300	-08014000
Remark Estates Mobile Home Park	PA0036617	NPDES Permit Sewage Discharges, Non-Municipal, Minor	01/22/01	01/21/06	Lackawannock Township	Mercer	+4113430	-08020040
Remington American Grille Restaurant	PA0222062	NPDES Permit Sewage Discharges, Non-Municipal, Minor	05/13/03	05/12/05	Springfield Township	Mercer	+4110247	-08014080
Richard D. Mooney SRSTP	PAG048791	PAG-04 Small Flow Treatment Facility	03/04/02	03/03/07	Neshannock Township	Lawrence	+4102390	-08018490
Richard H. Craig SRSTP	PAG048799	PAG-04 Small Flow Treatment Facility	07/02/02	07/01/07	Findley Township	Mercer	+4111210	-08009170
Ricky K. Truesdell SRSTP	PAG048927	PAG-04 Small Flow Treatment Facility	11/12/03	11/11/08	Coolspring Township	Mercer	+4117392	-08014245
Roger A. & Amy L. Sandak SFTF	PA0238414	NPDES Permit Sewage Discharges, Non-Municipal, Minor	01/12/01	01/11/06	Scott Township	Lawrence	+4100485	-08013490
Ronald E. Greenawalt SRSTP	PAG048792	PAG-04 Small Flow Treatment Facility	06/27/02	06/26/07	Lackawannock Township	Mercer	+4112480	-08022330
Ryan Wells SRSTP	PAG048810	PAG-04 Small Flow Treatment Facility	07/02/02	07/01/07	Lake Township	Mercer	+4121180	-08011000
Sandra J. Van Dusen SRSTP	PAG048942	PAG-04 Small Flow Treatment Facility	02/05/04	02/04/09	Fairview Township	Mercer	+4121080	-08013030
Sandra K. Hill SRSTP	PAG048783	PAG-04 Small Flow Treatment Facility	02/14/02	02/13/07	Coolspring Township	Mercer	+4114540	-08012430

Site/Facility Name	Permit #	Permit Type	Issue Date	Expire Date	Municipality	County	Latitude	Longitude
<i>Neshannock Creek/Big Run Subwatershed (continued)</i>								
Sandra Shuttleworth SRSTP	PAG048411	NPDES Permit Sewage Discharges, Non-Municipal, Minor	08/16/01	08/15/06	Shenango Township	Mercer	+4111280	-08023400
Sue A. Brown & Amy J. Wagner SRSTP	PA0238457	NPDES Permit Sewage Discharges, Non-Municipal, Minor	04/18/01	04/17/06	Wilmington Township	Lawrence	+4105310	-08020220
Terence L. Young SRSTP	PAG048887	PAG-04 Small Flow Treatment Facility	04/14/03	04/13/08	Jackson Township	Mercer	+4116450	-08009300
Thomas L. Waterloo SRSTP	PAG048871	PAG-04 Small Flow Treatment Facility	04/07/03	04/06/08	East Lackawannock Township	Mercer	+4113420	-08016010
Timothy P. Yesko SRSTP	PAG048765	PAG-04 Small Flow Treatment Facility	11/30/01	11/29/06	Perry Township	Mercer	+4122580	-08014460
Tri-Lane Estates Mobile Home Park	PA0221627	NPDES Permit Sewage Discharges, Non-Municipal, Minor	08/11/00	08/10/05	Lackawannock Township	Mercer	+4114060	-08020060
UPS New Castle Distribution Center	PAR808343	PAG-03 Discharge of Stormwater Associated with Industrial Activities	08/30/00	08/29/05	Wilmington Township	Lawrence	+4059290	-08019490
US Can Company	PAR208350	PAG-03 Discharge of Stormwater Associated with Industrial Activities	06/21/01	06/20/06	Shenango Township	Lawrence	+4059000	-08018000
US Postal Service New Castle Vehicle Maintenance Facility	PAR808341	PAG-03 Discharge of Stormwater Associated with Industrial Activities	09/14/00	09/13/05	New Castle City	Lawrence	+4059450	-08019150
Verna D. Smith SRSTP	PAG048554	PAG-04 Small Flow Treatment Facility	08/14/03	08/13/08	Pymatuning Township	Mercer	+4118100	-08025120

Site/Facility Name	Permit #	Permit Type	Issue Date	Expire Date	Municipality	County	Latitude	Longitude
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Neshannock Creek/Big Run Subwatershed (continued)

Volant Borough Sewage Treatment Plant	PA0221007	NPDES Permit for New & Existing Sewage Discharge, Municipal, Minor	01/12/01	01/11/06	Volant Borough	Lawrence	+4106410	-07015330
Wade Plymire SRSTP	PAG048602	PAG-04 Small Flow Treatment Facility	06/29/04	02/04/09	Lackawannock Township	Mercer	+4111430	-08022190
Willow Bend Mobile Home Park	PA0033901	NPDES Permit Sewage Discharges, Non-Municipal, Minor	09/12/00	09/11/05	Lackawannock Township	Mercer	+4113300	-08020520
Wilmington Township Sewer Authority - Orchard Terrace	PA0103641	NPDES Permit for New & Existing Sewage Discharge, Municipal, Minor	05/14/01	07/31/06	Wilmington Township	Lawrence	+4105550	-08020590

SRSTP- Single Resident Sewage Treatment Plan

APPENDIX H. RARE, THREATENED, AND ENDANGERED SPECIES (PNDI)

Scientific Name	Common Name	State	Global Status	State Status	Global/State Rank	Subwatersheds
Bats						
<i>Myotis septentrionalis</i>	northern myotis	PA	not ranked	recommended	G4/S3BS3N	Neshannock Creek/Big Run
Birds						
<i>Ardea herodias</i>	great blue heron	PA	not ranked	not ranked	G5/S3S4B,S4N	Middle Shenango River
<i>Chlidonias niger</i>	black tern	PA	not ranked	endangered	G4/S1B	Upper Shenango River
<i>Cistothorus platensis</i>	sedge wren	OH	not ranked	not ranked	G5/ S2	
<i>Cistothorus palustris</i>	marsh wren	PA	not ranked	candidate rare	G5/S3S3B	Neshannock Creek/Big Run
<i>Haliaeetus leucocephalus</i>	bald eagle	PA, OH	threatened, proposed delisting	PA endangered; OH threatened	G4/S2B	Upper Shenango River, Middle Shenango River
<i>Ixobrychus exilis</i>	least bittern	PA	not ranked	endangered	G5/S1B	Neshannock Creek/Big Run
<i>Porzana carolina</i>	sora	OH	not ranked	not ranked	G5/S3	Middle Shenango River
<i>Protonotaria citrea</i>	prothonotary warbler	PA	not ranked	not ranked	G5/S2S3B	Upper Shenango River
<i>Rallus elegans</i>	king rail	PA	not ranked	endangered	G4G5/S1B	Neshannock Creek/Big Run
<i>Rallus limicola</i>	Virginia rail	PA	not ranked	not ranked	G5/S3B	Neshannock Creek/Big Run
<i>Sphyrapicus varius</i>	yellow-bellied sapsucker	OH	not ranked	endangered	G5/S1	Upper Shenango River
Communities						
<i>Alnus rugosa-cornus amomum</i>	speckled alder-silky dogwood	PA	not ranked	not ranked	GNR/SNR	Upper Shenango River
<i>A. rubrum-t. canadensis-b. alleghaniensis</i>	red maple-eastern hemlock-yellow birch	PA	not ranked	not ranked	GNR/GNR	Upper Shenango River
<i>A. saccharum-f. grandifolia-b. alleghaniensis</i>	sugar maple-American beech-yellow birch	PA	not ranked	not ranked	GNR/SNR	Upper Shenango River
<i>broadleaf-conifer swamp</i>	broadleaf-conifer swamp	PA	not ranked	not ranked	GNR/S3S4	Upper Shenango River

Scientific Name	Common Name	State	Global Status	State Status	Global/State Rank	Subwatersheds
Communities (continued)						
<i>Carex spp. colony</i>	sedge colony	PA	not ranked	not ranked	GNR/SNR	Neshannock Creek/Big Run
<i>Hillside graminoid-forb fen</i>	hillside graminoid-forb fen	PA	not ranked	not ranked	GNR/S1	Neshannock Creek/Big Run
<i>mixed emergent marsh</i>	mixed emergent marsh	OH	not ranked	not ranked	G4/SNR	Middle Shenango River
<i>mollusk bed</i>	mollusk bed	OH	not ranked	not ranked	GNR/SNR	Middle Shenango River
<i>Northern hardwood forest</i>	northern hardwood forest	PA	not ranked	not ranked	GNR/S3S4	Neshannock Creek/Big Run
<i>Oligotrophic glacial kettlehole bog</i>	glacial bog	PA	not ranked	not ranked	GNR/S3	Middle Shenango River
<i>Pinus strobus-larix laricina</i>	white pine-american larch forest	PA	not ranked	not ranked	GNR/SNR	Upper Shenango River
<i>Pinus strobus-larix laricina-mixed shrub</i>	white pine-larch-mixed shrub community	PA	not ranked	not ranked	GNR/SNR	Upper Shenango River
<i>Pinus strobus-tsuga canadensis (hydric)</i>	white pine-eastern hemlock	PA	not ranked	not ranked	GNR/SNR	Upper Shenango River
<i>Robust emergent marsh</i>	robust emergent marsh	PA	not ranked	not ranked	GNR/S2	Neshannock Creek/Big Run
<i>Sedum telephioides</i>	Allegheny stonecrop	PA	not ranked	PA rare	G4/S3	Neshannock Creek/Big Run
<i>Symplocarpus foetidus-onoclea sensibilis</i>	skunk cabbage-sensitive fern colonies	PA	not ranked	not ranked	GNR/SNR	Upper Shenango River
<i>T. canadensis hardwood swamp</i>	hemlock hardwood swamp	OH	not ranked	not ranked	G5/SNR	Upper Shenango River
<i>Typha angustifolia</i>	narrow-leaved cattail colony	PA	not ranked	not ranked	GNR/SNR	Upper Shenango River
<i>Weakly minerotrophic lakeside bog</i>	weakly minerotrophic lakeside bog	PA	not ranked	not ranked	GNR/S2	Neshannock Creek/Big Run

Scientific Name	Common Name	State	Global Status	State Status	Global/State Rank	Subwatersheds
Fish						
<i>Culea inconstans</i>	brook stickleback	PA	not ranked	candidate	G5/S3	Neshannock Creek/Big Run, Middle Shenango River
<i>Ichthyomyzon greeleyi</i>	mountain brook lamprey	PA	not ranked	threatened	G3G4/S2	Neshannock Creek/Big Run
<i>Labidesthes sicculus</i>	brook silverside	PA	not ranked	candidate	G5/S3	Middle Shenango River
<i>Lepomis gulosus</i>	warmouth	PA	not ranked	endangered	G5/S1S2	Upper Shenango River, Middle Shenango River, Neshannock Creek/Big Run
<i>Lythrurus umbratilis</i>	redfin shiner	PA	not ranked	endangered	G5/S2	Neshannock Creek/Big Run
<i>Minytrema melanops</i>	spotted sucker	PA	not ranked	threatened	G5/S2	Upper Shenango River
<i>Moxostoma carinatum</i>	river redhorse	PA	not ranked	candidate	G4/S3	Middle Shenango River
<i>Nocomis biguttatus</i>	hornyhead chub	PA	not ranked	candidate	G5/S2	Neshannock Creek/Big Run, Middle Shenango River
<i>Noturus miurus</i>	brindled madtom	PA	not ranked	threatened	G5/S2	Middle Shenango River
<i>Phoxinus erythrogaster</i>	southern redbelly dace	PA	not ranked	threatened	G5/S2S3	Neshannock Creek/Big Run, Upper Shenango River
<i>Umbra limi</i>	central mudminnow	PA	not ranked	candidate	G5/S3	Upper Shenango River, Middle Shenango River

Mammals

<i>Mustela erminea</i>	ermine	OH	not ranked	not ranked	G5/S2	Upper Shenango River
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Mussels

<i>Amblema plicata</i>	three-ridge	PA	not ranked	not ranked	G5/S3S3	Middle Shenango River
<i>Epioblasma torulosa rangiana</i>	northern riffleshell	PA	endangered	endangered	G2T2/S2	Middle Shenango River
<i>Epioblasma triquetra</i>	snuffbox	PA	not ranked	recommended endangered	G3/S1	Lower Shenango River, Middle Shenango River

Scientific Name	Common Name	State	Global Status	State Status	Global/State Rank	Subwatersheds
Mussels (continued)						
<i>Fusconaia subrotunda</i>	long-solid	PA	not ranked	recommended endangered	G3/S1	Lower Shenango River, Middle Shenango River
<i>Lasmigona compressa</i>	creek heelsplitter	PA	not ranked	candidate	G5/S2S3	Middle Shenango River
<i>Obovaria subrotunda</i>	round hickorynut	PA	not ranked	recommended endangered	G4/S1	Lower Shenango River, Middle Shenango River
<i>Pleurobema clava</i>	clubshell	PA	endangered, some experimental populations	endangered	G2/S1S2	Middle Shenango River
<i>Pleurobema sintoxia</i>	round pigtoe	PA	not ranked	recommended threatened	G4/S2	Middle Shenango River
<i>Quadrula cylindrica</i>	rabbitsfoot	PA	threatened or endangered in some of its range	recommended endangered	G3/S1	Middle Shenango River
<i>Tritogonia verrucosa</i>	pistolgrip mussel	PA	not ranked	recommended endangered	G4/S1	Lower Shenango River, Middle Shenango River

Odonates (dragonflies,damselflies)

<i>Somatochlora walshii</i>	brush-tipped emerald	OH	not ranked	endangered	G5/S1S2	Middle Shenango River
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Plants

<i>Alisma triviale</i>	broad-leaved water-plantain	PA	not ranked	endangered	G5/S1	Neshannock Creek/Big Run
<i>Alopecurus aequalis</i>	short-awn foxtail	PA	not ranked	none but vulnerable	G5/S3	Neshannock Creek/Big Run
<i>Betula populifolia</i>	gray birch	OH	not ranked	potentially threatened	G5/S3	Middle Shenango River
<i>Bidens discoidea</i>	small beggar-ticks	PA	not ranked	not ranked	G5/G3	Upper Shenango River

Scientific Name	Common Name	State	Global Status	State Status	Global/State Rank	Subwatersheds
<i>Botrychium multifidum</i>	leathery grape fern	OH	not ranked	threatened	G5/S1	Upper Shenango River
<i>Camassia scilloides</i>	wild hyacinth	PA	not ranked	threatened, recommended endangered	G4G5/S1	Neshannock Creek/Big Run
<i>Carex albolutescens</i>	pale sedge straw	OH	not ranked	threatened	G5/S1	Lower Shenango River
<i>Carex alata</i>	broad-winged sedge	PA	not ranked	threatened	G5/S2	Neshannock Creek/Big Run, Upper Shenango River
<i>Carex bebbii</i>	bebb's sedge	PA	not ranked	threatened	G5/S1	Upper Shenango River
<i>Carex buxbaumii</i>	brown sedge	PA	not ranked	undetermined; recommended rare	G5/S3	Neshannock Creek/Big Run
<i>Carex diandra</i>	lesser panicled sedge	PA	not ranked	threatened	G5/S2	Upper Shenango River
<i>Carex disperma</i>	soft-leaved sedge	PA	not ranked	rare	G5/S3	Neshannock Creek/Big Run, Upper Shenango River
<i>Carex flava</i>	yellow sedge	OH	not ranked	potentially threatened	G5/S2	Middle Shenango River
<i>Carex louisianica</i>	louisiana sedge	OH	not ranked	endangered	G5/SH	Upper Shenango River
<i>Carex mitchelliana</i>	Mitchell's sedge	PA	not ranked	endangered	G3G4/S1	Upper Shenango River
<i>Carex oligosperma</i>	few-seeded sedge	PA	not ranked	threatened	G4/S2	Middle Shenango River
<i>Carex pallescens</i>	pale sedge	OH	not ranked	potentially threatened	G5/S2	Upper Shenango River
<i>Carex prairea</i>	prairie sedge	PA	not ranked	threatened	G5/S2	Neshannock Creek/Big Run, Upper Shenango River
<i>Carex projecta</i>	necklace sedge	OH	not ranked	threatened	G5/S2	Upper Shenango River
<i>Carex pseudocyperus</i>	cyperus-like sedge	PA	not ranked	endangered	G5/S1	Upper Shenango River
<i>Carex sterilis</i>	sterile sedge	PA	not ranked	threatened, recommended endangered	G4/S1	Neshannock Creek/Big Run

Scientific Name	Common Name	State	Global Status	State Status	Global/State Rank	Subwatersheds
Plants (continued)						
<i>Carex tetanica</i>	a sedge	PA	not ranked	threatened	G4G5/S2	Neshannock Creek/Big Run
<i>Chenopodium capitatum</i>	strawberry goosefoot	PA	not ranked	undetermined	G5/SH	Upper Shenango River
<i>Clintonia umbellulata</i>	speckled wood-lily	OH	not ranked	threatened	G5/S2	Lower Shenango River
<i>Cornus canadensis</i>	bunchberry	OH	not ranked	threatened	G5/S2	Upper Shenango River
<i>Cuscuta cephalanthi</i>	button-bush dodder	PA	not ranked	tentatively undetermined	G5/SU	Lower Shenango River
<i>Cypripedium calceolus var. parviflorum</i>	small yellow lady's slipper	PA	not ranked	endangered	G5/S1	Upper Shenango River
<i>Cypripedium reginae</i>	showy lady's slipper	PA	not ranked	threatened	G4/S2	Upper Shenango River
<i>Dryopteris Clintoniana</i>	Clinton's wood fern	OH	not ranked	endangered	G5/S1	Upper Shenango River
<i>Eleocharis elliptica</i>	slender spike-rush	PA	not ranked	endangered	G5/S2	Neshannock Creek/Big Run
<i>Eleocharis intermedia</i>	matted spike-rush	PA	not ranked	threatened	G5/S2	Neshannock Creek/Big Run
<i>Eleocharis rostellata</i>	beaked spike-rush	PA	not ranked	endangered	G5/S1	Neshannock Creek/Big Run
<i>Epilobium strictum</i>	downy willow-herb	PA	not ranked	endangered	G5/S3	Upper Shenango River
<i>Equisetum sylvaticum</i>	woodland horsetail	OH	not ranked	threatened	G5/S2	Upper Shenango River, Middle Shenango River
<i>Eriophorum viridicarinatum</i>	green cotton-grass	OH	not ranked	potentially threatened	G5/S2	Upper Shenango River
<i>Geum rivale</i>	water avens	OH	not ranked	potentially threatened	G5/G3	Middle Shenango River
<i>Helianthus microcephalus</i>	small wood sunflower	PA	not ranked	not ranked	G5/S3	Middle Shenango River
<i>Hierochloe hirta ssp. arctica</i>	common northern sweet grass	PA	not ranked	recommended endangered	G5T5/S1	Neshannock Creek/Big Run
<i>Hypericum majus</i>	tall St. John's wort	OH	not ranked	potentially threatened	G5/ S3	Upper Shenango River

Scientific Name	Common Name	State	Global Status	State Status	Global/State Rank	Subwatersheds
<i>Isoetes engelmannii</i>	Appalachian quillwort	OH	not ranked	endangered	G4/S1	Middle Shenango River
<i>Juncus torreyi</i>	Torrey's rush	PA	not ranked	threatened, recommended endangered	G5/S2	Neshannock Creek/Big Run
<i>Lemna perpusilla</i>	minute duckweed	PA	not ranked	undetermined	G5/SU	Neshannock Creek/Big Run
<i>Lemna turionifera</i>	a duckweed	PA	not ranked	undetermined	G5/SU	Neshannock Creek/Big Run
<i>Lonicera oblongifolia</i>	swamp fly honeysuckle	PA	not ranked	endangered	G34/S1	Upper Shenango River
<i>Malaxis monophyllos</i> var. <i>brachypoda</i>	white adder's-mouth	PA	not ranked	undetermined	G4Q/S1	Upper Shenango River
<i>Myriophyllum sibiricum</i>	American water-milfoil	OH	not ranked	threatened	G5/S2	Upper Shenango River
<i>myriophyllum verticillatum</i>	whorled water-milfoil	PA	not ranked	endangered	G5/S1	Upper Shenango River
<i>Nelumbo lutea</i>	American lotus	PA	not ranked	endangered	G4/S1	Upper Shenango River
<i>Oxalis montana</i>	white wood sorrel	OH	not ranked	endangered	G5/S1	Upper Shenango River
<i>Oxypolis rigidior</i>	stiff cowbane	PA	not ranked	recommended threatened	G5/S2	Neshannock Creek/Big Run
<i>Parnassia glauca</i>	Carolina grass-of- parnassus	PA	not ranked	endangered	G5/S2	Neshannock Creek/Big Run
<i>Pedicularis lanceolata</i>	swamp lousewort	PA	not ranked	not ranked	G5/S1S2	Neshannock Creek/Big Run, Upper Shenango River
<i>Poa paludigena</i>	bog bluegrass	PA	not ranked	threatened	G3/S3	Neshannock Creek/Big Run, Upper Shenango River
<i>Polygonum setaceum</i> var. <i>interjectum</i>	a swamp smartweed	PA	not ranked	endangered	G5T4/S2	Upper Shenango River
<i>Potamogeton zosteriformis</i>	flat-stem pondweed	PA	not ranked	rare	G5/S2S3	Upper Shenango River
<i>Ranunculus aquatilis</i> var. <i>diffusus</i>	white water-crowfoot	PA	not ranked	rare	G5T5/S3	Upper Shenango River, Middle Shenango River

Scientific Name	Common Name	State	Global Status	State Status	Global/State Rank	Subwatersheds
<i>Ranunculus flabellaris</i>	yellow water-crowfoot	PA	not ranked	not ranked	G5/S2	Middle Shenango River
<i>Rhododendron nudiflorum</i> <i>var. roseum</i>	northern rose azalea	OH	not ranked	potentially threatened	G5/S3	Middle Shenango River
<i>Rhynchospora alba</i>	white beak-rush	OH	not ranked	potentially threatened	G5/S2	Upper Shenango River
<i>Ribes triste</i>	red currant	PA	not ranked	threatened	G5/S2	Upper Shenango River
<i>Salix serissima</i>	autumn willow	PA	not ranked	threatened	G4/S2	Neshannock Creek/Big Run, Upper Shenango River
<i>Solidago purshii</i>	Pursh's golden-rod	PA	not ranked	undetermined	G5/SH	Neshannock Creek/Big Run
<i>Sphenopholis pensylvanica</i>	swamp-oats	OH	not ranked	potentially threatened	G4/S2	Upper Shenango River
<i>Streptopus roseus</i>	rose-twisted stalk	OH	not ranked	endangered	G5T4/?	Upper Shenango River
<i>Swertia caroliniensis</i>	American columbo	PA	not ranked	threatened	G5/S1	Neshannock Creek/Big Run
<i>Symphyotrichum firmum</i>	firm aster	PA	not ranked	recommended threatened	G5/S2	Neshannock Creek/Big Run, Upper Shenango River
<i>Trillium undulatum</i>	painted trillium	OH	not ranked	endangered	G5/S2	Upper Shenango River
<i>Viburnum alnifolium</i>	hobblebush	OH	not ranked	potentially threatened	G5/SNR	
<i>Viburnum trilobum</i>	highbush-cranberry	PA	not ranked	undetermined	G5T5/S3S4	Neshannock Creek/Big Run, Upper Shenango River
<i>Woodwardia areolata</i>	netted chainfern	PA	not ranked	not ranked	G5/S2	Middle Shenango River
<i>Potamogeton hillii</i>	hill's pondweed	OH	not ranked	endangered	G3/S1	Middle Shenango River
<i>Clintonia borealis</i>	bluebead-lily	OH	not ranked	endangered	G5/S1	Middle Shenango River
<i>Viola primulifolia</i>	primrose-leaved violet	OH	not ranked	endangered	G5/S1	Middle Shenango River
<i>Callitriche verna</i>	vernal water-starwort	OH	not ranked	threatened	G5/SNR	Middle Shenango River
<i>Elymus trachycaulus</i>	bearded wheat grass	OH	not ranked	threatened	G5/S1	Middle Shenango River
<i>Viburnum opulus var. americana</i>	highbush cranberry	OH	not ranked	endangered	G5/S2	Middle Shenango River

Scientific Name	Common Name	State	Global Status	State Status	Global/State Rank	Subwatersheds
Plants (continued)						
<i>Spiranthes romanzoffiana</i>	hooded Ladies' tresses	OH	not ranked	threatened	G5/S1	Middle Shenango River
<i>Trollius laxus</i>	spreading globeflower	OH	not ranked	endangered	G4/S1	Middle Shenango River
<i>Platanthera psycodes</i>	small purple fringed orchid	OH	not ranked	endangered	G5/S2	Middle Shenango River
<i>Epilobium strictum</i>	simple willow-herb	OH	not ranked	threatened	G5?/S2	Middle Shenango River
<i>Polygonum setaceum var. interjectum</i>	bristly smartweed	OH	not ranked	endangered	G5/SNR	Middle Shenango River
<i>Wolffiella gladiata</i>	bog-mat	PA	not ranked	rare	G5/S2	
Snakes						
<i>Sistrurus catenatus catenatus</i>	eastern massasauga	PA	candidate	endangered	G3G4T3T4/S1S2	Neshannock Creek/Big Run, Upper Shenango River

APPENDIX I. WILDLIFE LISTING

Mammal Species*(developed from Carnegie Museum of Natural History records and published distributions)*

Common Name	Scientific Name
Allegheny woodrat*	<i>Neotoma floridana</i>
bat, hoary*	<i>Lasiurus cinereus</i>
bat, northern long-eared*	<i>Myotis septentrionalis</i>
bat, silver-haired*	<i>Lasionycteris noctivagans</i>
bat, big brown	<i>Eptesicus fuscus</i>
bat, eastern pipistrelle	<i>Pipistrellus subflavus</i>
bat, little brown	<i>Myotis lucifugus</i>
bat, red	<i>Lasiurus borealis</i>
bear, black	<i>Ursus, americanus</i>
beaver	<i>Castor canadensis</i>
chipmunk, eastern	<i>Tamias striatus</i>
coyote	<i>Canis latrans</i>
deer, whitetailed	<i>Odocoileus virginianus</i>
fox, gray	<i>Curocyon cinereoargenteus</i>
fox, red	<i>Vulpes vulpes</i>
lemming, bog	<i>Synaptomys cooperi</i>
marten, pine*	<i>Martes americana</i>
mink	<i>Mustela vision</i>
mole, hairy-tailed	<i>Parascalops breweri</i>
mole, star-nosed	<i>Condylura cristata</i>
mouse, deer	<i>Peromyscus maniculatus</i>
mouse, house	<i>Mus musculus</i>
mouse, meadow jumping	<i>Zapus hudsonius</i>
mouse, white-footed	<i>Peromyscus leucopus</i>
mouse, woodland jumping	<i>Napaeozapus insignis</i>
muskrat	<i>Ondatra zibethicus</i>
opossum	<i>Didelphis virginicana</i>
otter, river	<i>Lutra canadensis</i>
rabbit, eastern cottontail	<i>Sylvilagus floridanus</i>
raccoon	<i>Procyon lotor</i>
rat, Norway	<i>Rattus norvegicus</i>
shrew, least	<i>Cryptotis parva</i>
shrew, masked	<i>Sorex cinereus</i>
shrew, smoky	<i>Sorex fumeus</i>
shrew, short-tailed	<i>Blarina brevicauda</i>

Mammal Species (continued)

Common Name	Scientific Name
skunk, striped	<i>Mephitis mephitis</i>
squirrel, fox	<i>Sciurus niger</i>
squirrel, red	<i>Tamiasciurus hudsonicus</i>
squirrel, southern flying	<i>Glaucomys volans</i>
vole, meadow	<i>Microtus pennsylvanicus</i>
vole, pine/woodland	<i>Microtus pinetorum</i>
vole, red-backed	<i>Clethrionomys gapperi</i>
weasel, least	<i>Mustela nivalis</i>
weasel, long-tailed	<i>Mustela frenata</i>
weasel, short-tailed	<i>Mustela erminea</i>
woodchuck or groundhog	<i>Marmota monax</i>
* most probably in watershed, though no record	

Amphibians and Reptiles

(Developed from "Amphibians and Reptiles of Pennsylvania and the Northeast")

Common Name	Scientific Name
bullfrog	<i>Rana catesbeiana</i>
frog, pickerel	<i>Rana palustris</i>
frog, green	<i>Rana clamitans</i>
frog, mountain chorus*	<i>Pseudacris brachyphona</i>
frog, northern leopard	<i>Rana pipiens</i>
frog, western chorus	<i>Pseudacris triseriata triseriata</i>
frog, wood	<i>Rana sylvatica</i>
mudpuppy	<i>Necturus maculosus maculosus</i>
newt, red-spotted	<i>Notophthalmus viridescens viridescens</i>
peeper, northern spring	<i>Pseudacris crucifer crucifer</i>
rattlesnake, eastern massasauga**	<i>Sistrurus catenatus</i>
salamander, ravine*	<i>Plethodon richmondi</i>
salamander, eastern hellbender	<i>Cryptobranchus alleganiensis alleganiensis</i>
salamander, four-toed	<i>Hemidactylium scutatum</i>
salamander, Jefferson*	<i>Ambystoma jeffersonianum</i>
salamander, longtail	<i>Eurycea longicauda longicauda</i>
salamander, mountain dusky	<i>Desmognathus ochrophaeus</i>
salamander, northern dusky	<i>Desmognathus fuscus fuscus</i>
salamander, northern red	<i>Pseudotriton ruber ruber</i>
salamander, northern slimy	<i>Plethodon glutinosus</i>
salamander, northern spring	<i>Gyrinophilus porphyriticus porphyriticus</i>
salamander, northern two-lined	<i>Eurycea bislineata</i>
salamander, redback	<i>Plethodon cinerius</i>
salamander, spotted	<i>Ambystoma maculatum</i>

Amphibians and Reptiles (continued)

Common Name	Scientific Name
skink, five-lined *	<i>Eumeces fasciatus</i>
snake, black rat	<i>Elaphe obsoleta obsoleta</i>
snake, eastern milk	<i>Lampropeltis triangulum triangulum</i>
snake, eastern ribbon	<i>Thamnophis sauritus</i>
snake, eastern garter	<i>Thamnophis sirtalis</i>
snake, northern black racer*	<i>Coluber constrictor constrictor</i>
snake, northern brown	<i>Storeria dekayi dekayi</i>
snake, northern copperhead*	<i>Agkistrodon contortrix mokasen</i>
snake, northern redbelly	<i>Storeria occipitomaculata occipitomaculata</i>
snake, northern water	<i>Nerodia sipedon sipedon</i>
snake, queen	<i>Regina septemvittata</i>
snake, smooth green	<i>Opheodrys vernalis</i>
snake, northern ringneck	<i>Diadophis punctatus edwardsii</i>
toad, eastern American	<i>Bufo americanus americanus</i>
toad, Fowler's *	<i>Bufo woodhousii fowleri</i>
treefrog, gray*	<i>Hyla versicolor, Hyla chrysoscelis</i>
turtle, Blanding's**	<i>Emydoidea blandingii</i>
turtle, bog**	<i>Clemmys muhlenbergii</i>
turtle, common musk	<i>Sternotherus odoratus</i>
turtle, common snapping	<i>Chelydra serpentina serpentina</i>
turtle, eastern box	<i>Terrapene carolina carolina</i>
turtle, eastern spiny softshell	<i>Apalone spinifera</i>
turtle, painted	<i>Chrysemys picta</i>
turtle, spotted	<i>Clemmys guttata</i>
turtle, wood*	<i>Clemmys insculpta</i>
*probable inhabitant, though no record	
**expected to be extirpated	

Bird Species

(developed from Bartramian birding club sightings and the US Breeding Bird Survey)

Common Name	Scientific Name
avocet, American	<i>Recurvirostra americana</i>
black duck, American	<i>Anas rubripes</i>
blackbird, red-winged	<i>Agelaius phoeniceus</i>
blackbird, rusty	<i>Euphagus carolinus</i>
bluebird, eastern	<i>Sialia sialis</i>
bobolink	<i>Dolichonyx oryzivorus</i>
bunting, Indigo	<i>Passerina cyanea</i>
cardinal, Northern	<i>Cardinalis cardinalis</i>
chat, yellow-breasted	<i>Icteria virens</i>
catbird, gray	<i>Dumetella carolinensis</i>
chickadee, black-capped	<i>Poecile atricapillus</i>

Bird Species (continued)

Common Name	Scientific Name
coot, American	<i>Fulica americana</i>
cormorant, double-crested	<i>Phalacrocorax auritus</i>
cowbird, brown-headed	<i>Molothrus ater</i>
creeper, brown	<i>Certhia americana</i>
crow, American	<i>Corvus brachyrhynchos</i>
cuckoo, black-billed	<i>Coccyzus erythrophthalmus</i>
cuckoo, yellow-billed	<i>Coccyzus americanus</i>
dove, mourning	<i>Zenaida macroura</i>
dove, rock	<i>Columba livia</i>
dowitcher, long-billed	<i>Limnodromus scolapaceus</i>
dowitcher, short-billed	<i>Limnodromus griseus</i>
duck, bufflehead	<i>Bucephala albeola</i>
duck, canvasback	<i>Aythya vallisneria</i>
duck, common goldeneye	<i>Bucephala clangula</i>
duck, common merganser	<i>Mergus merganser</i>
duck, hooded merganser	<i>Lophodytes cucullatus</i>
duck, long-tailed	<i>Clangula hyemalis</i>
duck, red-breasted merganser	<i>Mergus serrator</i>
duck, redhead	<i>Aythya americana</i>
duck, ring-necked	<i>Aythya collaris</i>
duck, ruddy	<i>Oxyura jamaicensis</i>
duck, wood	<i>Aix sponsa</i>
dunlin	<i>Calidris alpina</i>
eagle, bald	<i>Haliaeetus leucocephalus</i>
egret, great	<i>Area alba</i>
falcon, peregrine	<i>Falco peregrinus</i>
finch, house	<i>Carpodacus mexicanus</i>
finch, purple	<i>Carpodacus purpureus</i>
flicker, northern	<i>Colaptes auratus</i>
flycatcher, Acadian	<i>Empidonax virescens</i>
flycatcher, great-crested	<i>Myiarchus crinitus</i>
flycatcher, least	<i>Empidonax minimus</i>
flycatcher, olive-side	<i>Contopus cooperi</i>
flycatcher, willow	<i>Empidonax trailli</i>
flycatcher, yellow-bellied	<i>Empidonax flaviventris</i>
gadwall	<i>Anas strepera</i>
gnatcatcher, blue-gray	<i>Polioptila coerulea</i>
goldfinch, American	<i>Carduelis tristis</i>
goose, Canada	<i>Branta canadensis</i>
goose, snow	<i>Chen caerulescens</i>
goshawk, northern	<i>Accipiter gentilis</i>
grackle, common	<i>Quiscalus quiscula</i>
grebe, eared	<i>Podiceps nigricollis</i>
grebe, horned	<i>Podiceps auritus</i>

Bird Species (continued)

Common Name	Scientific Name
grebe, pied-billed	<i>Podilymbus podiceps</i>
grosbeak, blue	<i>Guiraca caerulea</i>
grosbeak, rose-breasted	<i>Pheucticus ludovicianus</i>
grouse, ruffed	<i>Bonasa umbellus</i>
gull, Bonaparte's	<i>Larus philadelphia</i>
gull, Franklin's	<i>Larus pipixcan</i>
gull, great black-backed	<i>Larus marinus</i>
gull, herring	<i>Larus argentatus</i>
gull, ring-billed	<i>Larus delawarensis</i>
harrier, northern	<i>Circus cyaneus</i>
hawk, Cooper's	<i>Accipiter cooperii</i>
hawk, red-shouldered	<i>Buteo lineatus</i>
hawk, red-tailed	<i>Buteo jamaicensis</i>
hawk, sharp-shinned	<i>Accipiter striatus</i>
heron, black-crowned night	<i>Nycticorax nycticorax</i>
heron, great blue	<i>Ardea herodias</i>
heron, green	<i>Butorides virescens</i>
hummingbird, ruby-throated	<i>Archilochus colubris</i>
ibis, glossy	<i>Plegadis falcinellus</i>
jay, blue	<i>Cyanocitta cristata</i>
junco, dark-eye	<i>Junco hyemalis</i>
kestrel, American	<i>Falco sparverius</i>
kildeer	<i>Charadrius vociferus</i>
kingbird, eastern	<i>Tyrannus tyrannus</i>
kingfisher, belted	<i>Ceryle alcyon</i>
kinglet, golden-crowned	<i>Regulus satrapa</i>
kinglet, ruby-crowned	<i>Regulus calendula</i>
lark, horned	<i>Eremophila alpestris</i>
loon, common	<i>Cavia immer</i>
mallard	<i>Anas platyrhynchos</i>
martin, purple	<i>Progne subis</i>
meadowlark, eastern	<i>Sturnella magna</i>
merlin	<i>Falco columbarius</i>
mockingbird, northern	<i>Mimus polyglottos</i>
nighthawk, common	<i>Chordeiles minor</i>
nuthatch, red-breasted	<i>Sitta canadensis</i>
nuthatch, white-breasted	<i>Sitta Carolinensis</i>
oriole, Baltimore	<i>Icterus galbula</i>
oriole, orchard	<i>Icterus spurius</i>
osprey	<i>Pandion haliaetus</i>
ovenbird	<i>Seiurus aurocapillus</i>
owl, barred	<i>Strix varia</i>
owl, eastern screech	<i>Otus asio</i>
owl, great horned	<i>Bubo virginianus</i>

Bird Species (continued)

Common Name	Scientific Name
parula, northern	<i>Parula americana</i>
phalarope, red-necked	<i>Phalaropus lobatus</i>
phalarope, Wilson's	<i>Phalaropus tricolor</i>
pheasant, rink-necked	<i>Phasianus colchicus</i>
phoebe, eastern	<i>Sayornis phoebe</i>
pintail, northern	<i>Anas acuta</i>
pipit, American	<i>Anthus rubescens</i>
plover, American golden	<i>Pluvialis dominica</i>
plover, black-bellied	<i>Pluvialis squatarola</i>
plover, semipalmated	<i>Charadrius semipalmatus</i>
rail, Virginia	<i>Rallus limicola</i>
red knot	<i>Calidris canatus</i>
redstart, American	<i>Setophaga ruticilla</i>
robin, American	<i>Turdus migratorius</i>
ruddy turnstone	<i>Arenaria interpres</i>
sandpiper, Baird's	<i>Calidris bairdii</i>
sandpiper, buff-breasted	<i>Tryngites subrafficollis</i>
sandpiper, least	<i>Caliris minutilla</i>
sandpiper, semipalmated	<i>Calidris pusilla</i>
sandpiper, solitary	<i>Tringa solitaria</i>
sandpiper, spotted	<i>Actitis macularia</i>
sandpiper, stilt	<i>Calidris himantipus</i>
sandpiper, western	<i>Calidris mauri</i>
sandpiper, white-rumped	<i>Calidris fuscicollis</i>
sapsucker, yellow-bellied	<i>Sphyrapicus varius</i>
sanderling	<i>Calidris alba</i>
scaup, greater	<i>Aythya marila</i>
scaup, lesser	<i>Aythya affinis</i>
scoter, surf	<i>Melanitta perspicillata</i>
shoveler, northern	<i>Anas clypeata</i>
shrike, northern	<i>Lanius excubitor</i>
snipe, common	<i>Gallinago gallinago</i>
sparrow, chipping	<i>Spizella passerina</i>
sparrow, field	<i>Spizella</i>
sparrow, fox	<i>Passerella iliaca</i>
sparrow, house	<i>Passer domesticus</i>
sparrow, Lincoln's	<i>Melospiza lincolnii</i>
sparrow, Savannah	<i>Passerculus sandwichensis</i>
sparrow, song	<i>Melospiza melodia</i>
sparrow, swamp	<i>Melospiza georgiana</i>
sparrow, vesper	<i>Pooecetes gramineus</i>
sparrow, white-crowned	<i>Zonotrichia leucophrys</i>
sparrow, white-throated	<i>Zonotrichia albicollis</i>
starling, European	<i>Sturnus vulgaris</i>

Bird Species (Continued)

Common Name	Scientific Name
swallow, bank	<i>Riparia riparia</i>
swallow, barn	<i>Hirundo rustica</i>
swallow, cliff	<i>Petrochelidon pyrrhonota</i>
swallow, northern rough-winged	<i>Stelgidopteryx ruficollis</i>
swallow, tree	<i>Spizella arborea</i>
swan, mute	<i>Cygnus olor</i>
swan, trumpeter (re-introduced)	<i>Cygnus cucinator</i>
swan, tundra	<i>Cygnus columbianus</i>
swift, chimney	<i>Chaetura pelagica</i>
tanager, scarlet	<i>Piranga olivacea</i>
teal, blue-winged	<i>Anas discors</i>
teal, green-winged	<i>Anas crecca</i>
tern, black	<i>Chlidonias niger</i>
tern, Caspian	<i>Sterna caspia</i>
tern, common	<i>Sterna hirundo</i>
tern, Forster's	<i>Sterna forsteri</i>
thrasher, brown	<i>Toxostoma rufum</i>
thrush, hermit	<i>Catharus guttatus</i>
thrush, Swainson's	<i>Catharus ustulatus</i>
thrush, wood	<i>Hyocichla mustelina</i>
titmouse, tufted	<i>Baeolophus bicolor</i>
towhee, eastern	<i>Pipilo erythrophthalmus</i>
tree sparrow, American	<i>Spizella arborea</i>
turkey, wild	<i>Meleagris gallopavo</i>
vireo, blue-headed	<i>Vireo solitarius</i>
vireo, Philadelphia	<i>Vireo philadelphicus</i>
vireo, red-eyed	<i>Vireo olivaceus</i>
vireo, warbling	<i>Vireo gilvus</i>
vireo, white-eyed	<i>Vireo griseus</i>
vulture, turkey	<i>Cathartes aura</i>
Warbler, bay-breasted	<i>Dendroica castanea</i>
warbler, black-and-white	<i>Mniotilta varia</i>
warbler, blackburnian	<i>Dendroica fusca</i>
warbler, blackpoll	<i>Dendroica striata</i>
warbler, black-throated green	<i>Dendroica virens</i>
warbler, blue-winged	<i>Vermivora pinus</i>
warbler, Canada	<i>Wilsonia canadensis</i>
warbler, Cape May	<i>Dendroica tigrina</i>
warbler, cerulean	<i>Dendroica cerulea</i>
warbler, chestnut-sided	<i>Dendroica pennsylvanica</i>
warbler, Connecticut	<i>Oporornis agilis</i>
warbler, hooded	<i>Wilsonia citrina</i>
warbler, magnolia	<i>Dendroica magnolia</i>
warbler, Nashville	<i>Vermivora ruficapilla</i>

Bird Species (Continued)

Common Name	Scientific Name
warbler, orange-crowned	<i>Vermivora celata</i>
warbler, palm	<i>Dendroica palmarum</i>
warbler, pine	<i>Dendroica pinus</i>
warbler, Tennessee	<i>Vermivora peregrina</i>
warbler, Wilson's	<i>Wilsonia pusilla</i>
warbler, yellow	<i>Dendroica petechia</i>
warbler, yellow-throated	<i>Dendroica dominica</i>
waterthrush, Louisiana	<i>Seiurus motacilla</i>
waterthrush, northern	<i>Seiurus noveboracensis</i>
waxwing, cedar	<i>Bonbycilla cedrorum</i>
whimbrel	<i>Numenius phaeopus</i>
whip-poor-will	<i>Caprimulgus vociferus</i>
wigeon, American	<i>Anas americana</i>
willet	<i>Catoptrophorus semipalmatus</i>
woodcock, American	<i>Scolopax minor</i>
woodpecker, downy	<i>Picoides pubescens</i>
woodpecker, hairy	<i>Picoides villosus</i>
woodpecker, pileated	<i>Dryocopus pileatus</i>
woodpecker, red-bellied	<i>Melanerpes carolinus</i>
woodpecker, red-headed	<i>Melanerpes erythrocephalus</i>
wood-pewee, eastern	<i>Contopus virens</i>
wren, Carolina	<i>Thryothorus lodocianus</i>
wren, house	<i>Troglodytes aedon</i>
wren, winter	<i>Troglodytes troglodytes</i>
yellowlegs, greater	<i>Tringa melanoleuca</i>
yellowthroat, common	<i>Geothlypis trichas</i>

APPENDIX J. RECREATIONAL PARKS

Park	Location	Commodities
13th Street Playground	Sharpsville	Playground
B Street Playground	Hermitage	Playground
Baker Ave. Playground	Hermitage	Playground
Beechwood Playground	Wheatland	Playground
Bicentennial Park	Hermitage	Playground
Brandy Springs Park	Mercer	Pool, playground, picnic area, baseball field, softball field, tennis courts, gazebo, pond
Buhl Farm Park	Sharon/Hermitage	Playground, picnic areas, pool, hiking, tennis, fitness trail, snack bar, driving range, outdoor stage
Cascade Park	New Castle	Fitness trail, swimming pool, dance hall, carousel building, bocci court, horsehoe court, outside ampitheater, picnic areas
Case Ave. Playground	Hermitage	Playground
Commodore Perry Community Park	Perry Township	Playground
Community Center Park	North Shenango Township	Playground
Darlington Park	New Castle	Restored Caboose and Gazebo
Emerson Ave. Playground	Farrell	Playground
Erie Canal/ Recreation Area	Sharpsville	Playground
Flaherty Field	New Castle	Lighted baseball field and four softball fields
Fredonia Park	Fredonia	Playground
Gaston Park	New Castle	Picnic Areas, softball fields, pool, playground, tennis courts
Greenville Riverside Park	Greenville	Swimming, playgrounds, tennis, picnic areas
Hempfield Township Community Park	Hempfield Township	Playground
Henderson Taylor Community Park	Clark	Playground
Jefferson Ave. Playground	Hermitage	Playground
Kedron Park	Farrell	Playground
Marti Park	New Wilmington	
McCullough Run Athletic Complex	South Pymatuning Township	
Memorial Field	Hermitage	Football field, playground
Mesabi Street Playground	Hermitage	Playground
Musser Playground	Hermitage	Playground
New Wilmington Borough Park	New Wilmington	Picnic areas, pool, playground, play fields, tennis courts, basketball courts

Park	Location	Commodities
North Sharon Playground	Hermitage	Playground
Pearson Park	Neshannock Township	Picnic areas, football/soccer fields, baseball fields, playgrounds, tennis courts, volleyball courts, fitness trail, year-round ice skating
Pymatuning Deer Park	Jamestown	Picnic area, snack bar, gift shop, western town, petting zoo, pony rides, train rides.
Pymatuning State Park	Crawford/ Mercer counties	Boating, fishing, hiking, hunting, sledding, ice boating, ice fishing, ice skating, snowmobile trails, cross country skiing, boat launch, boat rentals, camping, picnic areas, swimming, snack bar, playgrounds, cabins, restroom/shower facilities
Pymatuning Township Community Park	Pymatuning Township	Playground
Recreation Station	Hermitage	Miniature golf, bankshot basketball, batting cages, video arcade, go-carts
Riverside Park	Hermitage	Playground
Rodney White Olympic Park	Hermitage	Playground
School Park	Farrell	Playground
Scipio Street Park	Jamestown	Playground
Shenango River Lake	Clark	Boating, water skiing, fishing, camping, hiking, nature trails, picnic areas, playgrounds, swimming, boat launch, camping, restroom/shower facilities
Shenango Township Community Park	Shenango Township	Playground
Shenango Valley Softball Complex		Softball fields
South West Gardens Play Area	Farrell	Playground
Steel City Terrace	Farrell	Playground
Veteran Square Park	Farrell	
Veterans Park	Sharpsville	
Wengler Playground	Hermitage	Playground
Wesley McAfoose Community Park	Jackson Center	Playground
West Middlesex Regional Skate Park	West Middlesex	
West Park	Lawrence County	
Westhill Playground	Hermitage	Playground
Wolf Creek Township Community Park	Wolf Creek Township	Playground

APPENDIX K. NATIONAL REGISTER OF HISTORIC SITES**(Source: Pennsylvania Historical Museum Commission and National Parks Service)**

Historic Site	Municipality	Status	Date
<i>Crawford County</i>			
There are no sites within the watershed in this county.			
<i>Lawrence County</i>			
McDowell Farm	Hickory Township	Eligible	7/31/1986
Cascade Park	New Castle City	Eligible	3/22/2000
Christopher Columbus Society Building	New Castle City	Eligible	4/13/1989
Dean Block	New Castle City	Eligible	8/22/1998
First Christian Church	New Castle City	Eligible	11/19/1985
George Greer House	New Castle City	Eligible	4/4/1994
Hoyt Building	New Castle City	Eligible	4/23/1992
Lawrence County Courthouse	New Castle City	Listed	12/15/1978
North Hill Historic District	New Castle City	Listed	2/18/2000
Pennsylvania Engineering Works	New Castle City	Eligible	1/8/2002
Saint Mary's Roman Catholic Church	New Castle City	Eligible	4/14/1993
Scottish Rite Cathedral	New Castle City	Eligible	6/29/1988
Terrace Avenue School	New Castle City	Eligible	5/19/1999
U.S. Post Office, New Castle	New Castle City	Eligible	5/14/1982
Wallace Building	New Castle City	Eligible	4/23/1992
Overlook Hospital	New Wilmington Borough	Eligible	12/6/1991
Thompson, S.R., House	New Wilmington Borough	Listed	3/7/1985
Westminster College Historic District	New Wilmington Borough	Eligible	4/19/1999
New Castle Armory	Union Township	Listed	5/9/1991
Volant Mill	Volant Borough	Eligible	12/19/1984
Bank's Covered Bridge	Wilmington Township	Listed	6/27/1980

Mercer County

New Hamburg Historical Areas	Delaware Township	Listed	12/2/1974
Sharlow Farm	East Lackawannock Township	Eligible	2/12/1987
Farrell, J.A. Elementary School	Farrell City	Eligible	7/24/1998
Shenango Land Plan Historic Data	Farrell City	Eligible	6/19/2001
Greenville Commercial Historic District	Greenville Borough	Listed	8/10/2000
Greenville Hall	Greenville Borough	Eligible	12/16/1991
U.S. Post Office, Greenville	Greenville Borough	Eligible	7/3/1984
Waugh, Alexander P. & James S., House	Greenville Borough	Listed	4/23/1998
Quaker Bridge	Hempfield Township	Listed	6/22/1998
Gibson Property	Hermitage City	Eligible	5/26/1995
Joseph, Bryan, Property	Hermitage City	Eligible	5/26/1995
Kelly Road Bridge	Hermitage City	Eligible	11/28/1990
Western Pennsylvania Adolescent Center	Hermitage City	Eligible	5/26/1995

Historic Site	Municipality	Status	Date
<i>Mercer County (continued)</i>			
King's Tavern	Jackson Township	Eligible	4/7/1995
Campbell, James, House	Jamestown Borough	Eligible	11/19/1982
Gibson House	Jamestown Borough	Listed	12/1/1978
Stone Arch Bridge, Jamestown & Franklin Railroad	Jamestown Borough	Eligible	5/9/1990
Big Bend Historical Areas	Jefferson Township	Listed	4/21/1975
Bridge # 1608	Lake Township	Eligible	11/30/1993
Houston's Building	Mercer Borough	Eligible	10/3/2001
Lindsey, Christiana House	Mercer Borough	Listed	1/15/1998
Mercer County Courthouse	Mercer Borough	Listed	11/12/1998
Mercer County Jail	Mercer Borough	Eligible	7/20/1978
Kidd's Mill Historical Area	Pymatuning Township	Listed	12/2/1974
Buhl, Frank H. Mansion	Sharon City	Listed	12/2/1977
Sharon Junior & Senior High School	Sharon City	Eligible	7/31/2001
West Hill Historic District	Sharon City	Eligible	3/21/1990
Erie Extension Canal Lock 10	Sharpsville Borough	Eligible	6/29/1998
First Universalist Church of Sharpsville	Sharpsville Borough	Eligible	1/7/2002
Kelly Road Bridge	Sharpsville Borough	Eligible	11/28/1990
Pierce, Jonas J., House	Sharpsville Borough	Listed	10/24/1996
Orangeville	South Pymatuning Township	Eligible	1/4/1983
Johnston's Tavern	Springfield Township	Listed	3/24/1972
Porter House	West Salem Township	Eligible	6/25/2001

Ashtabula County

There are no sites within the watershed in this county.

Mahoning County

There are no sites within the watershed in this county.

Trumbull County

Allen, Dr. Peter, House	Kinsman	Listed	9/3/1971
Brookfield Center Historic District	Brookfield	Listed	10/10/1985
Congregational-Presbyterian Church	Kinsman	Listed	9/3/1971
Darrow, Clarence, Octagon House	Kinsman	Listed	9/10/1971
Jones, Elam, Public House	Hartford	Listed	1/8/2003

APPENDIX L. SURVEYS AND INTERVIEWS

**Shenango River Watershed
Conservation Plan**

Survey

1.) What county do you reside in?

- Crawford
- Mercer
- Lawrence

Township or Borough _____

2.) What do you think are the two most common land uses in your area?

- Residential
- Commercial
- Industrial
- Agricultural
- Forested
- Coal Mines
- Recreation
- Barren
- Other _____

3.) What do you think is the most prevalent water quality issue in the watershed?

- Abandoned Mine Drainage
- Agricultural Runoff
- Urban/Road Runoff
- Land Development
- Other _____
- Sewage Systems
- Industrial Discharges
- Stormwater/Flooding
- Dredging

4.) Number the following list in order of importance in regards to your future visions for the watershed. One being the most important.

- _____ Attractive Natural Settings
- _____ Recreational Opportunities
- _____ New Business/Jobs
- _____ Residential Development
- _____ Other _____
- _____ Preserving Historic Sites
- _____ Water Quality Improvements
- _____ Community Activities
- _____ Educational Opportunities

5.) Number the following list of recreational opportunities in order of your interest. One being the most important.

- | | | |
|------------------------|------------------------|--------------------|
| _____ Boating/Canoeing | _____ Bike Trails | _____ Fishing |
| _____ Hunting | _____ Horseback riding | _____ Swimming |
| _____ Hiking Trails | _____ Bird watching | _____ Picnic Areas |
| _____ Public Parks | _____ Athletic Fields | _____ Photography |
| _____ Scenic Vistas | _____ Other _____ | |

6.) List three positive things about the area in which you live.

1. _____
2. _____
3. _____

7.) List three negative things about the area in which you live.

1. _____
2. _____
3. _____

8.) List three things that would help make the area better place to live or help improve conditions in the watershed.

1. _____
2. _____
3. _____

9.) Other comments/concerns you have about the watershed or the watershed conservation planning process:

Please return this survey to the designated drop off boxes located through out the meeting or return it to Watershed Assistance Center, 246 South Walnut Street Blairsville, PA 15717, Attn: Jessica Coil

Shenango River Watershed Conservation Plan

Municipal Survey

1.) What local government are you affiliated with?

Township, Borough, or City _____

- Crawford County
- Mercer County
- Lawrence County

2.) What do you think are the two most common land uses in your area?

- Residential
- Commercial
- Industrial
- Agricultural
- Forested
- Coal Mines
- Recreation
- Barren
- Other _____

3.) What do you think is the most prevalent water quality issue in the watershed?

- Abandoned Mine Drainage
- Agricultural Runoff
- Urban/Road Runoff
- Land Development
- Other _____
- Sewage Systems
- Industrial Discharges
- Stormwater/Flooding
- Dredging

4.) Number the following list in order of importance in regards to your future visions for the watershed. One being the most important.

- _____ Attractive Natural Settings
- _____ Recreational Opportunities
- _____ New Business/Jobs
- _____ Residential Development
- _____ Other _____
- _____ Preserving Historic Sites
- _____ Water Quality Improvements
- _____ Community Activities
- _____ Educational Opportunities

5.) Number the following list of recreational opportunities in order of your interest. One being the most important.

- | | | |
|------------------------|------------------------|--------------------|
| _____ Boating/Canoeing | _____ Bike Trails | _____ Fishing |
| _____ Hunting | _____ Horseback riding | _____ Swimming |
| _____ Hiking Trails | _____ Bird watching | _____ Picnic Areas |
| _____ Public Parks | _____ Athletic Fields | _____ Photography |
| _____ Scenic Vistas | _____ Other _____ | |

6.) List three positive things about the area you represent.

1. _____
2. _____
3. _____

7.) List three negative things about the area you represent.

1. _____
2. _____
3. _____

8.) List three things that would help make the area better place to live or help improve conditions in the watershed.

1. _____
2. _____
3. _____

9.) Other comments/concerns you have about the watershed or the watershed conservation planning process:

10.) Are you willing to actively participate in the Watershed Conservation Plan process?

- Yes No

What projects would you like to see implemented in the area that you represent that could be included in the Shenango River Watershed Conservation Plan? Please list short-term and long-term projects and goals.

Land Use/Land Resources (farmland preservation, development, planning, etc.)

Water Resources (quality, quantity, etc.)

Biological Resources (plant, animal, terrestrial, aquatic, areas of concern, etc.)

Cultural Resources (historical, recreational, environmental education, etc.)

Other (roads/other transportation, economy/jobs, population & demographic trends)

**Please return this survey to Watershed Assistance Center, 246 South Walnut Street
Blairsville, PA 15717, Attn: Jessica Coil**

9. What might prevent the plan from being successful....What must the Plan NOT say or contain?

10. Do you have any advice for us as we go about the process of preparing a Conservation Plan for the Shenango River watershed?

11. Do you know of any other people we should interview?

12. Do you have any other comments you would like to make for the record before we conclude this interview?

APPENDIX M. FUNDING SOURCES

Sponsoring Organization	Description / Restrictions
BMP	
State Conservation Commission-Dirt and Gravel Roads Maintenance	Available to local municipalities and state agencies for projects dealing with the BMPs for erosion and sedimentation control problems and fugitive dust in watersheds; dirt and gravel road jurisdiction required.
Community	
Pittsburgh Foundation	Economic, community development and the environment. Activities that increase employment, build strong neighborhoods, and promote civic engagement by all segments of the population. Funds for quality of life.
Energy	
DEP - Alternative Fuels	The Alternative Fuels Incentive Grants program continues to fund a considerable number of projects that use alternative fueled energy sources to reduce air pollution and our dependence on foreign oil. Alternative fuels include compressed natural gas.
Environmental	
Beldon II Fund	Support environmental organizations working at the state-level. Some grants are made to regional and national organizations for efforts that support the work of state level groups.
Ben & Jerry's Foundation	Grant applications need to demonstrate that the project will lead to environmental change, address the root causes of environmental problems, and must help ameliorate an unjust or destructive situation by empowering constituents and facilitating leadership.
Eddie Bauer	Fund projects in certain local areas that support environmental goals such as clean rivers and streams or beautifying parks and school grounds. Must be 501(c) 3 and proposal should be kept between 2-3 pages.
Howard Heinz Endowment	This program promotes environmental quality and sustainable development by supporting efforts to eliminate waste, harness the power of the market, and create a restorative economy. Should Promote sustainable urban design. Concentrated in Western Pennsylvania.

Sponsoring Organization	Description / Restrictions
Environmental (continued)	
Raymond Proffitt Foundation	The foundation's purpose is to protect and restore the quality of the natural and human environment by informing and educating the general public about the impact of human endeavors upon the natural environment. The RPF strives to advance this understanding.
Surdna Foundation	The foundation's goal is to prevent damage to the environment and to promote more efficient, economically sound, environmentally beneficial, and equitable use of land and natural resources. Does not fund environmental education, sustainable agriculture, food production or toxic and hazardous waste.
Vira I Heinz Endowment	This program promotes environmental quality and sustainable development by supporting efforts to eliminate waste, harness the power of the market, and create a restorative economy. The program's goal is to promote sustainable urban design. Western Pennsylvania watersheds only.
Environmental / Watershed	
EPA-Clean Water State Revolving Fund	May also contact: Beverly Reinhold (717) 783-6589. Infrastructure Investment Authority, Keystone Building 22 South Third Street, Harrisburg, PA 17101. email: breinhold@state.pa.us or Peter Slack, (717) 772-4054; DEP 400 Market Street, Harrisburg, PA 17105
WREN - Conference/Training Scholarships	The activities funded must be educational and relate to drinking water source protection or watershed education. Applicant is required to provide a five percent match.
River Network Watershed Assistance Grants	Watershed projects and group start-ups.
Western Pennsylvania Watershed Program, Howard Heinz Endowments	Provides funding to grassroots organizations and watershed associations for specific watershed remediation in western Pennsylvania. Select western Pennsylvania watersheds only.
Environmental Education	
Captain Planet	Supports hands-on environmental projects for children and youth to encourage innovative programs that empower children and youth around the world to work individually and collectively to solve environmental problems. Only for environmental education of children. Online only.
DEP Environmental Education Grants	Open to schools, conservation districts, and non-profits. Open in summer, awarded in spring. Final application due dates vary. Application available online. Requires twenty percent match and reimbursement program.

Sponsoring Organization	Description / Restrictions
Environmental Education (continued)	
Education Mini Projects Program	Small grants for Pennsylvania-based grassroots educational projects that address non-point source watershed concepts.
Emerson Charitable Trust	Strong emphasis on cultural aspects and youth education, also science and education.
EPA Environmental Education Grants Region III	Grants awarded to small non-profit groups for various projects in Region III.
National Environmental Education and Training Foundation	To increase environmental awareness, environmental education, partnerships, etc. May also be reached at (202) 261-6464. Proposal deadlines: Jan. 1, March 1, July 15, and Sept. 1
PACD - Mini Projects	The objectives of the Educational Mini-Project must promote the We All Live Downstream message by: stimulating an awareness of and interest in Pennsylvania's non-point source water pollution problems and solutions; salaries are not an approved expenditure.
Project Wild	Project Wild is an interdisciplinary supplementary environmental and conservation program for educators of children in grades K-12. Small grants only.
The Dunn Foundation	Promote the issues of the negative effect that sprawl, visual pollution, and poorly planned development have on the visual environment of communities and the resulting loss of quality of life. Encourage dialogue within and between communities. Do not fund property acquisition, capital improvement projects, capital campaigns, endowments, individuals, religious groups, or political organizations.
The Pathways to Nature Conservation Fund - National Fish and Wildlife Foundation	A partnership between the more than 270 Wild Birds Unlimited, Inc. franchises and the National Fish and Wildlife Foundation. The Pathways to Nature Conservation Fund offers grants to enhance environmental education activities and bird and wildlife viewing opportunities at significant sites.
Water Resources Education Network - LWV	Funding to develop education programs for water issues facing communities. Local contact is shrenehess@yourinter.net, Indiana PA, 724-465-2595. Must be 501(c)3
WREN - Opportunity Grants	The activities funded must be educational and relate to drinking water source protection or watershed education.

Sponsoring Organization	Description / Restrictions
Environmental Justice	
EPA-Environmental Justice Small Grant Program	The program provides financial assistance to eligible affected local community-based organizations working on or planning to work on projects to address local environmental and/or public health concerns.
Nathan Cummings Foundation	The foundation's purpose is to facilitate environmental justice and environmentally sustainable communities by supporting the accountability of corporations, governments, and other institutions for their environmental practices. Does not fund individuals, scholarships, or capital or endowment campaigns.
Norman Foundation	Support efforts that strengthen the ability of communities to determine their own economic, environmental, and social well-being, and that help people control those forces that affect their lives. Only fund in U.S. They do not fund individuals, universities, conferences, scholarships, research, films, media, arts projects, capital campaigns, fundraising drives, or direct social service programs .
Environmental Planning	
Coldwater Heritage Partnership	Grants for prioritizing watersheds in need of protection, for assessment of coldwater ecosystems, and for the development of watershed conservation plans.
DEP Nonpoint Source Control	Grants for planning and non-point source pollution control projects.
DCNR - Community Conservation Partnership Program	Available to organizations that conserve and enhance river resources. Planning grants are available to identify significant natural and cultural resources, threats, concerns, and special opportunities, and the development of river conservation plans. Grants requires 50 percent match.
NRCS Watershed Surveys and Planning	Providing assistance for planning in water and coordinated water and related land resource programs in watersheds and river basins. Types of surveys and plans funded include watershed plans, river basin surveys and studies, flood hazard analyses, and floodplain studies.
Flood Protection	
DEP Flood Protection Grant Program	Open to communities that need to perform non-routine maintenance or improvements to already existing flood protection projects. Also applies to the purchase of specialized equipment. Open to communities that have flood protection projects that are deemed operable.

Sponsoring Organization	Description / Restrictions
General	
Archer-Daniels-Midland Foundation	Proposals can be sent in letter form containing: 1) Description of the organization applying. 2) Description of the project/What funding would be used for. 3) A budget including how much is going to administrative costs. Emphasis is given to corporate operating locations.
Audrey Hillman Fisher Foundation, Inc.	Must refer to Application Procedures for more information. Preference given to southwestern Pennsylvania and central New Hampshire.
Eureka Company	No specific interest, but, general focus is on social services, health, and the environment (wildlife, fisheries, habitat, and sustainable community development)
Henry Hillman Foundation	Preference is given to organizations in the Pittsburgh/southwestern Pennsylvania area.
Patagonia, Inc. Environmental Grants Program	Supports small grassroots organizations. Does not fund land acquisition.
The Boeing Company	Provides contributions for capital campaigns, seed money (one-time grants) for new programs or projects that address community needs and priorities, and one-time grants to buy equipment, improve facilities, or enable special projects.
The Education Foundation for America	EFA's priorities include supporting the monitoring of the utility restructuring process as it impacts the environment, combating the growth of the "wise-use" movement, opposing large-scale live-stock confinement, and cutting federal "pollution." Letter limited to two pages.
The Prospect Hill Foundation	The foundation's environmental grant making concentrates on habitat and water protection in the northeastern region of the United States. Must have 501(c)3. The organization does not fund individuals, basic research, sectarian religious activities, or organizations that lack tax exemption under U.S. Law.
GIS	
DEP-GIS Software Grant	The grants consist of the latest commercial release of ArcView GIS software; several texts about utilizing GIS for environmental applications and land-use planning; CD-ROM containing spatial data about the commonwealth. Only issue 10 per quarter.

Sponsoring Organization	Description / Restrictions
Habitat	
General Challenge Grant Program -National Fish and Wildlife Foundation	Requires non-federal match of 2:1. Address actions promoting fish and wildlife conservation and habitat; should involve conservation and community interest; leverage available funding and evaluate project outcomes.
Keep the Wild Alive (KWA) Species Recovery Fund	Fund on-the-ground projects that directly improve conditions for the endangered species highlighted in the KWA campaign. Current National Wildlife Federation employees are ineligible and applications must be submitted in English.
Small Grants Program - National Fish and Wildlife Foundation	Address priority actions promoting fish and wildlife conservation and the habitats on which they depend; work proactively to involve other conservation and community interest; leverage available funding, and evaluate project outcomes. A 2:1 match of non-federal funds is required.
Internship	
Office of Surface Mining Intern Program	Candidates must organize their work, work well with community groups and on their own, quickly internalize the requirements of acid mine drainage remediation and the national Clean Streams program, write well and enjoy public presentations. Academic credit. Can be undergraduate or graduate student. Positions available in AL, IL, IN, IA, KY, MD, MS, OH, OK, PA, TN, VA, WV. Must provide housing for interns.
Land Protection	
DCNR - Land Trust Grants	Provide funding for acquisition and planning of open space and natural areas which face imminent loss. Lands must be open to public use and priority is given to habitat for threatened species. Eligible applicants are non-profit land trusts and 501(c)3. Requires 50 percent match.
Lowes Charitable Foundation	Environmental initiatives that support the continued enhancement of the natural landscape, natural environment enhancers, and/or park improvement projects. Must apply online. Must be a 501(c)3.
Michael D. Ferguson Charitable Foundation	General environment, wildlife, fisheries, habitat, sustainable community, and development.
Nationals Parks Service - Land & Water Conservation Fund	Provide federal grants for land acquisition and conservation to federal and state agencies.

Sponsoring Organization	Description / Restrictions
Land Protection (continued)	
The Wilderness Society	To preserve wilderness and wildlife, protect America's prime forest, parks, rivers, and shore lands, and foster an American land ethic. Alternate address Montana Regional Office, 105 West Main St., Suite E, Bozeman, MT 59715-4689
Town Creek Foundation	Environmental issues of interest to the foundation include: 1) Preserving the ecological richness of our natural heritage, with a major focus on our federal public lands. 2) Promoting policies and practices to protect the land, estuaries, and coastal bays.
Loan	
Environmental Loan Fund	The loan can be used for membership development, creating and implementing a workplace giving program, cause-related marketing, donor development, special events, direct mail campaigns, mission related business enterprises, or capital campaign work.
Pennsylvania Infrastructure Investment Authority Drinking Water Loans	Must show water quality impact, must have qualified loan candidate. Loans to stormwater projects and non-point source projects. Interest is 1-2.8 percent over 20 years.
Multiple	
Acorn Foundation	Interested in small and innovative community-based projects which preserve and restore habitats supporting biological diversity and wildlife, and advocate for environmental justice. Does not fund the following: direct services, capital expenditure, construction or renovation programs, programs undertaken by tax-supported institutions or government initiatives, emergency funding, scholarship funds, or other individual aid.
Allegheny Foundation	The Allegheny Foundation concentrates its giving in the western Pennsylvania area and confines its grant awards to programs for historic preservation, civic development, and education. No event sponsoring. Does not fund individuals.
Anne & George Clapp Charitable & Educational Trust	Fields of interest include education, social services, youth and child welfare, and aging. Limited support for cultural programs, historic preservation, and conservation. Southwestern Pennsylvania only; grants are not made to individuals. No grants are made for medical research, research projects, filmmaking, conferences, or field trips.
Charlotte and Donald Teast Foundation	Sustainable communities, arts, humanities, civic and public affairs, education, the environment, health, and social services.

Sponsoring Organization	Description / Restrictions
Multiple (continued)	
DCNR Community Conservation Partnership Program	Conserve and enhance river resources by offering planning grants, technical assistance, implementation grants, development grants, and acquisition grants.
Ford Foundation	Interested in general/operating support, continuing support, endowment funds, program development, conferences/seminars, professorships, publication, seed money, fellowships, internships, research, technical assistance, consulting services, and program-related investments.
Max and Victoria Dreyfus Foundation	Consider support for museums, schools, educational and skill training projects, programs for youth, seniors, and the handicapped. Must be located in the U.S. Does not issue grants to individuals.
National Fish and Wildlife Fund -Five Star Restoration Challenge	Projects must involve diverse partnerships of, ideally, five organizations that contribute funding, land, technical assistance, workforce support, and/or other in-kind services. Projects involving only research, monitoring, or planning are not eligible. No mitigation work.
National Parks Foundation	Education, training, preservation, and conservation. The grants that are available change often. See the website for current funding opportunities. Projects must connect with National Parks, be located on or next to National Park or River, and work in cooperation with the National Park. Alternate Phone: 202-785-3539.
Native Plant Conservation Initiative - National Fish and Wildlife Foundation	Through this initiative, grants of federal dollars will be provided to non-profit organizations and agencies at all levels of government to promote the conservation of native plants. There is a strong preference for "on-the-ground" projects that involve local communities and citizen volunteers in the restoration of native plant communities. Projects that include a pollinator conservation component are also encouraged.
Public Welfare Foundation	The Public Welfare Foundation supports organizations that address human needs in disadvantaged communities, with strong emphasis on organizations that include service, advocacy and empowerment in their approach: service that remedies specific problems; advocacy that addresses those problems in a systemic way through changes in public policy; and strategies to empower people in need to play leading roles in achieving those policy changes and in remedying specific problems.

Sponsoring Organization	Description / Restrictions
Multiple (continued)	
Robertshaw Charitable Foundation	Money to assist those organizations who work to enhance the educational, health and welfare, cultural, youth development, social welfare, and community development needs of the area. Only one grant per year will be awarded to any organization. Preference to southwestern Pennsylvania organizations.
Scaife Family Foundation	Grants awarded will support programs that strengthen families, address the health and welfare of women and children, or promote animal welfare. No event sponsorships, endowments, capital campaigns, renovations, or government agencies. No grants to individuals.
The French Foundation	Environment, and natural resources
The Lawrence Foundation	The mission of The Lawrence Foundation is to make a difference in the world by providing contributions and grants to organizations that are working to solve pressing educational, environmental, health, and other issues.
The Max and Anna Levinson Foundation	Interested in the environment, including preservation of ecosystems and biological diversity, but also environmental justice, alternative energy, alternative agriculture, and toxics. Must have 501(c)3 status. Rarely fund organizations with budgets in excess of \$500,000.
Turner Foundation	Supports activities to preserve the environment, conserve natural resources, protect wildlife, and develop and implement sound population policies. Interested in protecting rivers, lakes, wetlands, aquifers, oceans. Does not provide funding for buildings, land acquisition, endowments, start-up funds, films, books, magazines, or other specific media projects. Alternate Phone: 404-681-0172.

Natural Resources

Beneficia Foundation	Only applications for projects focusing on conservation of the environment or the arts will be considered. Beneficia has no geographic preferences, but favors requests for project support over general support and does not look favorably upon requests for general overhead or construction of facilities.
Canaan Valley Institute	Promotes the development and growth of local associations committed to improving or maintaining the natural resources of their watersheds in the Mid-Atlantic portions of Pennsylvania.
Charles A. and Anne Morrow Lindburgh Foundation	Grants awarded for the conservation of natural resources and water resource management. Grants are awarded to individuals for research and educational programs, not to organizations for institutional programs.

Sponsoring Organization	Description / Restrictions
Natural Resources (continued)	
Dana Corporation	Will consider funding air quality, environment, general, and water resources projects. Emphasis is given to areas where the corporation operates.
DCNR- Community Conservation Partnership Program	Awarded for local recreation, park, and conservation projects, including rehabilitation and development of parks and recreation facilities, acquisition of land for park and conservation purposes, and technical assistance for feasibility studies, and trail studies. Requires 50 percent match, except for some technical assistance and projects eligible as small community projects.
Home Depot	Assistance is provided to non-profit organizations that direct effort toward protecting our natural systems. The grant program focuses on forestry and ecology, clean up, and recycling, green building design, and lead poisoning prevention.
W. Alton Jones Foundation, Inc.	The goals of the foundation are to build a sustainable world by developing new ways for humanity to interact responsibly with the planet's ecological systems, and build a secure world by eliminating the possibility of nuclear war by providing alternative methods of resolving conflicts and promoting security.
Leo Model Foundation	Grants for habitat conservation, watershed conservation, and species preservation in the U.S.
National Fish and Wildlife Fund Challenge Grants for Conservation	The foundation, in partnership with the NRCS and NACD (National Association of Conservation Districts) provides challenge grants. Primary goal of the program is to support model projects which positively engage private landowners.
Rivers, Trails and Conservation Assistance Program	Grants to work with National Park Service to conserve land and river resources, and provides funding for various projects dealing with the conservation of these resources, including the development of trails and greenways.
The River Restoration - NOAA	Submittal by email whenever possible. Encourage contact to discuss project prior to submitting application. Formal non-federal matches not required, but encouraged. Dam removal and fish passage. Available in northeast, Mid-Atlantic, and California.
The Watershed Protection and Flood Prevention Act	Plan development for natural resource concerns within a watershed area; cost sharing available to carry out plan.
The William C. Kenney Watershed Protection Foundation	Protecting the remaining wild rivers of the west and ensuring the effectiveness of small environmental organizations.

Sponsoring Organization	Description / Restrictions
Other	
Charles Stewart Mott Foundation	The environmental program is devoted to reform of international lending and trade policies. Projects must be part of a national demonstration when out of the Flint, Michigan area.
North American Fund for Environmental Cooperation	Funds community based projects in Canada, Mexico and the U.S. to enhance regional co-operation, prevent environmental and trade disputes, and to promote the effective enforcement of environmental law.
PA DEP Brownfields Inventory	Grantees will be paid \$1,000 for each site registered into the PA Site finder. Municipalities and economic development agencies may apply for the grant by submitting an application.
Retired and Senior Volunteer Program (RSVP)	Provides a variety of opportunities for people aged 55+ to volunteer in the management of trails, rivers, and open space. Grants can be used for staff salaries, fringe benefits, travel, equipment, and transportation.
Plantings	
National 4-H Council	Grants are used to stimulate community tree planting and/or reforestation projects. Awarded to communities in support of on-going community planting/reforestation project or to stimulate new and creative youth-led projects. Organization must secure matching funds or in-kind contributions from other sources equal to the amount requested.
National Gardening Association	One hundred grants to be awarded to start-up programs involving children, and 300 will be awarded to established programs. Covers tools, seeds, plant materials, products, and educational resources. Grant restricted to programs involving children. There is a \$10.00 administrative fee.
Plant Material Centers	American Indian Liaison Resource Conservation and Community Assistance Division of USDA/NRCS. PMC select and grow plants that grow naturally and provide them to those people who wish to grow native plants.

Sponsoring Organization	Description / Restrictions
Remediation/Restoration	
Abandoned Mine Land Reclamation Program - Office of Surface Mining	Applications accepted anytime. Provides for the restoration of eligible lands and waters that have been mined, abandoned, or left inadequately restored. Two different grants are available. Protects land and corrects environmental damage caused by coal mining.
AMD Watershed Assessment - Bureau of Mining and Reclamation	Must be a municipality, municipal authority or incorporated non-profit. AMD projects only.
American Canoe Association CFS Grants	For grassroots organizations to improve waterways. Cleanups, riparian corridor, and water quality monitoring projects. Very flexible as long as it is improving waterways and fish habitat. Can not be used to pay staff. However, it can be used to pay a contractor. Must use volunteer help.
PA DEP - BAMR Abandoned Mine Reclamation Grants	Funds must be used for project development, design, construction, and directly related expenses. Site chosen must be located in a watershed or area with an approved rehabilitation plan . No administrative cost. Must be a municipality, municipal authority, or incorporated 501(c)3.
Bring Back the Natives - National Fish and Wildlife Foundation	Supports on-the-ground habitat restoration projects that benefit native aquatic species in their historic range.
Community Foundation	Projects related to abandoned mine drainage remediation, alkaline discharges, streambank preservation, removal of spoil piles, and other issues related to water quality are of interest to the foundation's board of advisors.
EPA - Nonpoint Source Implementation Grants	Funds are provided to the state to carry out non-point source projects and programs pursuant to Section 319 of the Clean Water Act as amended by the Water Quality Act of 1987. Grants are awarded to a single agency in each state, designated by the governor. 40 percent non-federally funded match required. Only one administered to each state.
NOAA Fish Habitat Restoration Program	Financial assistance for community-based habitat restoration projects, to restore fish habitats.
Office of Surface Mining Clean Stream Initiative	This grant is used to treat AMD. Design and administration is covered but the bulk of funding must go into construction. Must have funding partners. Applications available upon request. Review period takes 2.5-3 months, depending on eligibility. Must be a cooperative agreement.
PA DEP -Stream Improvement Project Reimbursements	Provides assistance in an instance where a stream is posing a treat to structures, such as homes or businesses. Must pose threat to structure. Must be applied for by a conservation group or municipality.
PA Fish and Boat Commission	Habitat improvement and technical assistance.

Sponsoring Organization	Description / Restrictions
Remediation/Restoration (continued)	
Partnership with the U.S. Army Corps of Engineers	To foster cooperation on projects of mutual interest, such as fish and wildlife habitat restoration, non-structural flood control opportunities, wetland restoration, and endangered species protection.
Pinellas County Environmental Foundation National Fish and Wildlife Foundation	A partnership between Pinellas County and the National Fish and Wildlife Foundation. These two groups share the common goals of actively pursuing the protection, restoration and enhancement of fish and wildlife habitat, and developing creative and sustainable solutions to natural resource issues.
Research	
Conservation & Research Foundation at Connecticut College	The conservation and enlightened use of the earth's resources to encourage research to deepen the understanding of the intricate relationship between people and the environment. Will support higher education, individuals, museums, non-profits, and research. Unsolicited proposals are not accepted; however, letters of inquiry including a budget may be sent.
USDA - Nutrient Science for Improved Watershed Management	Funds for integrated research in extension management of nutrients on a watershed level. Nutrients of interest are nitrogen and phosphorous. Please note that a research foundation maintained by a college or university is not eligible. These grants are for research.
Stormwater Management	
DEP Stormwater Management Program	Watershed planning for stormwater control and implementation of programs at local levels.
Streambank Fencing	
Ducks Unlimited - PA Stewardship Program	Provides strong incentives to landowners to create wooded stream buffers, create wider than minimum buffers, and fence cattle out of the stream. Grant is available for fencing and tree planting.
Fish America Foundation	Grants awarded for streambank stabilization materials, instream habitat improvements, contracted heavy equipment, and stream morphology work. Match not required, but is highly recommended.

Sponsoring Organization	Description / Restrictions
Streambank Fencing	
Partners for Fish and Wildlife Program	The Partners for Fish and Wildlife Program provides technical and financial assistance to private landowners for habitat restoration on their lands. A variety of habitats can be restored to benefit Federal trust species (for example, migratory birds and fish and threatened and endangered species.) Normally the cost share is 50 percent (the Service and the landowner each pay half of the project costs), but the percentage is flexible. Services or labor can qualify for cost-sharing.
US Fish and Wildlife Service	Assists landowners in installation of high-tensile electric fence to exclude livestock from streams and wetlands. No buffer requirements.
USDA Conservation Reserve Program	Statewide costshare program for creating stream buffers. A 40 percent practice incentive as well as a \$10/acre incentive. Buffers of 35-180 feet per side of the stream. Land must have been pasture.
USDA - Environmental Quality Incentives Program	A statewide program based on environmental problems. It addresses all environmental problems on a farm. They fund BMPs.
USDA Project Grass	A co-operative effort of local farmers, conservation districts, with assistance from USDA, to improve agriculture productivity in southwestern Pennsylvania. For local contacts see information brochure on file. Contact: james.harrold@pasomerset.fsc.usda.gov
Technical Assistance	
Watershed Assistance Grants	Funding supports organizational development and capacity building for watershed partnerships with diverse membership. Match requested but not required. Non-profits, tribes, and local government only.
Trails	
DCNR - PA Recreational Trails Program	Will consider proposals for maintenance and restoration of existing recreational trails; development and rehabilitation of trailside and trailhead facilities and trail linkages; purchase and lease of recreational trail construction and maintenance equipment. Must have 20 percent match. Eligible applicants include federal and state agencies, local governments, and private organizations.
DCNR - Rails to Trails	Provide 50 percent funding for the planning, acquisition, or development of rail-trail corridors. Applicants include municipalities and non-profit organizations established to preserve and protect available abandoned railroad corridors for use as trails. Grants require 50 percent match.

Sponsoring Organization	Description / Restrictions
Volunteers	
3M Foundation	3M sponsors a volunteer program called Community Action Retired Employee Service (CARES). Company favors projects that impact 3M communities. Alternate Phone: 612-737-3061
Wetlands	
U.S. Fish and Wildlife Service	For wetland Conservation projects. Must have 50 percent non-federal match in small-grant program with North American Wetlands Conservation Council.
Wetlands Reserve Program USDA Natural Resources Conservation Service	Restore and protect wetlands on private property; provide landowners with financial incentives to enhance wetlands in exchange for retiring marginal agricultural land.

APPENDIX N. HELPFUL WEBSITES

Project Area

- *Commonwealth of Pennsylvania - Zoning and Comprehensive planning*
<http://www.elibrary.state.pa.us/disclaimer.asp>
- *United States Census Bureau – Population and economic data from the 1990 and 2000 Census*
<http://www.census.gov/>

Land Resources

- *United States Environmental Protection Agency – Brownfields*
http://www.epa.gov/swerosps/bf/basic_info.htm
- *United States Environmental Protection Agency - CERCLA overview*
<http://www.epa.gov/superfund/action/law/cercla.htm>
- *United States Environmental Protection Agency – SARA overview*
<http://www.epa.gov/superfund/action/law/sara.htm>
- *The Nature Conservancy - Conservation Easements*
<http://nature.org/aboutus/howwework/conservationmethods/privatelands/conservationeasements/>

Water Resources

- *Center for Dirt & Gravel Road Studies*
<http://www.mri.psu.edu/centers/cdgrs/Index.html>
- *League of Women Voters – Groundwater Primer for Pennsylvanians*
<http://pa.lwv.org/wren/pubs/primer.html>
- *Marinette County Land and Water Conservation Programs and Services - Agricultural best management practices*
http://www.marinettecounty.com/lw_ps_bmp_ag.htm
- *Ohio Environmental Protection Agency – Ohio Administrative Code*
<http://www.epa.state.oh.us/dsw/wqs/wqs.html#Beneficial%20Use%20Designations>
- *Ohio State University Extension – Agricultural best management practices*
<http://ohioline.osu.edu/aex-fact/0464.html>
- *Pennsylvania Department of Environmental Protection – Water resource plan*
<http://www.dep.state.pa.us/dep/deputate/watermgmt/wc/subjects/WaterResources/docs/WaterResourcesExecutiveSummary.htm>
- *United States Environmental Protection Agency – Water quality trading*
<http://www.epa.gov/owow/watershed/trading.htm>

- *Federal Emergency Management Agency* – Handbook of federal program offering non-structural flood recovery and floodplain management alternatives
<http://www.fema.gov/pdf/hazards/ombflood.pdf>

Biological Resources

- *Bartramian Audubon Society* – Bird listings
<http://www.csonline.net/russs/bas>
- *Carnegie Museum of Natural History* – Mammals of Pennsylvania
<http://www.carnegieinstitute.org/cmnh/mammals>
- *Pennsylvania Audubon Society* – Bird list developed during establishment of Important Bird Areas
<http://pa.audubon.org>
- *Pennsylvania Department of Conservation and Natural Resources* – Invasive species
<http://www.dcnr.state.pa.us/forestry/wildplant/invasive.asp>
- *Three Rivers Birding Club* – Bird listings
<http://3riversbirdingclub.org>
- *United States Geological Survey Prairie Wildlife Research Center* – Dragonflies and butterflies by counties in Pennsylvania
<http://www.npwrc.usgs.gov/resource/geograph.htm>

Cultural Resources

- *Pennsylvania Department of Conservation and Natural Resources* – Watershed Education Program
<http://www.watershed.dcnr.state.pa.us>
- *Pennsylvania Department of Conservation and Natural Resources* – Wild Resource Conservation Office educational resources
<http://www.dcnr.state.pa.us/aboutdcnr/ataglance/fswrcf.htm>
- *Pennsylvania Department of Education* – *Environment and ecology academic standards*
<http://www.pde.state.pa.us/k12/lib/k12/envec.pdf>

APPENDIX O. EFP2 STAKEHOLDER COMMENTS SUMMARIZED

These are a summarization of comments received about the Moraine Watershed Team priority objectives from a November 5, 2001 Environmental Futures Planning Process meeting. The priority objectives were developed for the Shenango River, Sandy Creek, and Slippery Rock Creek watersheds.

- Increase knowledge and awareness of basic environmental concepts in Pennsylvania's adult and school-age population.
 - The public feels that education should be the top priority. Emphasis should be placed on hands-on education.
 - Incorporate partnerships in providing education projects. Encourage both public and private entities to get involved.
- Promote pollution prevention and energy efficient practices.
 - The public liked the focus on prevention instead of cleanup.
 - Providing a mechanism to share information concerning recycling and reuse methods.
 - Expand programs like the mercury collection programs to other household substances.
- Maintain a low level of stream miles impaired by pollutants and sediments caused from roads and overland flow of precipitation over impervious areas.
 - Water quality assessments should be the number one priority. You must know what problems exist before educating about the problem.
 - Establish incentives to control runoff, such as providing funding or tax breaks.
- Reduce quantity of pollutants released from sewer plants.
 - This objective should be expanded to include sewage overflows, septic tanks, and on-lot sewage problems.
 - The objective should be related to specific problems in a stream and should be related to discharge limits to streams.
- Promote best management practices for the resource-extraction industry.
 - You have to be careful and define the meaning of best management practices. The promotion of best management practices should involve public.
 - Review and strengthen regulations to protect environmentally sensitive areas from resource extraction, etc.
- Other comments
 - Increase the recycling rate to meet the state's goal of 35 percent.
 - Implement mandatory trash collection and recycling.
 - Implement enforcement measures for new and existing municipal recycling ordinances.
 - Reduce the reliance on landfills through environmentally safer disposal alternatives.
 - Increase community stewardship and environmental awareness.
 - Work with community-based organizations such as PA CleanWays and watershed organizations to address problems and education.

APPENDIX P. PUBLIC COMMENTS

Comments from Public Meetings Held in April

Mercer Cooperative Extension – April 5, 2005

Project Area Characteristics

- Air Quality is not addressed in the plan.
 - *A section on air quality has been added to the Project Area Characteristics chapter between the Major Tributaries and Socio-economic Profile sections.*
- Mercury pollution coming from similar source? How does chemistry work? How does it affect fish?
 - *Information about mercury was added to the air quality section.*
- Emissions from scrubbers.
 - *Comment noted.*
- Tax reform to assist landowners to hold on to their properties.
 - *A recommendation was added.*
- Add Cooperative Extension to Land-Use Planning and Regulation and Zoning partners for education and research and in the management recommendation matrix.
 - *Cooperative Extensions were added as potential partners to five recommendations under the land-use planning and regulation section of the management recommendation matrix.*
- Management Recommendation under economics: the recommended tax incentives to keep land intact should be a high priority.
 - *A recommendation was added.*

Land Resources

- Landfills – River Road – leachate and a history of illegal dumping.
 - *Comment noted.*
- Slurry from former mills, South Pymatuning Twp., draining into Shenango River.
 - *Comment noted.*
- Illegal dumping “not in my backyard;” it’s someone else’s problem.
 - *A section on illegal dumping in the watershed is already included in the plan.*
- Additional available information about conservation easements and educate about conservation easements.
 - *Conservation easements are defined in the plan. A website with more information about conservation easements was added to Appendix N.*
- Support Woodland Owners Association efforts to educate public and restore degraded areas, and to develop demonstration areas.
 - *A recommendation was added.*

Land Resources (continued)

- Change the 4th and 6th recommendations under farmland preservation to high priority.
 - *After reviewing the original prioritizations, the priorities were changed.*
- Mercer County Agricultural Security Area parcels are missing from maps. (Where did the data come from?)
 - *At the time of the draft and final publication, the security area parcels data from Mercer County was not available. The Mercer County Comprehensive Plan will have that data, once completed. The Lawrence County Conservation District provided Lawrence County data and Crawford County is just getting their agricultural security program started, so no data is available yet.*
- Figures 2-10 and 2-8 largely show forest and agricultural land use, but do not show the residential use now present, especially around Lake Latonka.
 - *Updated land-use data was obtained from the Pennsylvania Department of Environmental Protection. Changes were made.*
- Promote local production of foods and farm markets (agricultural products and agricultural producers, agricultural preservation program).
 - *Management recommendation was added.*

Water Resources

- Definitions of water pollution. If water is altered by man, it is polluted (Murray, M. Shellgram). If water can be used for its intended use, it is not polluted (Sanitary Engineer).
 - *Comment noted.*
- Take BOD samples above and below sewage effluent. Water has to be sampled in order to determine what pollutants are present or absent. Dissolved oxygen is one of the big requirements for any stream.
 - *A recommendation was added.*
- Remove playground on figures 3-3, 3-7, and 3-12. Check others, particularly Lower Shenango maps, to see if playground is listed.
 - *Maps were corrected.*
- In table 3-4 what is “other” as the impairment source?
 - *Impairments where the source and cause of the pollution is unknown are classified as “other.”*
- Fox Run AMD project. Phase I is completed.
 - *Comment noted.*
- Update wetlands map and move to high priority. We need to know what to protect.
 - *A recommendation to update the wetland map is already included in the Water Resources chapter. After reviewing the original priorities, the recommendation will remain at a medium priority.*
- Nitrates and phosphorous – sewage treatment plants.
 - *Comment noted.*

Water Resources (continued)

- Hypolimnion draining.
 - *Comment noted.*
- Master Well Owners should be used as potential partners; they educate approximately 100 well owners each year. Program of Cooperative Extension.
 - *Master Well Owners and Cooperative Extensions were added to potential partners in a recommendation about protecting private well supplies to homeowners.*
- Possible AMD discharge on the Sharon School Site.
 - *Comment noted.*
- Is cleanup of mercury at power plants working?
 - *Comment noted.*
- Recommendation to continue macroinvertebrate sampling. Compare to previous results University of Pittsburgh Lab of Ecology.
 - *A recommendation was added.*
- Sewage is visible in Orangeville and Kinsman, but it is not addressed in plan. Trumbull County currently has cost-share program for septic pumping.
 - *Comment noted.*
- Increase funding to remediate sewage problems.
 - *A recommendation already exists in the Water Resources Chapter.*
- Page 7-13 Erosion and Sedimentation: change the language of the recommendation from “farmers” to “landowners” in the third recommendation so that the agricultural community doesn’t get offended.
 - *Recommendation was changed.*

Biological Resources

- No comments received.

Cultural Resources

- Improve communication among groups – annual get-together events to focus on common ground.
 - *There is already a recommendation in the Project Area Characteristics chapter addressing this concern.*
- Add to Environmental Education management recommendations: Continue development of Munnell Run Farm as an ecological and agricultural education center. Should be a medium priority. Potential partners should include the same ones as in West Park recommendation but add Munnell Run Farm Foundation and Mercer County Historical Society. For potential funding add USDA and PDA.
 - *Recommendation was added.*
- Add Bronzewood Golf Course in Andover, OH 18 hole public course to Table 5-5 on page 5-11.
 - *Golf course was added to the table.*

Cultural Resources (continued)

- Page 5-18 under origin of names change ...Chenango, meaning “bull thistle”.... To Chenango, meaning “big bull thistle”... Venango means little bull thistle. Also change the spelling of Shenango when used to describe the Iroquoian word to “Shaningo”.
 - *Changes were made.*

Neshannock High School Meeting – April 7, 2005

Project Area Characteristics

- Utilize environmental education to address watershed issues.
 - *Recommendations for utilizing environmental education to address watershed issues were already included in several recommendations.*

Land Resources

- Recovery of river and natural resources, which were available prior to industry.
 - *Comment noted.*
- Floodplain levels important to future projects.
 - *Comment noted.*
- Lawrence County Planning Department applied to DCNR to complete a greenway plan.
 - *Comment noted.*
- Lawrence County Planning Department sent DEP a letter of intent for stormwater management.
 - *Comment noted.*
- Preserve the canal lock in Pulaski on the east side of the river. It is located on State Game Lands.
 - *The canal lock preservation was specifically mentioned in changes made to a previous recommendation.*
- Do not include GPS addresses of sensitive or military identities and water utilities due to homeland security.
 - *Although the information is public information and can be obtained on the Internet, the latitude and longitude of sensitive sites has been removed from the appendices.*
- The Army Corps of Engineers should be more responsive to:
 - 1) 1-800 numbers are not accessible;
 - 2) No response to local concerns;
 - 3) Hill Side Road often closed (south of Sharpsville)
 - *Comments noted.*

Water Resources

- Source Water - All management recommendations should be ranked as “high” priority.
 - *After reviewing the original prioritizations two recommendations were raised to high priority, and two recommendations stayed at the medium priority level.*
- Wetlands need continuous study, identification.
 - *There is already a recommendation for this.*

Water Resources (continued)

- In the New Castle area, what impacts have economic development had on the historical loss of wetlands?
 - *Specific wetland loss data is currently not available; a recommendation will be added.*
- Erosion and sedimentation management recommendations should be a high priority. People don't realize that dirt can pollute.
 - *After reviewing the original prioritizations, only one recommendation was raised to a high priority.*
- Leave vegetation in its place.
 - *Comment noted.*
- Does the Army Corps of Engineers have control of a monitoring gauge at Nashaw Bridge? Is it functioning?
 - *Information about the gauge was added to the Water Resources chapter.*
- Include Act 167 in first management recommendation under Erosion and Sedimentation.
 - *Act 167 has been added to the recommendation.*
- Culverts under abandoned rail line on west side of river are plugged, causing flooding.
 - *A recommendation was added.*

Biological Resources

- USACE (acronym) is not identified in the chapter as the Army Corps of Engineering.
 - *Acronym identification was added.*
- Preserve Otter Creek Swamp. It is an IBA and massasaugua rattlesnakes reside there.
 - *A recommendation was added.*

Cultural Resources

- Add State Game Lands in Pulaski (downstream) to Table 5-3 on page 5-9. Additional acreage purchased by waterfowl USA to be attached to State Game Lands.
 - *The Pennsylvania Game Commission was contacted and they are currently unaware of the additional acreages of State Game Lands at this time.*
- Remove low head dam downstream of Pulaski to improve navigability.
 - *Recommendation was added.*
- More accessibility to rivers
 - *Recommendations to establish more accessibility to the river are located in the Cultural Resources Chapter.*

St. Phillip Social Hall – April 13, 2005

Project Area Characteristics

- Eliminate Tuttle Lake.
 - *Although it is listed as a town in the Pennsylvania Gazetteer, Tuttle Lake was removed from the maps because the local population does not recognize it as a town.*

Project Area Characteristics (continued)

- List Espyville on the maps (covered or not?)
 - *Espyville is identified in the Upper Shenango River Subwatershed maps for identification purposes. It is not identified on the entire watershed map, because individual towns are not included on that map, just boroughs and cities.*
- Establish a Shenango water trail or greenway plan for economic revitalization of downtown areas.
 - *A recommendation for water trails already exists.*
 - *A recommendation for a greenway plan was added.*
- Address hurricane damages; some portions of the rivers are inaccessible; it difficult to find people to clean up, and positive response is needed from municipalities.
 - *A recommendation was added.*
- Work more closely with and educate municipalities.
 - *A recommendation for this is already included in this chapter.*
- Watershed-level zoning – emphasize and encourage joint comprehensive plans – currently each township has each type of zoning – zone on a larger scale.
 - *A recommendation for this is already included in the Project Area Characteristics chapter.*

Land Resources

- Tuttle Lake is incorrect, it is actually Tuttle Point. Tuttle is the name of the family who owned the property before it was the state park.
 - *Although it is listed as a town in the Pennsylvania Gazetteer, Tuttle Lake was removed from the maps because the local population does not recognize it as a town.*
- List Espyville on the maps (covered or not?)
 - *Espyville is identified in the Upper Shenango River Subwatershed maps for identification purposes. It is not identified on the entire watershed map, because individual towns are not included on that map, just boroughs and cities.*
- Figures 2-3 and 2-7 show a tan color in the wetland area of Pymatuning Reservoir. What is the tan color? Should it be wetlands?
 - *Figure 2-3 discusses primary agricultural land and Pennsylvania important farmlands. The tan or gray colors are areas in the Upper Shenango River Subwatershed that are not prime agricultural lands or Pennsylvania important farmland.*
 - *Figure 2-7 was changed with updated land-use data from the Pennsylvania Department of Environmental Protection.*
- Why are the agricultural soils different from Ohio to Pennsylvania?
 - *The United States Geological Survey identifies prime agricultural soils during the preparation of the county soil survey, so each county can have different prime agricultural soils.*
- Prime agricultural soil maps vary considerably – review wetland areas.
 - *Because the agricultural soils are identified separately in each county, the maps are going to vary.*

Land Resources (continued)

- Figure 2-1 – No geology for Ashtabula.
 - *Geological data for Ashtabula County is currently not available.*
- Not enough crop rotation – poor farming practices (plant all in something – causes erosion).
 - *Recommendations to educate landowners about conservation practices are located in the Land Resources chapter.*

Water Resources

- Summerhill – Dirt and gravel roads sediment going into stream – gravel not of good quality and goes into the stream. Blacktop and seal to give base.
 - *Comment noted.*
- Dirt and gravel roads should be a high priority.
 - *After reviewing the original prioritizations, the recommendation will remain a medium priority.*
- Salt getting into streams from runoff.
 - *Comment noted.*
- Flooding on Conneaut Creek – trees blocking, creating floods.
 - *Conneaut Creek is not located in the watershed.*
- Pymatuning Laboratory of Ecology – fish-feeding study is interesting.
 - *Comment noted.*
- Management recommendations are good.
 - *Comment noted.*
- Is there any difference in the water quality from the Hartstown Marsh Swamp outlet down to the county line? What is the baseline of the stream?
 - *Recommendation added.*
- Will the “watershed” be defined as the entire Shenango watershed for pollution trading? North to South, Urban to Rural areas.
 - *Because pollution trading is currently in a pilot phase in the Chesapeake Bay watershed; the United States Environmental Protection Agency has yet to set trading zones.*

Biological Resources

- Add American lotus to Table 4-4.
 - *American lotus was not added to the table because it was an established table of common invasive species in Pennsylvania provided by the PA DCNR.*
- On page 4-11 add to the last paragraph about the impacts American lotus has on recreational areas, boating, fishing, others. TVA is having success controlling. Pymatuning State Park is currently trying to control.
 - *Impacts of the American lotus were added.*

Cultural Resources

- Establish a bike trail (and loop) around Linesville using abandoned rail lines and Pymatuning State Park.
 - *A recommendation was added.*
- Establish a network of trails linking to one another.
 - *This recommendation is already included in the Cultural Resources chapter.*
- The water trail idea is a great idea.
 - *Comment noted.*
- Canoeing access from the reservoir downstream; there is a problem with debris clogging the channel. Could create a trail if debris was removed to allow better river trail.
 - *A recommendation was added.*

Other Written Comments Received

Trumbull Soil and Water Conservation District, Ohio

- In Figure 1-2, the town of Coitsville is misspelled.
 - *Correction was made.*
- In Appendix I, the black bear was not mentioned under the mammal listing. I am pretty sure that there has been a harvest in Mercer County during hunting season. Pennsylvania Game Commission would have those figures in the Game News.
 - *Black bear was added.*
- In Appendix I, the big brown bat's scientific name was not in italics.
 - *Correction was made.*
- In Appendix J, the Brandy Springs Park in Mercer County also has baseball/softball fields, tennis court, pond, and gazebo.
 - *Corrections were made.*

Pennsylvania Department of Conservation and Natural Resources

- Where there any abandoned mines, quarries, or sinkholes?
 - *Appendix D has a listing of mines and quarries in the watershed.*
- What was the percentage of land that is private or public ownership?
 - *The percentages were added to the text.*
- Identify any group shelters, sports fields, and scenic vistas.
 - *They are already included and can be found in Appendix J.*
- Include a management recommendation that states that a biodiversity management plan be developed that includes restoration and maintenance of native species and elimination of invasive exotic plants within the study area.
 - *A recommendation was added.*

**Rachel Carson State Office Building
P. O. Box 8475, 6th Floor
Harrisburg, PA 17105-8475**

July 18, 2005

Bureau of Recreation and Conservation

(717) 783-8526

Mr. Mark Killar
Director of Watershed Services
Western Pennsylvania Conservancy
246 South Walnut Street
Blairsville, PA 15715

RE: Western Pennsylvania Conservancy (Multiple)
Shenango River Watershed Conservation Plan
BRC-RCP-8-25

Dear Mr. Killar:

We have reviewed the draft of the river conservation plan for the above referenced project as received by this office on April 4, 2005. The narrative report and the drawings were evaluated for the required minimum scope of work for Rivers Conservation Plans that are funded under the Keystone Community Grant Program. We are approving your plan contingent upon your addressing the following comments in finalizing the plan.

General:

The plan report and each must acknowledge Keystone funding by including the following citation on the plan's cover page:

This project was financed in part by a grant from the Keystone Recreation, Park and Conservation Fund under the administration of the Department of Conservation and Natural Resources, Bureau of Recreation and Conservation.

Narrative Report:

Land Resources:

Were there any abandoned mines, quarries or sinkholes?

What was the percentage of land that is private or public ownership?

Cultural Resources:

Identify any group shelters, sports fields and scenic vistas.

Management Recommendations:

We suggest including a management recommendation that states that a bio-diversity management plan be developed that includes restoration and maintenance of native species and elimination of invasive exotic plants within the study area.

Please review the above comments with your consultant and respond in writing and/or incorporate changes in the final draft of the plan.

In order to close out this grant project and for authorization of the final grant payment, the following items need to be submitted to the Bureau:

1. Three (3) copies of the final study report and one (1) PFD file on CD, along with verification that the Conservancy has received the required number of copies of the report and plan drawings.
2. Final Payment Request properly completed and signed. A copy of the form is enclosed. Copies of cancelled checks and invoices are required with this submission.
3. A letter from your consultant stating that the consultant contract has been paid in full.
4. A copy of a resolution passed and signed by the local governing body certifying that:
 - The project was completed in accordance with the grant contract;
 - All project expenditures have been made and were in accordance with the grant contract;
 - The River Conservation Plan and related materials are acceptable to the Conservancy; and,
 - The Conservancy will use the River Conservation Plan to guide future recreation, park, open space development, operations and maintenance.

A form of resolution is enclosed for your use. Attached are documents for the Pennsylvania Rivers Conservation Registry should you wish to apply.

Your cooperation on the above matters will be most appreciated. If you have any questions or comments on the above or as you continue with your project, please don't hesitate to contact me.

Sincerely,

M. Wesley Fahringer
Recreation and Park Advisor
Planning Projects Section
Grants Project Management Division

Enclosure(s)

cc: Mark Kulich, Regional Advisor

MWF:mwf