RESOLUTION

WHEREAS, the Stormwater Management Act 167 of 1978 provides for the regulation of land and water use for flood control and stormwater management, requires the Pennsylvania Department of Environmental Protection to designate watersheds, and provides for grants to be appropriated and administered by the Department for plan preparation and implementation costs, and provides that each county will prepare and adopt a watershed stormwater management plan for each designated watershed; and

WHEREAS, the Mercer County Commissioners entered into a grant contract with the Pennsylvania Department of Environmental Protection to develop the watershed stormwater management plan for Mercer County; and

WHEREAS, the purpose of the Mercer County Stormwater Management Plan is to protect public health and safety and to prevent or mitigate the adverse impacts related to the conveyance of excessive rates and volumes of stormwater runoff by providing for the management of stormwater runoff and control of erosion and sediment; and

WHEREAS, design criteria and standards of stormwater management systems and facilities within Mercer County shall utilize the criteria and standards as found in the watershed stormwater management plan;

NOW, THEREFORE, BE IT RESOLVED that the Mercer County Commissioners hereby adopt the Mercer County Stormwater Management plan , including all volumes, plates, and appendices, and forward the Plan to the Stormwater Planning and Management Department of the Pennsylvania Department of Environmental Protection for approval.

MERCER COUNTY COMMISSIONERS:

_____	_____
Mr. Brian Beader	Mr. Kenneth R. Ammann
_____	_____
Mr. John N. Lechner	Date

MERCER COUNTY
Act 167 Stormwater Management Plan

Prepared for the Mercer County Commissioners &
Pennsylvania Department of Environmental Protection

Prepared By:

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"Bridging the gap between engineering and ecology"

MCRPC Mercer County Regional Planning Commission

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Table of Contents

SECTION 1

1.0 INTRODUCTION

- 1.1 Stormwater
- 1.2 Stormwater Plan
- 1.3 Pennsylvania Stormwater Management Act (Act 167)
- 1.4 Benefits of Act 167 in Mercer County
- 1.5 Approach for the Development of the SWMP
- 1.6 Previous Plan Efforts

1.1 INTRODUCTION

1.2 Stormwater

Stormwater is part of a naturally occurring process called a "hydrologic cycle" - the endless circulation of water from bodies of water, the atmosphere and the earth's surface. Hydrology comes from the Latin words "hydro," meaning water, and "logia," meaning science of. For this purpose, the cycle will begin when precipitation falls on the surface of the earth. As precipitation falls, some of it will enter the soil by a process known as infiltration and some of it will evaporate into the atmosphere. The portion of precipitation that does not infiltrate or evaporate "runs off" to streams and/or rivers and is categorized as stormwater.

Inadequate management of accelerated runoff of stormwater resulting from development throughout a watershed increases flood flows and velocities, contributes to erosion and sedimentation overloads the carrying capacity of streams and storm sewers, greatly increases the cost of public facilities to manage and control stormwater, undermines flood plain management and flood control efforts in downstream communities, reduces groundwater recharge, and threatens public health and safety.

A comprehensive program of stormwater management, including reasonable regulation of development and activities causing accelerated runoff, is fundamental to the public health, safety and welfare, and to the protection of the people of the Commonwealth, their resources and the environment.

1.3 Stormwater Plan

This plan has been developed to meet the requirements of the Stormwater Management Act, P.L. 864, No. 167, October 4, 1978, herein referred to as Act 167. This is the initial plan prepared under said Act. Act 167 requires the county to review this plan at least every five (5) years to assess and evaluate the plan and to update the plan at the county's discretion when necessary.

It is the intent of this plan to recommend reasonable guidelines based on research and analysis for stormwater management, and to develop an ordinance based on this plan that will manage stormwater runoff as

close to the source as practical; thereby lessening the impact of stormwater runoff quantity, velocity and quality. This plan will also provide guidance for the conservation of valuable natural resources, including: wildlife habitat, water quality and supply, agricultural lands, wetlands, steep slopes, open space, riparian buffers and floodplains.

This plan can only be truly effective through advocacy and citizen involvement. For that reason, municipalities, government agencies and non-profit organizations were given the opportunity to identify problems in their communities. From this information, specific projects can be determined and corrective measures carried out.

As residential and commercial development increases within watersheds, the management of stormwater becomes an important element of project planning. The lack of stormwater management results in increased runoff, creating problems such as flooding, damage to properties, damage to roads, bridges, and culverts, reduced groundwater recharge, stream bank erosion and increased sediment pollution leading to a degradation of water quality effecting the stream's biological life. Left unchecked, conventional development has the potential to continue to degrade unprotected waters and lands of the Commonwealth. In recognition of the detrimental effects that increased stormwater runoff has within a watershed, the Pennsylvania legislature recognized the need to manage stormwater effectively and more efficiently and enacted Act 167.

1.4 Pennsylvania Stormwater Management Act (Act 167)

The Pennsylvania Stormwater Management Act requires counties to prepare stormwater management plans and submit them to DEP for approval. After the plans are approved by DEP, the Act requires municipalities to amend or adopt ordinances to implement the approved plans by regulating development within each municipality in a manner consistent with the approved plan and the Act.

Prior to adoption of the SWMP, each official planning agency and govern body of each municipality, the county planning commission and regional planning agencies were given the opportunity to provide input by answering questionnaires and/or by participation in sixteen (16) scheduled Watershed Plan Advisory Committee (WPAC) meetings conducted to listen, educate, discuss and document stormwater

related issues in the County. Based on this information, and on the research and limited analysis performed, a plan was developed, that incorporates sound engineering principles and Best Management Practices (BMP's), to protect the quality of Mercer County streams, while considering the various needs of the municipalities.

Preparation of the SWMP is facilitated by the Mercer County Regional Planning Commission (MCRPC). On August 21, 2007, the Pennsylvania DEP and Mercer County entered into an agreement for a Phase I Watershed Stormwater Management Plan Grant. Under this agreement, Mercer County was to prepare a SWMP in two phases: the first (Phase I) being the preparation and submission of a Scope of Study to the DEP for approval, and the second (Phase II) being the preparation and adoption of the plan. The Phase I agreement was terminated on June 30, 2008 and on July 23, 2008 a Phase II Scope of Study was approved. The Phase II agreement was executed on October 2, 2008.

On July 12, 2010, the SWMP was presented to the Mercer County Commissioners for adoption. Once adopted by the Commissioners, the SWMP will be submitted to DEP for review. Under Section 9(b) of Act 167, the DEP will have 90 days to review and approve the plan. In accordance with Section 11(b) of Act 167, municipalities will have six (6) months from the DEP's approval date to adopt or amend and implement such ordinances and regulations as are necessary to regulate development within the municipality in a manner consistent with the applicable SWMP and the provisions of Act 167. These regulations include: zoning, subdivision and land development, building code and erosion and sediment control ordinances. Failure of a municipality to implement these regulations will result in written notices of violation, and continued failure to comply could result in state funds being withheld from that municipality.

The model stormwater management ordinance (Appendix E) will outline the minimum requirements for future land development within the County. The groundwork for the creation of the SWMP included: background research on existing stormwater ordinances within the County, coordination with county, state, and federal agencies, technical analysis of streams and watersheds, and most importantly, the information provided by the individual municipalities. Input from

the municipalities provided important information in identifying and assessing the nature, cause, and severity of existing and potential stormwater runoff impacts within each watershed.

Each watershed stormwater plan shall include, but is not limited to:

1. a survey of existing runoff characteristics in small as well as large storms, including the impact of soils, slopes, vegetation and existing development; *(Section 2.7, Page 35; Section 2.8, Page 37; Section 2.9, Page 39)*
2. a survey of existing significant obstructions and their capacities; *(Appendix C)*
3. an assessment of projected and alternative land development patterns in the watershed, and the potential impact of runoff quantity, velocity and quality; *(Due to the abbreviated planning process imposed by DEP there was not sufficient time to complete this analysis.)*
4. an analysis of present and projected development in flood hazard areas, and its sensitivity to damages from future flooding or increased runoff; *(Due to the abbreviated planning process imposed by DEP there was not sufficient time to complete this analysis.)*
5. a survey of existing drainage problems and proposed solutions; *(Appendix C)*
6. a review of existing and proposed stormwater collection systems and their impacts; *(Appendix C)*
7. an assessment of alternative runoff control techniques and their efficiency in the particular watershed; *(Due to the abbreviated planning process imposed by DEP there was not sufficient time to complete this analysis.)*
8. an identification of existing and proposed State, Federal and local flood control projects located in the watershed and their design capacities; *(Due to the abbreviated planning process imposed by DEP there was not sufficient time to complete this analysis.)*
9. a designation of those areas to be served by stormwater collection and control facilities within a ten year period, an estimate of the design capacity and costs of such facilities, a schedule and proposed methods of financing the development, construction and operation of such facilities,

and an identification of the existing or proposed institutional arrangements to implement and operate the facilities; *(Due to the abbreviated planning process imposed by DEP there was not sufficient time to complete this analysis.)*

10. an identification of flood plains within the watershed; *(Section 2.11, Page 45)*
11. criteria and standards for the control of stormwater runoff from existing and new development which are necessary to minimize dangers to property and life and carry out the purposes of this act; *(Section 5.1, Page 104)*
12. priorities for implementation of action within each plan; *(Due to the abbreviated planning process imposed by DEP there was not sufficient time to complete this analysis.)* and
13. provisions for periodically reviewing, revising and updating the plan. *(Section 1.2, Page1)*

Each watershed storm water plan shall:

1. contain such provisions as are reasonably necessary to manage storm water such that development or activities in each municipality within the watershed do not adversely affect health, safety and property in other municipalities within the watershed and in basins to which the watershed is tributary; and

2. consider and be consistent with other existing municipal, county, regional and State environmental and land use plans.

1.5 Benefits of Act 167 in Mercer County

According to the Executive Summary of the *Shenango River Watershed Comprehensive Plan (July, 2005)*, "Stormwater runoff is a major concern within the Shenango River Watershed." As with other counties in Pennsylvania, Mercer County has geological, economical, and political conditions that are unique. The *Shenango River Watershed Comprehensive Plan* specifically states the need for the completion and implementation of the Act 167 SWMP and recommends that individual watersheds be inventoried to determine percent of

impervious cover and stormwater impacts. The *Mercer County Comprehensive Plan (April, 2006)* mentions that the county has not prepared a SWMP for any of its eight (8) major watersheds.

This plan promotes the stormwater management goals of the *Mercer County Comprehensive Plan* by managing development to minimize site disturbance and stormwater generation, to maximize infiltration (where appropriate) and to maintain water quality by working with municipalities to update stormwater management regulations that adequately address water quality as required by government agencies, encourage best management practices and innovative stormwater management techniques to minimize runoff from new land development; thereby reducing the potential for increased flooding and flood damage and minimize erosion potential from existing development and construction sites.

Currently, the municipalities in Mercer County vary in their implementation and enforcement of stormwater management regulations. The primary objective of the technical study and planning process is to develop a stormwater management ordinance to encourage and support the consistency of regulations throughout Mercer County. Due to the abbreviated planning process imposed by DEP, there was not sufficient time to conduct watershed modeling. The modeling would have provided municipalities, as well as public works officials, with a considerable amount of useful information that could have been utilized for planning and engineering purposes.

The Phase II SWMP will encourage local administration and management of stormwater consistent with the Commonwealth's duty as trustee of natural resources and the people's constitutional right to the preservation of natural, economic, scenic, aesthetic, recreational and historic values of the environment, and provide procedures to aid in the implementation of the model ordinance by each of the forty-eight (48) municipalities within the county

1.6 Development of the SWMP

The SWMP was developed in two phases. Phase I included background research, secondary source data collection and coordination with the municipalities to identify problematic areas. Phase I not only resulted

in the identification of problematic areas within the County, but also a technical analysis work plan for Phase II.

During Phase I, it was necessary to conduct comprehensive surveys of stormwater issues within all watersheds in Mercer County. A Watershed Plan Advisory Committee (WPAC) was initially formed of members from municipalities within Mercer County, the Mercer County Regional Planning Commission, the Mercer County Conservation District, interested state agencies, and interested non-profit watershed groups. During Phase I, an initial round meetings with the WPAC was held to determine support for the project. The Mercer County Regional Planning Commission and Wallace & Pancher, Inc. worked collaboratively to create the "Mercer County Watersheds Act 167 Stormwater Management Plan Questionnaire" (Appendix B, Figure 1.) This questionnaire was distributed at the first WPAC meeting and was mailed to any municipality that did not attend the first meeting. All municipalities and all interested agencies were asked to complete the questionnaire. The questionnaire assisted in the collection of information from the municipalities regarding their stormwater issues, and assisted in the establishment of the WPAC.

Of the forty-eight (48) municipalities in Mercer County, thirty-six (36) completed and returned their questionnaires. Additionally, five (5) agencies/groups returned questionnaires and offered to participate in the WPAC. The WPAC members will be asked to assist their municipality in the adoption of the final plan and the ordinances required by plan.

A second round of meetings was held to review the questionnaire results and to receive further input. Stormwater related problems, significant obstructions, watershed characteristics, and hydrological conditions were compiled from the questionnaires and meetings. It is from this data and input provided by the Mercer County Regional Planning Commission and Mercer County Conservation District that a Phase I Scope of Study was compiled and submitted to the DEP for review and comments, on July 23, 2008.

Phase II involves the creation of the model stormwater management ordinance incorporating the results of the technical analysis of the larger rivers within the County and of previously identified problematic

areas (e.g. street flooding, stream erosion, etc.). The DEP's "Index of Designated Watersheds" mistakenly omitted Slippery Rock Creek from the list of designated watersheds present ion Mercer County, thereby bringing the number of watersheds listed to eight (8). The technical analysis to be conducted in Phase II was also to include the hydraulic and hydrologic modeling of the aroremention ed watersheds within Mercer County, the development of criteria for stormwater management, and the identification of conceptual solutions to address specific stormwater problems identified during Phase I. However, due to the abbreviated planning process imposed by DEP there was not sufficient time to complete a comprehensive technical analysis.

Objectively prioritizing watersheds to determine stormwater impacts presents a number of challenges. Certain areas are ultimately given greater attention and scrutiny than others — particularly those near significant communities of people. Furthermore, annual and seasonal fluctuations in water quality and quantity complicate the process of assigning precise rankings. Nevertheless the need to rank watersheds for stormwater management is attempted based on the total length of stream impairments within a given watershed.

The following list of the eight (8) major watersheds designated by DEP within Mercer County is prioritized for future consideration:

1. Shenango River
2. Wolf Creek
3. Neshannock Creek
4. Sandy Creek
5. Little Shanango River
6. French Creek
7. Little Neshannock Creek
8. Slippery Rock Creek

1.7 Previous Plan Efforts

No previous Act 167 Plans have been prepared for Mercer County. The following relevant documents were utilized in the preparation of the plan:

Mercer County Comprehensive Plan, (April, 2006)

In 1995/1996 the Mercer County Regional Planning Commission prepared the Mercer County Comprehensive Plan, Planning for Livable Communities. Its theme was: making Mercer County communities a better place to live, work and play. This 2006 Mercer County Comprehensive Plan is an update to the 1995/96 Comprehensive Plan and recognizes that much has occurred in the intervening 10 years. The 2000 Census data is now available, major changes were made to the Pennsylvania Municipalities Planning Code in 2000, and much progress has occurred in Mercer County.

This Updated Comprehensive Plan renews the vision for Mercer County, a vision that integrates the rural character with sound community development, a healthy economy, and coordinated public and private resource management to sustain and enhance our quality of life.

The Comprehensive Plan has incorporated many innovative techniques during the plan development process. Community indicators have been used to measure the community health and well being. Public involvement sessions have identified and prioritized community planning concerns and issues, as well as an updated vision for the future. The plan also incorporates a new Long Range Transportation Plan for Mercer County, as well as a Target Location Assessment for identifying potential economic development sites in Mercer County.

Shenango River Watershed Comprehensive Plan (Revised: July, 2005)

Watershed or River Conservation Plans are comprehensive plans that study natural, recreational and historical resources of a particular watershed or stream corridor. The plans are typically funded by grants from the Pennsylvania Department of Conservation and Natural Resources' Community Conservation Partnership Program (DCNR C2P2). Watershed Conservation Plans are locally prepared and incorporate a strong community participation element. They compile broad-based data about the watershed to include a wide range of interest including socio-economics and identify future projects to assess, protect and remediate its resources. Once completed,

additional funding opportunities become available to implement projects identified in the plans.

The Shenango River Watershed Comprehensive Plan documents current conditions and identifies additional initiatives aimed at improving the livability and attractiveness of the Shenango River watershed region. The watershed community was involved in the development of the vision for the watershed and provided input through public meetings, interviews and surveys. Stakeholders identified resources needing restoration, protection, conservation and/or preservation and incorporated important issues into the plan. The plan presents a strategy to make the vision for the watershed a reality. Practical solutions and action steps are suggested and resources to support implementation are identified.

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 and should be used for growth planning.

Eight Headwaters Watershed Assessment & Protection Plan in Hermitage (August, 2004)

Concerns about the state of surface water quality within the City of Hermitage led the City to seek funding for a study to assess the status of eight (8) headwater streams that flow within the City, and develop plans for restoring and maintaining these streams. Major funding for this project was provided through a Growing Greener grant provided by the Pennsylvania Department of Environmental Protection. The Steering Committee for this plan included City staff, staff from local and state agencies, local professionals and concerned individuals who came together to begin examining water quality and land use.

This plan provides the City of Hermitage with a comprehensive watershed assessment and protection plan, intended to form the basis for developing tools that will allow the City to properly manage, improve and protect its streams and water quality. The eight (8) headwater streams have all been affected by various land use practices. The assessment and protection plan is intended to help manage current and future land use in order to protect water quality.

Natural Heritage Inventory (June, 2003)

The Pennsylvania Natural Heritage Program (PNHP) is a partnership between The Department of Conservation and Natural Resources, the Western Pennsylvania Conservancy, the Pennsylvania Game Commission and the Pennsylvania Fish and Boat Commission. County Natural Heritage Inventories showcase Western Pennsylvania Conservancy's conservation science efforts by combining and presenting information on unique plants, animals, natural ecological communities, and other important natural resources in Pennsylvania. These projects identify, map and discuss important places within a county, prioritize them based upon their attributes, and provide recommendations regarding their management and protection.

County inventories are designed to inform the residents of a county about their living heritage and give them a tool to use in planning the future of their communities. County and municipal planners; federal, state and local agencies; businesses; environmental consultants; developers; local conservation organizations; and many other people and groups use these studies to help make land-use decisions within their counties. With increasing emphasis on planning within the state, these studies will become more and more important for considering the resources of the commonwealth wisely and comprehensively.

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

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

Greener Visions, Making Smart Growth Options Work in Mercer County (June, 2006)

The project provides education and sample conservation ordinances that can be used by municipalities and developers to provide alternatives to traditional residential developments. The project found that Mercer County will be facing a demographic crisis, having a smaller population than it did in 1960. The median age of a County resident is over four (4) years older than the median age for an American. The project results suggested that for the County to grow and thrive it will need to attract new residents by marketing its many attributes and by providing housing choices that appeal to today's homebuyers such as proximity to highway access, walking/bike trails, sidewalks on both sides of the street and parks/playgrounds.

Mercer County can recognize the need to attract new development by promoting the expansion of choices for housing and residential land development within the County through the Greener Visions initiative. Greener Visions promotes the use of new planning tools enabled by the PA Municipalities Planning Code and the creation of new design standards. These new tools and concepts include: 1) Planned Residential Developments; 2) Rural Conservation Subdivisions; and 3) Traditional Neighborhood Developments. These tools could be a development option in a Mercer County community if the community adopts one of the new model development ordinances that have been prepared as part of the Greener Visions Initiative.

MCRPC can work with local planning commissions and elected officials to examine how these new tools could work in their municipality. By adopting one or more of these tools, you will be providing your community with choices to meet the needs of future homebuyers. If you do not make use of these tools, developers who wish to build in your community may be forced to build conventional subdivisions that are land consumptive, automobile dependent and at odds with community character.

Current Municipal Ordinances

Current municipal ordinances provide for the harmonious, orderly, efficient and integrated development of the municipality and to promote the sound layout and design for subdivisions and land developments. A summary of the current municipal ordinances is further defined in 2.1 Political Jurisdictions.

SECTION 2

2.0 GENERAL DESCRIPTION OF COUNTY

2.1 Political Jurisdictions
2.2 Transportation
2.3 General Development Patterns
2.4 Water Resources
2.5 Climate
2.6 Bedrock Formations
2.7 Slopes
2.8 Prime Farmlands
2.9 Soils
2.10 Wetlands
2.11 Floodplains
2.12 Vegetation and Wildlife
2.13 Forestry
2.14 Mining
2.15 Oil and Gas
2.16 Obstructions
2.17 Mapping

2.0 GENERAL DESCRIPTION OF COUNTY

2.1 Political Jurisdictions

Mercer County is a 5th class county with an elected 3-member Board of Commissioners. The Mercer County seat lies in the Borough of Mercer, located in the south-central portion of the County. Mercer County contains forty-eight (48) municipalities, including thirty-two (32) Townships, thirteen (13) Boroughs, and three (3) Cities (Table 1). It is ranked 29th in the state in total population, having a population of 120,293 persons according to the 2000 Census. According to the *Mercer County Comprehensive Plan* the county saw a population decrease of 0.6% between 1990 and 2000.

As Table 1 indicates, a majority (30 of 48) of the municipalities have adopted or are in the process of completing a municipal or multi-municipal comprehensive plan. In addition to these localized comprehensive plans, the Mercer County Commissioners adopted the latest update to the county comprehensive plan in 2006.

Similarly, 30 of the 48 municipalities in the county have adopted zoning ordinances. While only 25% of Mercer County municipalities administer their own Subdivision and Land Development Ordinance (SALDO), the remainders are covered by the Mercer County SALDO.

A number of municipalities administer provisions or separate ordinances regarding specific stormwater issues including floodplains, stormwater, erosion or drainage. Eighteen (18) municipalities have floodplain regulations, eleven (11) stormwater, four (4) erosion and sediment control and nine (9) address the issues of drainage (Table 1). Additionally, every municipality in Mercer County has had flood boundary and floodway mapping completed through FEMA. Following the completion and adoption of the stormwater management plan, all Mercer County municipalities will be covered by stormwater management planning.

Table 1. Municipal Comprehensive Plans

CURRENT PLANS as of 2010 MUNICIPALITY	* LOCAL COMPREHENSIVE PLANS	LAND DEVELOPMENT ORDINANCE	ZONING	OTHER REGULATIONS / ORDINANCES			
				FLOODPLAIN	STORM	**EROSION	DRAINAGE
CLARK BOROUGH	X	X	X	X			
COOLSPRING TOWNSHIP	X		X	X			
DEER CREEK TOWNSHIP							
DELAWARE TOWNSHIP							
EAST LACKAWANNOCK TOWNSHIP	X		X	X			
FAIRVIEW TOWNSHIP							
CITY OF FARRELL	X	X	X	X			
FINDLEY TOWNSHIP	X		X	X			X
FREDONIA BOROUGH							
FRENCH CREEK TOWNSHIP				X			
GREENE TOWNSHIP							
GREENVILLE BOROUGH	X		X	X			X
GROVE CITY BOROUGH	X	X	X	X			
HEMPFIELD TOWNSHIP	X		X				
CITY OF HERMITAGE	X	X	X	X	X		X
JACKSON CENTER BOROUGH	x		X				
JACKSON TOWNSHIP	X		X				
JAMESTOWN BOROUGH	X		X				
JEFFERSON TOWNSHIP	X	X	X				
LACKAWANNOCK TOWNSHIP				X			
LAKE TOWNSHIP	x						
LIBERTY TOWNSHIP	X		X	X			
MERCER BOROUGH	X	X	X	X	X	X	
MILL CREEK TOWNSHIP							
NEW LEBANON BOROUGH			X				X
NEW VERNON TOWNSHIP	X		X	X			
OTTER CREEK TOWNSHIP			X				
PERRY TOWNSHIP							

CURRENT PLANS as of 2010 MUNICIPALITY	* LOCAL COMPREHENSIVE PLANS	LAND DEVELOPMENT ORDINANCE	ZONING	OTHER REGULATIONS / ORDINANCES			
				FLOODPLAIN	STORM	**EROSION	DRAINAGE
PINE TOWNSHIP	X		X	X	X		X
PYMATUNING TOWNSHIP			X				
SALEM TOWNSHIP							
SANDY CREEK TOWNSHIP							
SANDY LAKE BOROUGH	X		X		X		
SANDY LAKE TOWNSHIP	X						
CITY OF SHARON	X	X	X	X	X		X
SHARPSVILLE BOROUGH	X	X	X				
SHEAKLEYVILLE BOROUGH							
SHENANGO TOWNSHIP	X		X		X		
SOUTH PYMATUNING TOWNSHIP	X	X	X	X	X	X	X
SPRINGFIELD TOWNSHIP	X	X	X	X	X	X	
STONEBORO BOROUGH	X		X				X
SUGAR GROVE TOWNSHIP							
WEST MIDDLESEX BOROUGH	X	X	X	X			
WEST SALEM TOWNSHIP							
WHEATLAND BOROUGH	X	X	X	X			
WILMINGTON TOWNSHIP	x		X	X	X		X
WOLF CREEK TOWNSHIP	X		X	X			
WORTH TOWNSHIP	x						

*** ALL MUNICIPALITIES ARE ALSO COVERED BY THE MERCER COUNTY COMPREHENSIVE PLAN IN ADDITION TO ANY LOCAL COOPERATIVE PLANNING.**

 # THE MERCER COUNTY SUBDIVISION AND LAND DEVELOPMENT ORDINANCE (SALDO) IS A REQUIREMENT IN ANY MUNICIPALITY WITHOUT A LOCAL SALDO.

****** EROSION & SEDIMENTATION CONTROL IS PRIMARILY CONCERNED WITH EROSION AND STABILIZATION OF A SITE DUE TO CONSTRUCTION ACTIVITY. IT IS ADMINISTERED BY THE MERCER COUNTY CONSERVATION DISTRICT AND IS SEPARATE REGULATION FROM THE PERMANENT STORMWATER MANAGEMENT REQUIREMENTS.

2.2 Transportation

The transportation system within Mercer County includes highways, rail service, public transportation and hiking trails. According to the *Mercer County Comprehensive Plan*, the following roadways in Mercer County are included in the National Highway System (NHS): I-79, I-80, I-376 US 322, US 62, PA 18, and PA 58. The primary east-west highway across the United States, I-80, passes through the southern portion of the county, and the primary north-south connector between Erie and Pittsburgh, I-79, passes through the eastern portion of the county. Mercer County also has several important Minor Arterials that connect the economic and population centers to each other and to surrounding areas, including: PA 18, US 19, PA 58, US 62, PA 173, PA 208, and PA 358. Other highways, PA 418, PA 518, PA 718, and PA 846, in Mercer County function primarily as connectors within the economic activity centers.

Air transportation within Mercer County consists only of privately owned facilities: West Middlesex Airport, Greenville Municipal Airport, Grove City Airport, and Merry's Pymatuning Airport. There is no commercial air service located within the county.

Mercer County's well-developed railroad infrastructure provides an economical, efficient and environmentally-friendly transportation alternative for freight shippers and receivers. Canadian National Railway, Norfolk Southern Railway, CSX Transportation, and the Western New York and Pennsylvania Railroad operate routes within the County providing a high-capacity supply chain and distribution network for commerce to and from points spanning North America. The county's robust rail freight network routinely handles multiple, 100-ton carload shipments in trains of 100 and more cars, but also handles individual shipments that weigh more than one million pounds on a single railcar.

Although the Shenango River is considered a navigable waterway (as defined by United States Army Corps of Engineers, Section 10 of the 1899 Rivers and Harbors Act and Section 404 of the Clean Water Act), it is not used for commerce. According to the *Shenango River*

Watershed Comprehensive Plan, current plans exist to develop the entire Shenango River into a water trail, increasing its recreational value. This water trail would provide access to several communities within Mercer County and outside of county borders. River access points are proposed at the Village of Pulaski, and at other locations in Neshannock, Pulaski, Taylor, and Wayne Townships; Wampum and New Beaver Boroughs; and the City of New Castle. Several possibilities exist for development of access points on the water trail in the near future. Additionally, the Greenways Plan recommends that the County consider further research into the feasibility of developing boat launches. This plan recognizes the importance of the Shenango River and its contributing watershed as home to several rare, threatened and endangered species and provides guidelines to manage the effects of erosion and sedimentation and nutrient loading, and the illicit discharge of on-lot septic and sewages systems by implementing BMP's.

Hiking trails within the County include several Rail-to-Trail projects, specifically in the north and in the Shenango Valley. The Mercer County Trails Association, Inc. was formed with the primary purpose of developing and maintaining multipurpose trails in the County for public use. Trout Island and Shenango Rivers Trails are ongoing projects to achieve these goals. In keeping with these goals and objectives this plan will:

- Promote health and fitness by providing a safe and pleasant setting for many recreational activities including biking, jogging, walking, cross-country skiing, in-line skating, and by providing wheelchair accessibility,
- Encourage tourism and contribute to the economic vitality of our communities, and
- Help protect our environment and natural resources by making transportation links in our area that are not dependent on the automobile.

2.3 General Development Patterns

The *Mercer County Comprehensive Plan* suggests that there has been a noted population shift between the municipalities in Mercer County. In general, the municipalities with the highest population growth are in the rural areas in the eastern portion of the county. The municipalities

with the highest population loss are in or adjacent to the Shenango Valley region, comprised of the Cities of Farrell, Hermitage, and Sharon, the Boroughs of Clark, Sharpsville, West Middlesex, and Wheatland, and the Townships of Lackawannock, Shenango, and South Pymatuning. Combined, the housing units in the Shenango Valley make up approximately 48% of the County's total housing stock. Due to the close proximity to major transportation routes, the majority of industrial and commercial growth takes place in this area.

The rural areas in the county are experiencing the highest rate of residential growth. Overall, the trend in Mercer County is decreasing amounts of farmland, and more land being converted from farmland to forest lands or to residential lots.

The model storm water management ordinance will help to protect the rural areas from the unregulated development that has taken place in the past by recommending methods for low impact development and the implementation of non-structurals BMP's.

Table 2 indicates the trends in commercial, industrial and residential sprawl throughout the county with respect to employment, income and sales.

Table 2. Land Use Indicators *(Mercer County Comprehensive Plan)*

Dates	Plan Indicators	Percent Change
1973 - 1993	Non-Agricultural Employment	+2%
	Annual Incomes	-7%
	Retail Sales	-4%
	Commercial Land Development Sprawl	+33%
	Industrial Land Development Sprawl	+24%

	Residential Land Development Sprawl	+46%
1970 - 2000	Population	-5.4%

According to the Penn-Northwest Development Corporation, there are 196 acres of available land within the active and proposed industrial parks within Mercer County.

2.4 Water Resources

Mercer County lies within the Ohio River Basin (ORB), Figure 1, Page 20. The ORB extends from southwest New York through Pennsylvania, West Virginia, Ohio, Indiana, Kentucky and Illinois with a total population of 25 million (approximately 10% of the United States population). For Act 167 Stormwater Management Planning purposes, DEP has identified eight (8) major watersheds within the Mercer County area. Table 3 identifies those watersheds and the approximate acreage of each within the County. It is relevant to note, there is a small portion of the Slippery Rock Creek Watershed located in Mercer County, however, it is not identified as a designated watershed by DEP.

Water is a tremendously valuable natural resource that is often taken for granted. The County's streams, rivers and lakes face increasing demands for commercial and recreational uses. Pollutants from vehicles (oil, gas, antifreeze, heavy metals, salt and liter), homes and businesses (fertilizers, pesticides, animal waste, yard waste, chemicals, trash and debris), and construction sites (soil sediment, trash and debris) are washed into the drainage system during storm events and consequently enters our streams and rivers. This changes the physical, biological and chemical composition of the water resulting in an unhealthy environment for aquatic organisms, wildlife and humans.

By requiring riparian buffer zones around streams and rivers water quality is protected when development occurs nearby. The model stormwater ordinance contains a section on riparian buffers, although

optional it is strongly recommended that this section be adopted in conjunction with the model storm water ordinance.

Figure 1. Ohio River Basin

Table 3. Acreage of Watershed within County

WATERSHED	ACREAGE
French Creek	21,409 acres
Sandy Creek	50,772 acres
Wolf Creek	50,078 acres
Shenango River	144,500 acres
Neshannock Creek	92,815 acres
Little Neshannock	26,768 acres
Little Shenango River	47,309 acres
Slippery Rock Creek	2,892 acres

The municipalities and the watersheds associated with those municipalities are summarized in Table 4.

Table 4. Municipalities and Watershed Locations

MUNICIPALITY	WATERSHED
City of Farrell	Shenango River (all)
City of Hermitage	Little Neshannock Creek, Shenango River
City of Sharon	Shenango River (all)
Clark Borough	Shenango River (all)
Fredonia Borough	Neshannock Creek (all)
Greenville Borough	Little Shenango River, Shenango River
Grove City Borough	Wolf Creek (all)
Jackson Center Borough	Neshannock Creek (all)
Jamestown Borough	Shenango River (all)

Mercer Borough	Neshannock Creek (all)
New Lebanon Borough	French Creek (all)
Sandy Lake Borough	Sandy Creek (all)
Sharpsville Borough	Shenango River (all)
Shealleyville Borough	Sandy Creek (all)
Stoneboro Borough	Sandy Creek (all)
West Middlesex Borough	Shenango River (all)
Wheatland Borough	Shenango River (all)
Coolspring Township	Neshannock Creek (all)
Deer Creek Township	French Creek, Sandy Creek
Delaware Township	Neshannock Creek, Shenango River
East Lackawannock Township	Neshannock Creek, Little Neshannock Creek, Shenango River
Fairview Township	Neshannock Creek, Little Shenango River
Findley Township	Neshannock Creek (all)
French Creek Township	French Creek
Green Township	Little Shenango River, Shenango River
Hempfield Township	Little Shenango River, Shenango River
Jackson Township	Neshannock Creek (all)
Jefferson Township	Neshannock Creek, Little Neshannock Creek, Shenango River
Lackawannock Township	Little Neshannock Creek, Shenango River
Liberty Township	Wolf Creek, Slippery Rock Creek
Lake Township	Neshannock Creek, Little Shenango River
Mill Creek Township	French Creek
New Vernon Township	Sandy Creek, Little Shenango River
Otter Creek Township	Neshannock Creek, Little Shenango River
Perry Township	Neshannock Creek, Little Shenango River
Pymatuning Township	Shenango River (all)

Pine Township	Wolf Creek (all)
Salem Township	Sandy Creek, Little Shenango River
Sandy Creek Township	Sandy Creek, Little Shenango River
Sandy Lake Township	Sandy Creek (all)
Shenango Township	Little Neshannock Creek, Shenango River
South Pymatuning Township	Shenango River (all)
Springfield Township	Wolf Creek, Slippery Rock Creek, Neshannock Creek
Sugar Grove Township	Little Shenango River (all)
West Salem Township	Shenango River (all)
Wilmington Township	Neshannock Creek, Little Neshannock Creek, Shenango River
Wolf Creek Township	Wolf Creek, Neshannock Creek
Worth Township	Sandy Creek, Wolf Creek, Neshannock Creek

Figure 2, Page 25, presents the watershed designations and municipal boundaries within Mercer County. The French Creek and Sandy Creek watersheds are located in the northeast portion of the county and drain into the Allegheny River Basin. The Neshannock Creek and Little Neshannock Creek watersheds drain into the Beaver River, a tributary to the Ohio River. The Wolf Creek watershed drains into Slippery Rock Creek which flows into the Beaver River. The Little Shenango River watershed drains into the Shenango River; it merges with the Beaver River to form the Mahoning River, which in turn flows into the Ohio River. The major streams and lakes within Mercer County are presented in Figure 3, Page 26.

The Shenango River runs from north to south through the western part of the County and is the County's major river. The river originates at the Pymatuning Reservoir approximately 1.5 miles north of Jamestown, Pennsylvania and flows south into Mercer County. In 1965, the Army Corps of Engineers completed The Shenango River Lake Project, a dam providing flood protection for the Shenango River Valley, as well as for the Beaver and upper Ohio Rivers. The project

also provides seasonal discharge regulation for water quality improvement and recreational opportunities. According to the US Army Corps of Engineers, the Shenango Lake encompasses 15,071 acres with a drainage area of 589 square miles. As stated earlier, the Shenango River is considered to be a navigable waterway, but it is not currently used for commerce. However, in the 1860's, the Shenango River was utilized as part of the Erie Canal.

Aside from the Shenango River Lake, other significant lakes within Mercer County include Lake Wilhelm, a 1,860 acre lake within Goddard State Park, north of Sandy Lake Borough; Stoneboro Lake, a private 150 acre lake located in Stoneboro; and Lake Latonka, a private lake located along the border of Coolspring Township and Jackson Township.

Figure 2. Watershed Designations and Municipal Boundaries

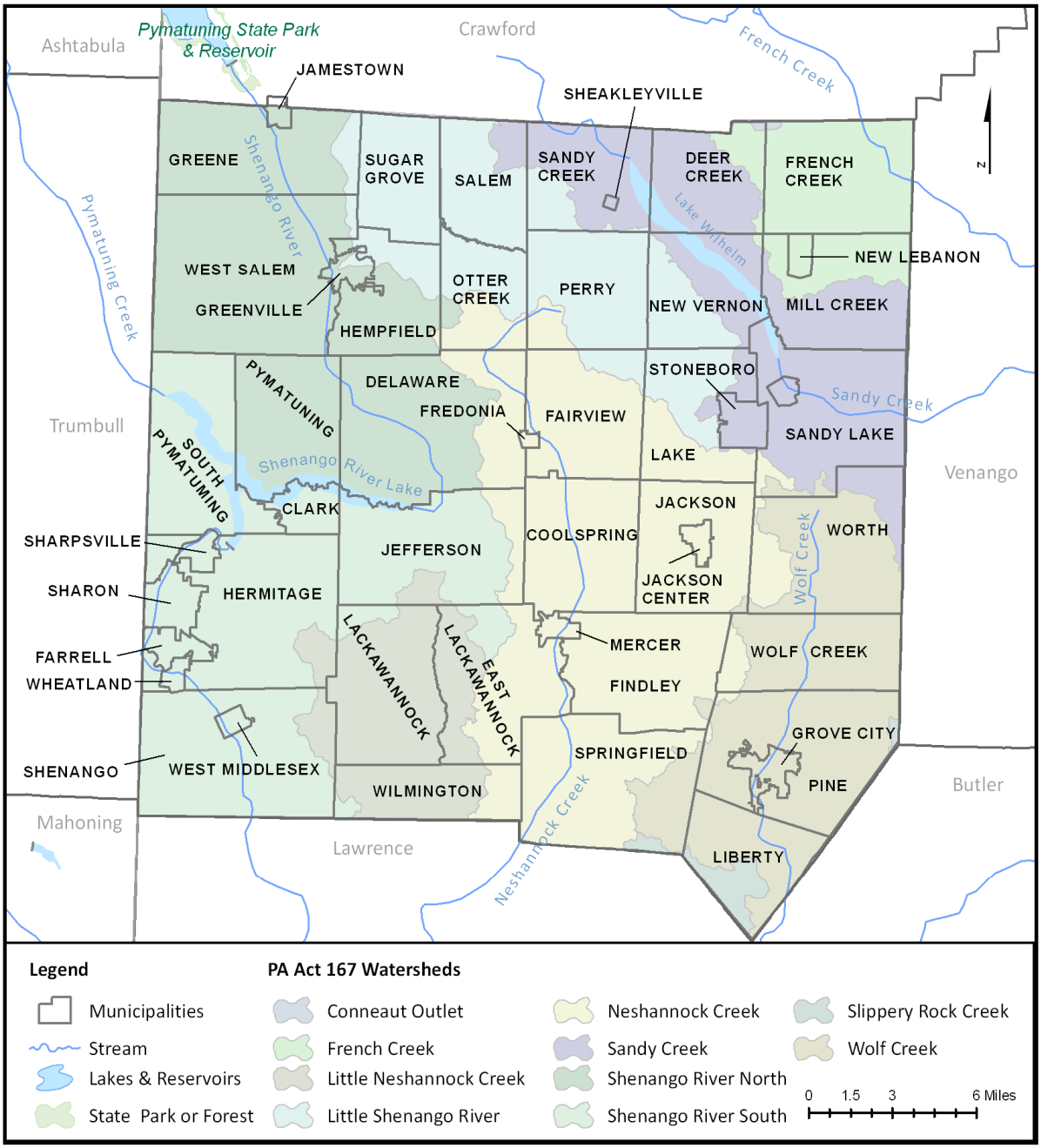
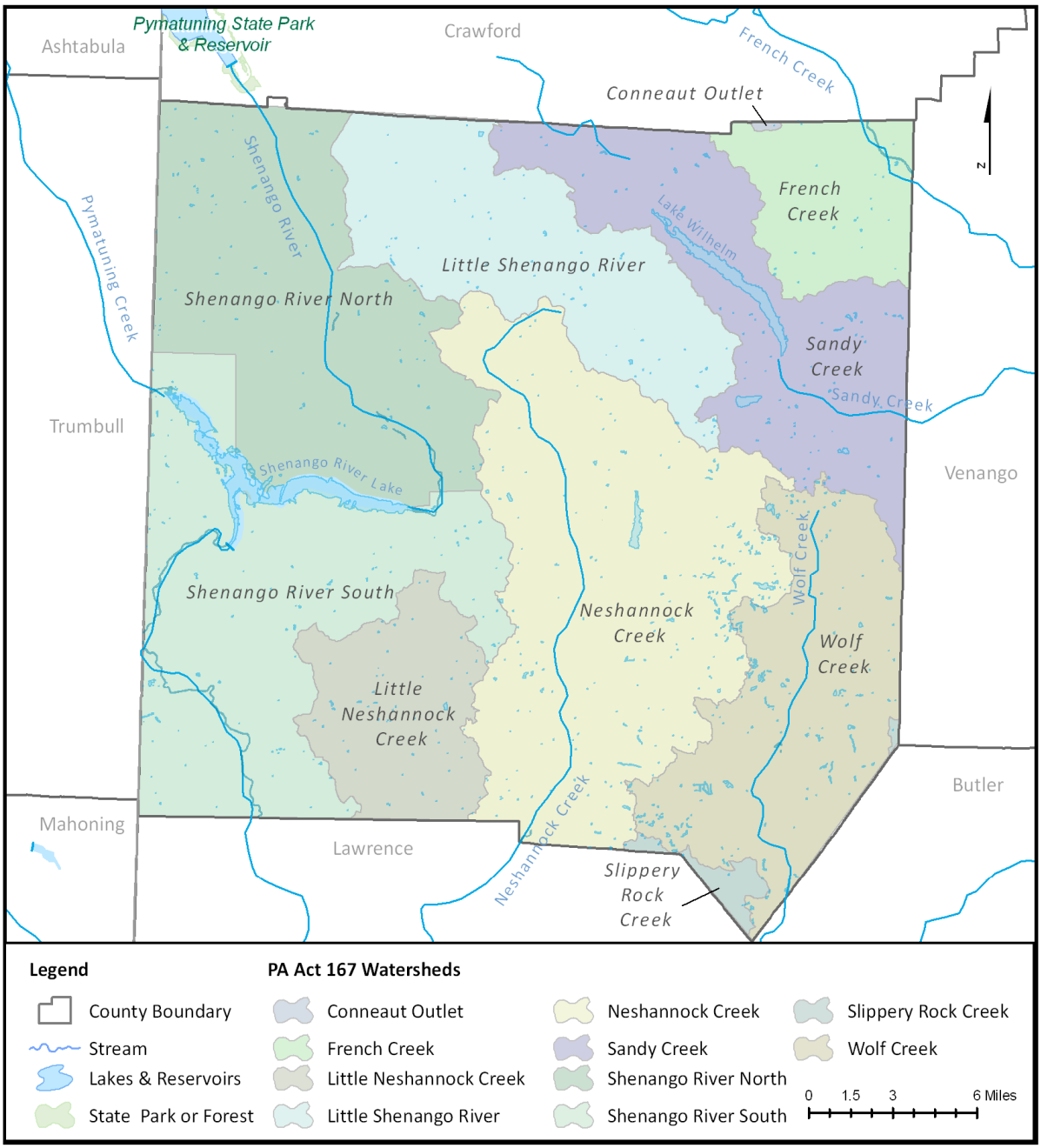


Figure 3. Major Streams and Lakes



According to the Pennsylvania Chapter 93 Water Quality Standards, the majority of the streams and rivers in Mercer County are designated as Warm Water Fishes (WWF). The Table 5 lists the water quality designation and description of Mercer County streams.

Table 5. Pennsylvania Chapter 93, Water Quality Standards

Water Classification	Description	Location
Special Protection Waters	Water bodies with exceptional water quality and environmental features.	Little Sandy Creek in Mill Creek Township
(WWF) Warm Water Fishes	Maintenance and propagation of fish species and additional flora and fauna which are indigenous to a warm water habitat.	Most streams in Mercer County fall in this category. Including the remainder of the Shenango River main stem.
(TSF) Trout Stocking	Maintenance of stocked trout from February 15 to July 31 and maintenance and propagation of fish species and additional flora and fauna which are indigenous to a warm water habitat.	Neshannock Creek basin, Lackawannock Creek, The Little Shenango River basin, and a segment of the Shenango River in Sharpsville from the reservoir dam to 1.0 river mile downstream.
(CWF) Cold Water Fishes	Maintenance or propagation, or both, of fish species including the family Salmonidae and additional flora and fauna which are indigenous to a cold water habitat.	Wolf Creek and the previously discussed segment of the Shenango River in Sharpsville .

The County has 1,135 miles of streams of which 67 miles (6%) are impaired (Figure 4, Page 30), meaning they fail to meet the water quality standards for their designated use or special protection classification. Table 6 lists the stream reaches considered impaired:

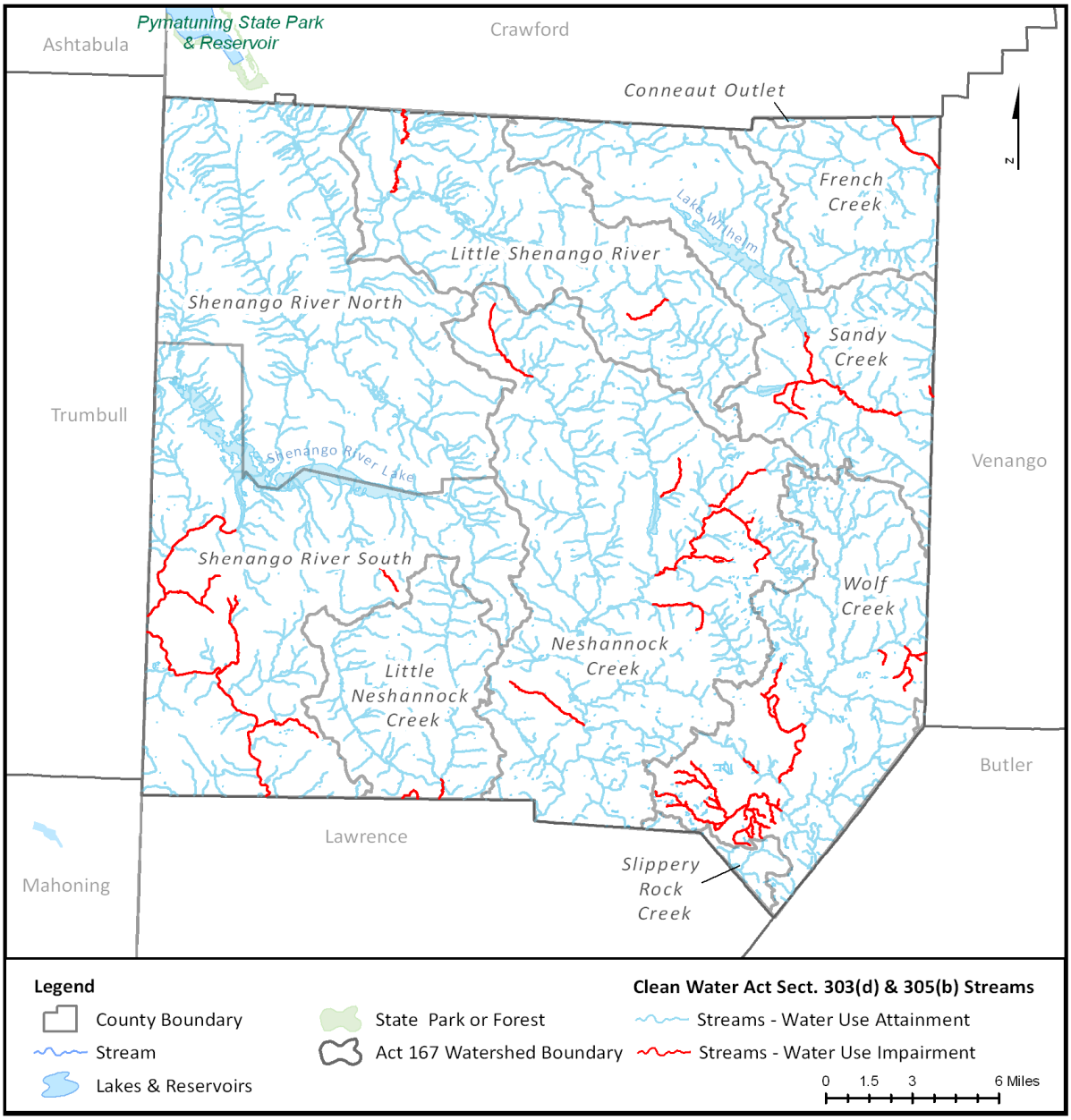
Table 6. Stream Impairments

River System	PA Code	Impairment(s)	Source
Shenango River	PA20A35482_970729_1345_JJM	Organic Enrichment, Oxygen Depletion	Hydromodification
Crooked Creek	PA20A36175_970721_0930_JJM	Organic Enrichment, Sediment, Oxygen Depletion	Hydromodification
Otter Creek	PA20A35679_970908_1130_JJM	Nutrients, Organic Enrichment, Oxygen Depletion	Agriculture, Natural Sources
Shenango River	PA20A35482_971009_0930_JJM	Nutrients	Hydromodification
Magargee Run	PA20A36056_980112_1030_JJM	Nutrients	Unknown
Fox Run	PA20A35793_970911_1145_JJM	Metals (other than mercury), Organic Enrichment, Oxygen Depletion	Abandoned Mine Drainage, Natural Sources
Yellow Creek	PA20A35778_970910_1330_JJM	Metals (other than mercury)	Abandoned Mine Drainage
Mill Creek	PA20A35754_970916_1230_JJM	Metals (other than mercury)	Unknown
Shenango River	PA20A35482_990625_1515_JJM	Metals (other than mercury), Nutrients	Unknown
Bobby Run	PA20A35940_970819_1220_JJM	Nutrients	Other

Shenango River	PA20A35482_990513_1345_JJM	Metals (other than mercury), Nutrients	Hydromodification

There are approximately 1,900 acres of developed land that fall within the 100 year floodplains of Mercer County's waterways. This represents approximately 7% of the total floodplain acreage and only 0.4% of the total land in the County.

Figure 4. Impaired Streams



2.5 Climate

Mercer County is situated in the Allegheny Plateau Climatic Division of Pennsylvania. The Allegheny Plateau has a continental climate, with changeable temperatures and more frequent precipitation than other parts of Pennsylvania. Mercer County generally has a humid climate and occasionally, winter minimum temperatures can be severe. Winter precipitation is usually three (3) to four (4) inches less than summer rainfall and is produced most frequently from northeastward-moving storms. When temperatures are low enough, these storms cause heavy snowfalls which may be twenty (20) inches or greater. Total precipitation ranges from 32"–47" annually. Heavy thunderstorm rains can cause severe flash flooding in many areas. Generally, the most widespread flooding occurs during the winter and spring with heavy rains, or heavy rains combined with snowmelt. The prevailing westerly winds carry most of the weather disturbances that affect Mercer County from the interior of the continent. Thunderstorms are concentrated in the warm months and are responsible for most of the summertime rainfall which can produce significant runoff events. (Penn State University, Department of Meteorology and Atmospheric Science).

2.6 Bedrock Geology

Almost one-half (50 percent) of the County is underlain by the Pottsville Formation or subsurface geologic formations. The Shenango Formation and the Cuyahoga Group are closely associated and are generally found in the northwestern part of the County. Together, they cover 35% of the County (Figure 5, Page 32). Karst is a type of topography formed when limestone, dolomite or gypsum dissolves, leaving sinkholes and caves. When rain falls onto a karst terrain the water becomes slightly acidic as it flows through the overlying soils. This water, when it encounters the alkaline bedrock below, slowly begins to dissolve that rock. Karst is typified by sinkholes, sinking streams, a lack of surface streams, large springs, caves, and underground streams. The potential for this formation exists in the southeastern corner of the County as shown in Figure 6, Page 33.

Figure 5. Bedrock Geology

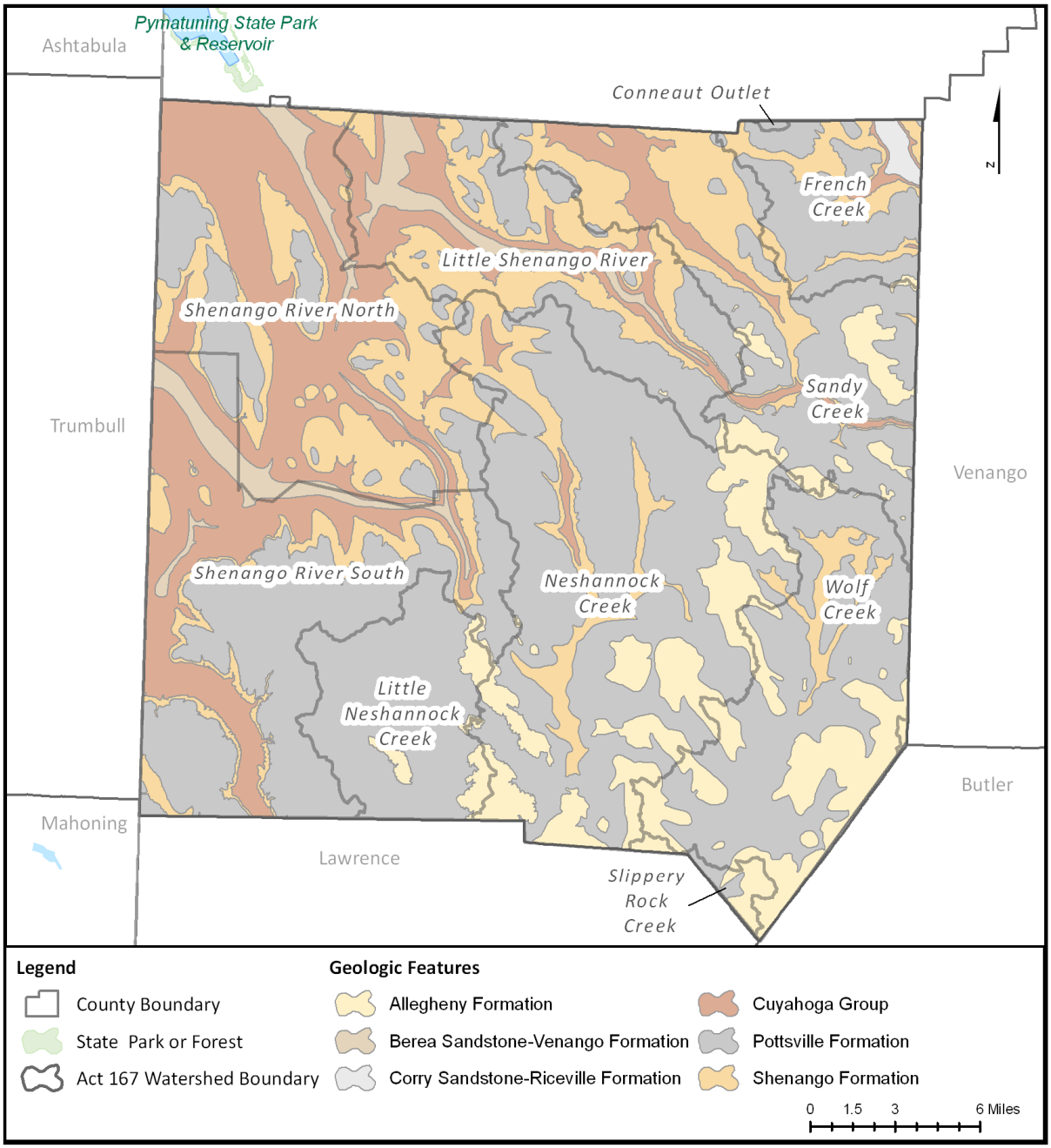
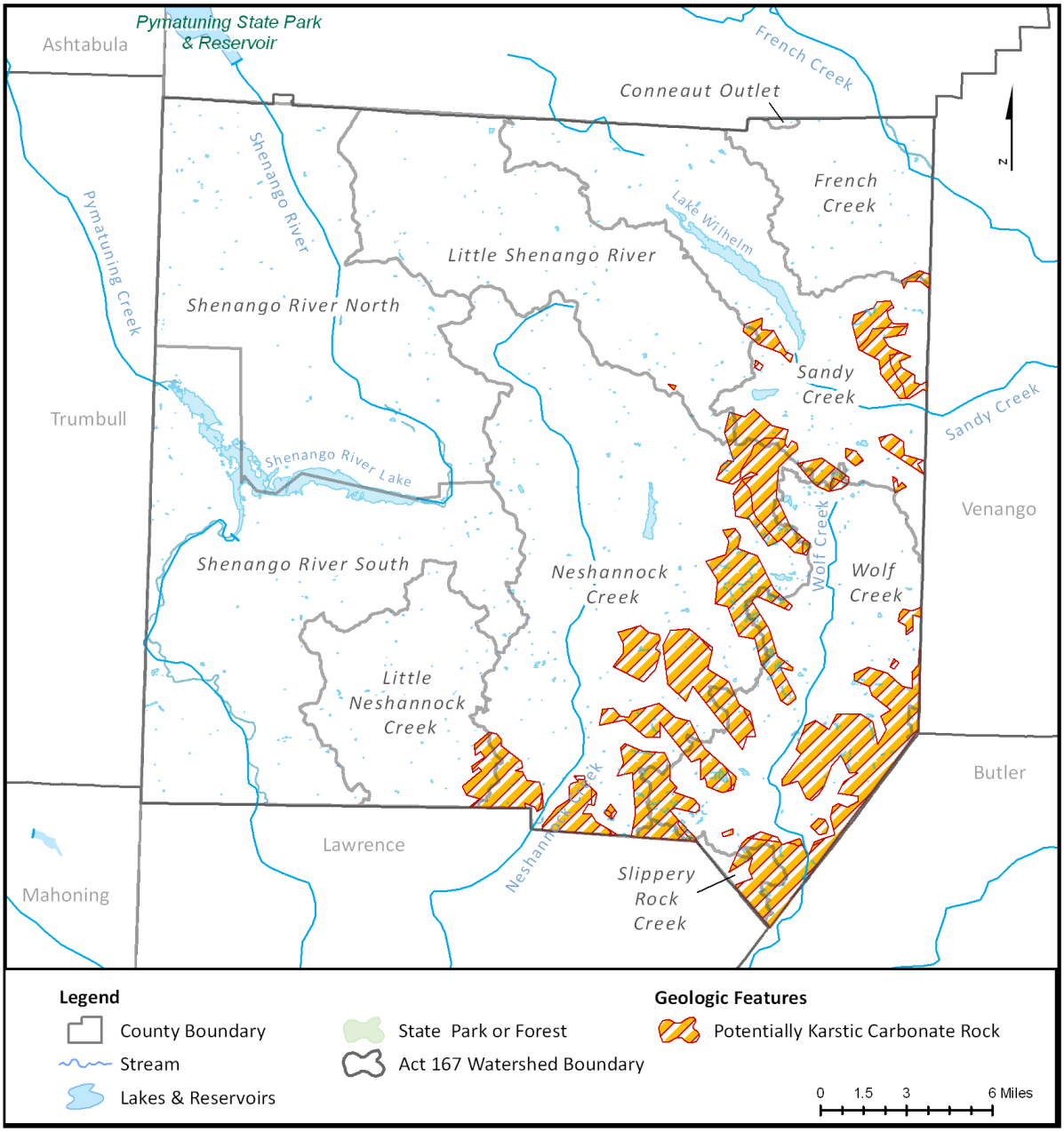


Figure 6. Karstic Geology



2.7 Slopes

Mercer County lies within the Appalachian Plateau Physiographic Province, specifically the Northwestern Glaciated Plateau portion. The dominant topographic form within this portion is characterized by broad, rounded upland and deep, steep sided, linear valleys that are partly filled with glacial deposits. The underlying rock is composed of shale, siltstone, and sandstone.

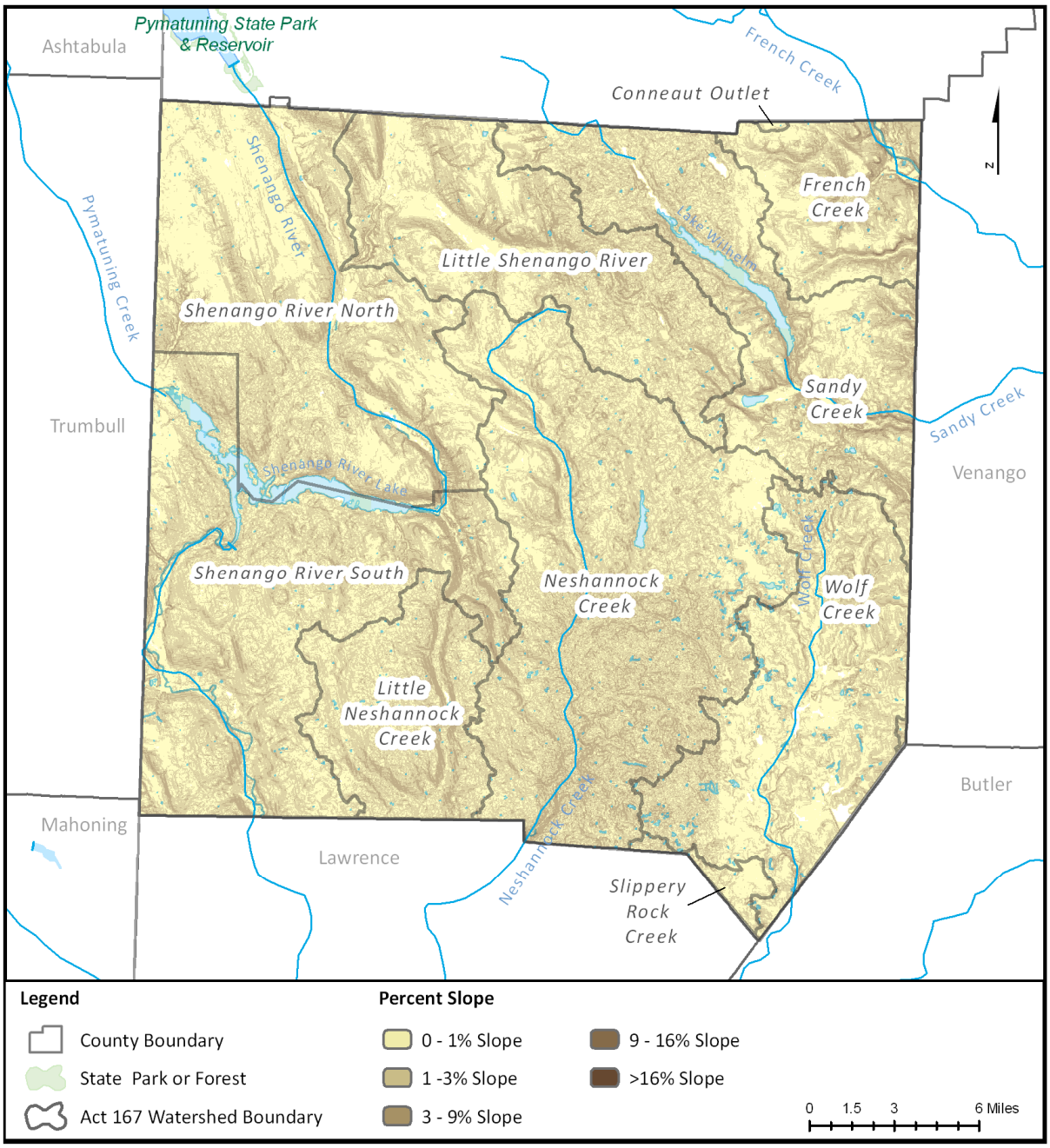
Virtually all of the very steep slopes in Mercer County are found along river and stream corridors, including the Big Bend area of the Shenango River, parts of Neshannock Creek in Lackawannock Township, parts of Sandy Creek and at the south end of Lake Wilhelm. If disturbed, areas of steeper slope can produce heavy soil erosion and sediment loading in adjacent streams. To minimize erosion and surface water degradation, additional stormwater runoff requirements should be added in steeper sloped areas.

Areas of flat or gently sloping grades are more easily developed for several reasons: less earthmoving necessary to develop; easier access to existing infrastructure (roads, utilities, wells, etc.); and less stabilization required for the site (i.e. retaining walls). These areas tend to be where the majority of the residential, commercial and industrial land uses occur throughout the county. Table 7 indicates the approximate number of square miles and percent of the county covered for each percent grade found in Mercer County, while Figure 7, Page 35 depicts the areas of the county with various slope ranges.

Table 7. Square Miles & Percent Slope

% Slope	Approx. Acreage	Approx. % of County
0%-8%	265,214.9	61%
9%-15%	123,570.7	28%
16%-25%	37,977.45	9%
>25%	9222.36	2%

Figure 7. Percent Slope



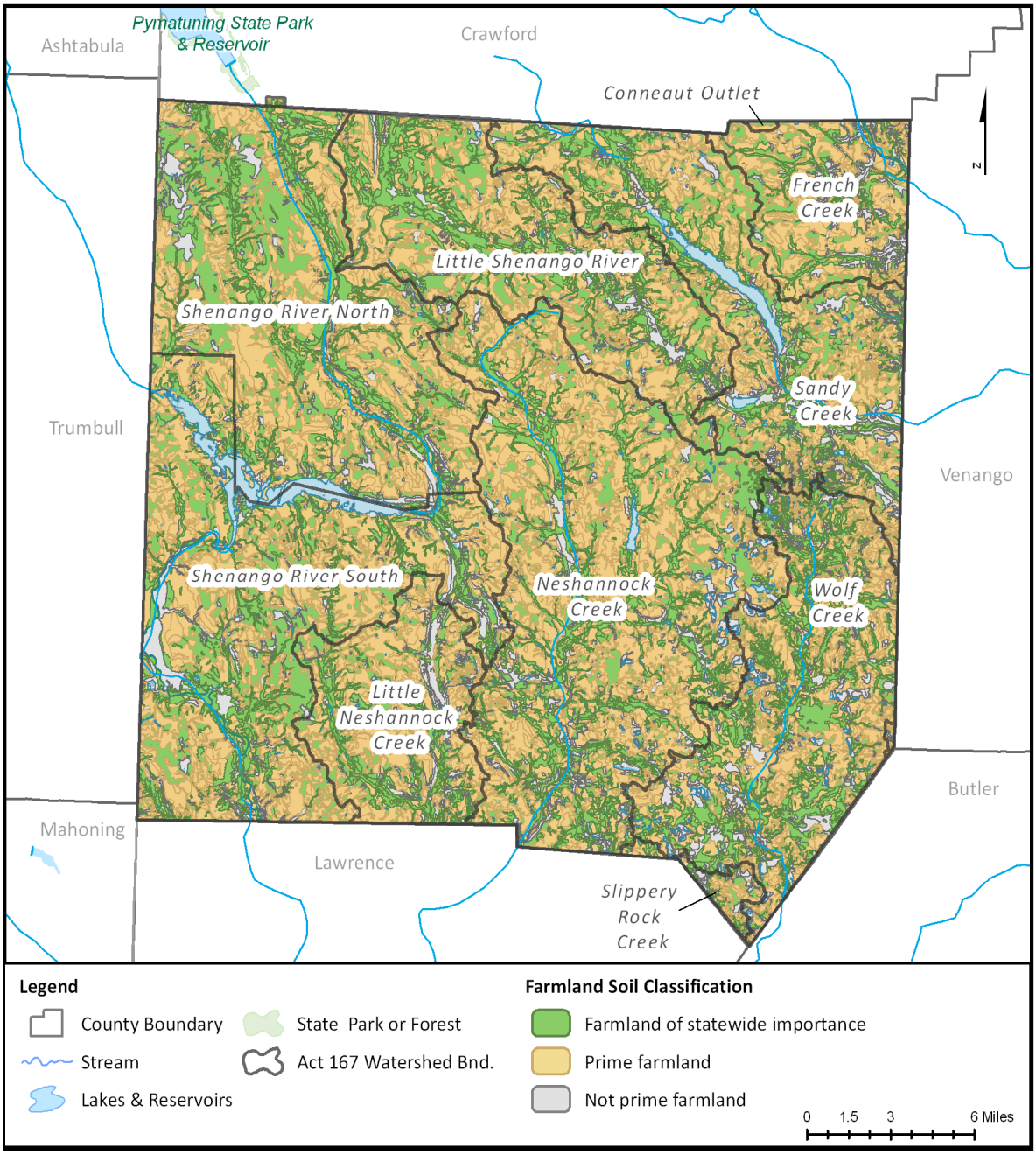
2.8 Prime Farmlands

Mercer County contains approximately 225,000 acres (51% of the County) of Prime Farmland soil types, (Figure 8, Page 37). Approximately 58,000 acres of these soils are not being used as active farmland, and approximately 37,000 acres are covered by forest. Mercer County also contains some farmland soils of statewide importance, approximately 145,000 acres or one-third (1/3) of the total land area in Mercer County. Of these Prime Farmland Soil Types 6% are rapidly permeable to water and 93% have some degree of resistance to water permeability because of a seasonal high water table, fragipan or clay content. The latter soil types were extensively drained to facilitate the growing of agriculture crops.

Preserving farmland protects the environment and our natural resources. Pennsylvania's Farmland Preservation Program works through the Pennsylvania Agricultural Conservation Easement Purchase Program. The program was developed in 1988 to help reduce the loss of prime farm land to non-agricultural uses. The program enables state, county and local governments to purchase conservation easements from owners of prime farmland. This commitment from farmers will allow all citizens to benefit from the perpetual open space.

Another form of farmland preservation is Agricultural Security Areas. Ag Security Areas were formerly allowed by the Pennsylvania Agricultural Area Security Act (PA 1981-43) and went into effect in August 1981. The Act defines an Ag Security Area as "a unit of 250 or more acres of land used for agricultural production of crops, livestock, or livestock products under the ownership of one or more persons." Ag Security Areas are reviewed every seven (7) years.

Figure 8. Farmland Soils



2.9 Soils

Soil surveys and the data they contain are only a starting point from which to design a site plan. Soil survey mapping is limited by the scale at which the data is contained in the survey. This should be kept in mind for small sites. The soil survey is a planning level tool only, containing data that can be used to restrict development in some areas or help plan where more detailed studies should be conducted. Unfortunately, the lack of subsurface features such as fragipans or clay pans, well defined in the surveys, can cause flooding problems for buildings with or without upslope development. However, this type of information in the soil surveys is often neglected, while too much emphasis is placed on the use of Hydrologic Soil Groups (HSG's) (Fennessey et al. Hawkins, 2001)

A HSG is a group of soils having similar runoff potential under similar storm and cover conditions. Soil properties that influence runoff potential are those that influence the minimum rate of infiltration for a bare soil after prolonged wetting and when not frozen. These properties are: depth to a seasonal high water table; saturated hydraulic conductivity after prolonged wetting; and depth to a layer with a very slow water transmission rate.

Four (4) HSG classifications are used to represent thousands of soils underlain by different geology in different regions of the United States. HSG's were developed considering precipitation events that produced large flood events. The HSG's were determined by "assuming that the soil surfaces were bare, maximum swelling had taken place, rainfall rates exceeded surface intake rates" (USDA, 1993) and after prolonged wetting of the soil B horizons. This is rarely the case for most rainfall events, especially those events that are specifically aimed to be control SWM BMP's. In addition, the HSG has no affect on recharge and should not be used as an indicator of recharge for infiltration systems for large impervious developments in an effort to control radical changes in volume. When done, these systems need to be thoroughly investigated and engineered. The successful implementation of this Stormwater Management Plan relies heavily on the performance of on-site soils analysis, and should be conducted in accordance with the PA Stormwater BMP Manual.

Factors that may limit the development of land include steep slopes, flooding, seasonal high water table, slow permeability (which could lead to the failure of on-lot wastewater treatment systems in rural

areas) and shallow depth to bedrock. Limiting soil factors for agricultural use for growing crops include steep slopes, susceptibility to drought, poor drainage, low natural fertility, large stones and boulders at the surface, shallowness to bedrock and erosion. Hydric soils are poorly drained and therefore can be limiting factors for both land development and agricultural use.

Mercer County generally contains soils that are poorly drained, subjecting the County to increased stormwater runoff rates, prompting flooding issues (Figure 9, Page 40). A brief definition of those soils follows:

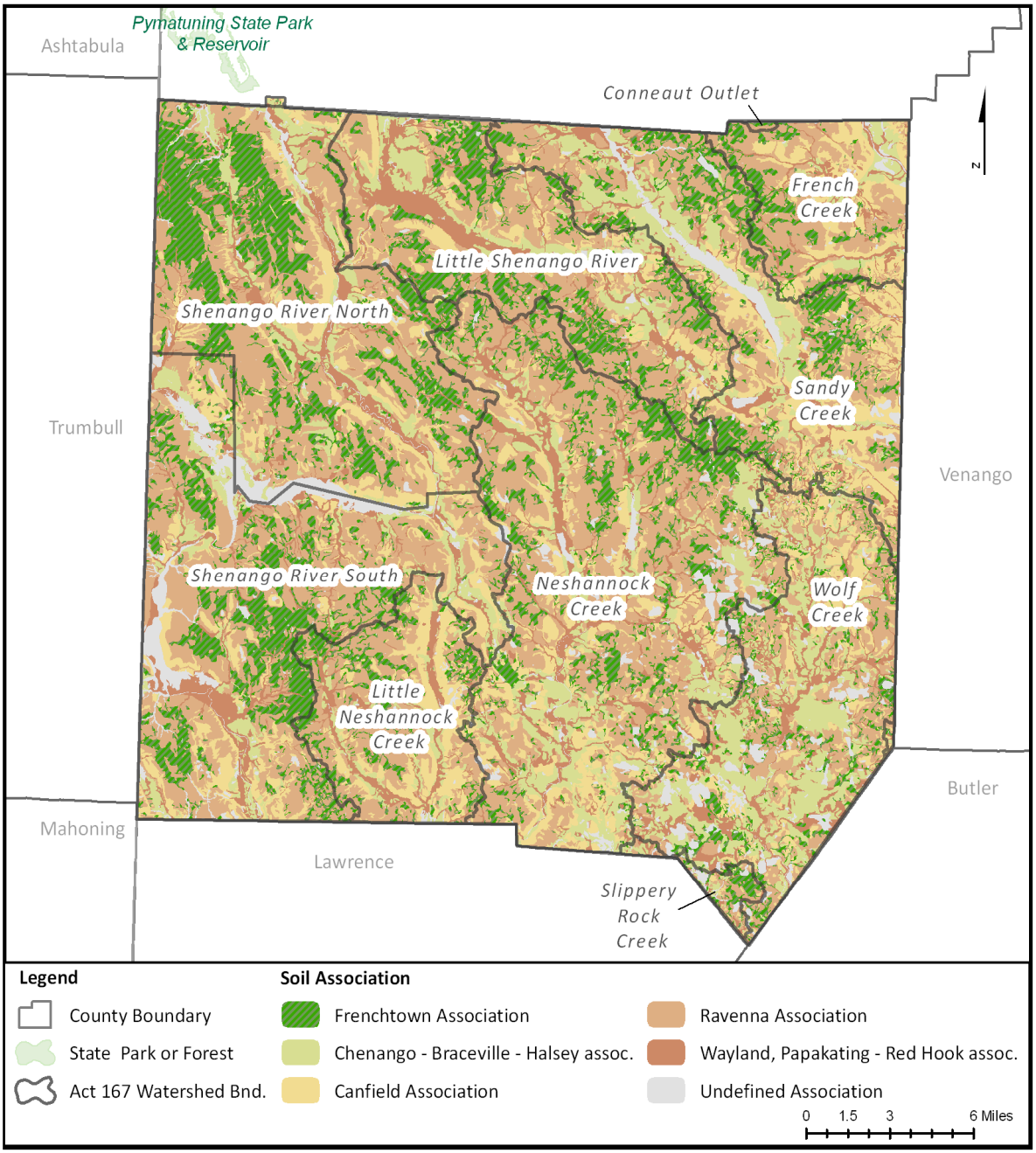
Ravenna-Frenchtown soil group is the most extensive soil association in Mercer County. It is a somewhat poorly drained soil type found in gently sloping to nearly level areas.

> Frenchtown and Ravenna, as well as Halsey, Caneadea, Luray and Papakating all have seasonal water tables at or within 6" of the surface in the spring or for longer periods. They may have wetlands, or soils that contain wetlands in the mapping unit. Site investigation will be needed to verify the in situ characteristics. These soils do not lend themselves to structural BMP's, i.e., Pervious Pavement with Infiltration Bed, Infiltration Basin, Subsurface Infiltration Bed, Infiltration Trench, Dry Well/Seepage Pit.

Chenango-Braceville-Halsey soil types occur on terraces along most of the major streams in the county. These soils can range from having well drained characteristics to having very poorly drained characteristics depending on the underlying deposits.

> The Braceville series is characterized by slowly permeable fragipan that restricts infiltration in the lower part of the subsoil, and the water table can be within 18" of the surface in the spring. However, it is underlain by thick deposits of sand and gravel that will provide the desired infiltration. The practicality of design and construction of BMP's in this soil depends on the depth to these deposits.

Figure 9. General Soils



The Chenango soil series is characterized by rapid permeability and will infiltrate stormwater readily. However, its rapid permeability may not allow for the desired water quality improvement. Structural BMP's are applicable in this soil.

Canfield-Ravenna is dominant on the more strongly sloping parts of the uplands. This soil type ranges from being moderately well drained to being somewhat poorly drained.

The Canfield series is characterized by a slowly permeable fragipan that restricts infiltration in the lower part of the subsoil and the water table can be within 18" of the surface in the spring. It is underlain by glacial till that may or may not provide the desired infiltration rates, especially in the spring. Structural BMP's, i.e. Pervious Pavement with Infiltration Bed, Infiltration Basin, Subsurface Infiltration Bed, Infiltration Trench, Dry Well / Seepage Pit can be employed with proper attention given to site characteristics. However, they may be effective in Ravenna Soils with special construction techniques and/or at dry times of the year (i.e. late spring through early fall). The following BMP's may be employed pending specific site determination, i.e.: Rain Garden/Bioretention Area, Constructed Filter, Vegetated Swale, Vegetated Filter Strip, Infiltration Berm and Retentive Grading.

Wayland Course Variant-Papakating-Red Hook soil type occurs as bands on the floodplains of most streams. It is a poorly drained to moderately well-drained soil found on nearly level land underlain by alluvium and on floodplains, and should be left in a natural condition or enhanced with appropriate plantings as much as possible.

The Mercer County Conservation District maintains that all nonstructural BMP's have application in the County. However, structural BMP's that rely on infiltration will have limitations, either seasonally or by the permeability of the soil, and sometimes both.

After reviewing the prevailing soil conditions, slope conditions, and water tables of Mercer County for SWM BMP's, it is apparent that most of the areas in Mercer County are not well suited for infiltration BMP's because of three recommendations from the storm water BMP manual:

1. It is recommended that a 24-inch buffer be maintained between the seasonal high water table and ground surface,

2. Infiltration BMP's are not recommended on slopes > 20%,
3. The recommended infiltration rates are from 0.1 - 10 in/hr

2.10 Wetlands

Figure 10, Page 44 identifies the NWI wetlands in Mercer County. Wetlands were obtained from the National Wetlands Inventory Maps and incorporated into the overall GIS. Wetlands play an important part in flow attenuation and pollutant filtering.

Wetlands, as the name implies, are lands that are wet for significant periods of time. They may be wet due to surface water, ground water, or usually a combination of both. They include the periodically flooded land occurring between uplands, and open bodies such as lakes, streams and rivers. Wetlands may also be found in depressional or sloping areas with seasonally high water tables that are surrounded by upland. "There is no single, correct, indisputable, ecologically sound definition for wetlands, primarily because of the diversity of wetlands and because the demarcation between dry and wet environments lies along a continuum" (Cowardin, et al. 1979). Wetland definitions were defined by various groups or organizations to support their individual needs.

A December 1990 study by the U.S. Fish and Wildlife Service found that in Pennsylvania, wetlands were most prevalent in Crawford, Erie, Monroe, Pike, Wayne, Luzerne and Mercer counties. This study identified 15,656 acres or 3.7% of the County's land area as wetlands, with the majority of these in private ownership. Considering that the *Mercer County Comprehensive Plan*, states that there are over 162,168 acres of forestland within Mercer County (37% of the county), the existence of wetlands is likely to be greater since aerial photography often does not reveal the presence of water below tree canopies. Additionally, new areas of wetlands are being discovered and delineated by wetland specialists almost daily.

Like the rest of the state, Mercer County has lost substantial wetland acreage over the centuries. To reverse this process, wetland protection is addressed by a variety of federal and state public agencies. Government agencies alone cannot accomplish the task of

wetland protection, municipalities, private organizations and individuals must assist in the effort.

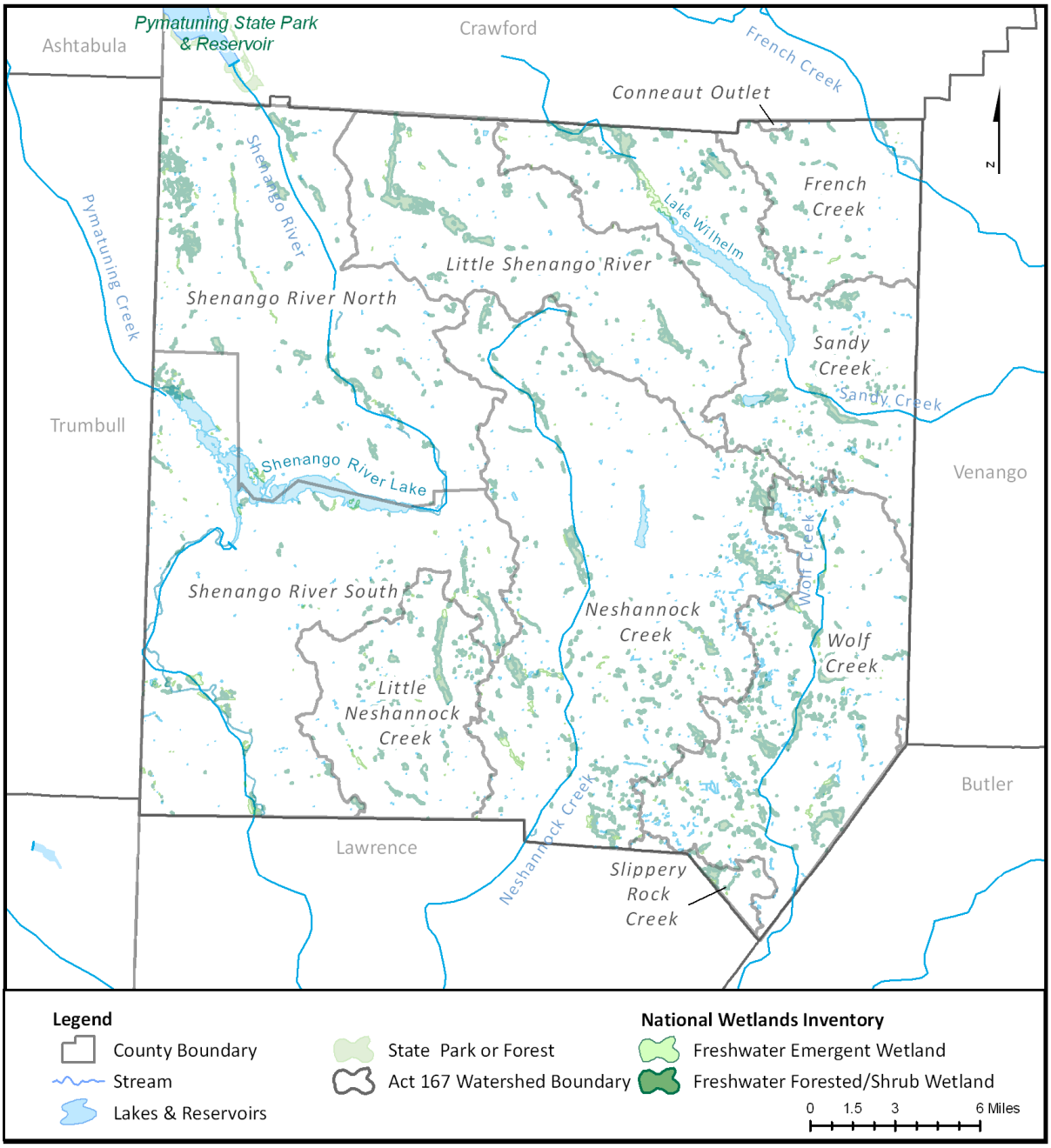


Figure 10. NWI Wetlands

2.11 Floodplains

The Federal Emergency Management Agency (FEMA) has undertaken an effort to update and digitize floodplain maps across the County. The preliminary maps for the County were released in January 2010 for review and comment.

In the past, paper copies of the FEMA maps were distributed by the FEMA Map Service Center (MSC); but, on October 1, 2009 the FEMA MSC discontinued the general distribution of paper mapping products, including Flood Insurance Rate Maps, Flood Hazard Boundary Maps, Flood Boundary and Floodway Maps, and Flood Insurance Study reports.

Flood Insurance Rate Maps (FIRM) for the County are available from the County Regional Planning Office or on line at www.msc.fema.gov. These maps are considered the primary source for identifying flood plains within the County's watersheds.

Table 8. Annual Chance Flood

STORM FREQUENCY	FEMA
2 - year	50 % Annual Chance Flood
10 - year	10 % Annual Chance Flood
25 - year	4 % Annual Chance Flood
100 - year	1 % Annual Chance Flood

The Federal Emergency Management Agency (FEMA) administers the National Flood Insurance Program (NFIP). One role of the NFIP is to reduce future flood damages to buildings and their contents by requiring the local regulation of new development in floodplain areas. A floodplain area is defined as any land area susceptible to inundation by water from any natural source or delineated by applicable Federal Emergency Management Agency (FEMA) maps and studies as being a special flood hazard area.

2.12 Vegetation and Wildlife

Preservation of woodlands is an important component of stormwater management. The value of woodlands to a municipality is both aesthetic and functional. The rural character of low density, less developed suburbs is largely due to the presence of extensive woodlands, hedgerows and cultivated vegetation. The vegetation provides soil stability, preventing stormwater erosion by dissipating rainfall. Habitat for wildlife is provided where significant stands of trees and shrubs are allowed to remain in a natural state. Protection of specimen vegetation such as heritage trees is common, but, protection of woodlands and hedgerows from alteration is less common. In order to effectively accomplish preservation of this resource, more effective regulation is needed to appropriately specify and effectively enforce woodland disturbance. A review of the ordinances indicates a general lack of consistency and clarity in regulating woodland disturbance.

The *Natural Heritage Inventory for Mercer County*, completed by the Western Pennsylvania Conservancy in June of 2003, provides an inventory and maps of the most significant natural places in Mercer County. Plant and animal species, natural communities that are unique or uncommon in the County and areas important for wildlife habitat and scientific study were investigated and included in the inventory process. This inventory provides necessary information to guide land acquisition and conservation decisions. The list of Natural Heritage Inventory sites can be found in the *Mercer County Comprehensive Plan, Profile 1 –Natural Resources, pages 13-15, Table 1-1-6.*

2.13 Forestry

As rural areas undergo conversion from forestry to non-forested land use, natural hydrologic pathways will be permanently altered. Forest practices can alter the hydrologic performance of a watershed by changing the magnitude and timing of stream flows. Timber harvesting operations opens the canopy and allows greater snow accumulation on the surface in winter. Accelerated melt rates are increased due to increased radiation, thus contributing to greater runoff in the spring. Forests within Mercer County provide many

resources such as: habitat for wildlife, water filtration, timber harvesting, and recreation. As stated earlier, according to the *Mercer County Comprehensive Plan*, there are over 162,168 acres of forestland within Mercer County (37% of the county), of which approximately 154,651 acres are deciduous. There are five designated Pennsylvania Game Commission state game land areas in Mercer County. Table 9 gives the State designation number and the location.

Table 9. Game Land Areas & Municipality

NUMBER	MUNICIPALITY
270	Sandy Creek and Deer Creek Townships
30	Worth, Sandy Lake, Jackson and Lake Townships
151	Liberty Township
284	Springfield Township
294	Coolspring and Fairview Townships

There are no National Forest Lands or State Forest Lands within Mercer County.

2.14 Mining

Mercer County has a long history of coal mining, primarily due to the location of bituminous coalfields in the eastern portion of the county. The DEP lists two (2) active coal mining permits in Mercer County. Even though a permit may be active, actual mining may not be taking place as there are various stages to active permits including: not started, active, treatment, reclamation, and forfeited. Coal mining accounts for 0.02% of land use within Mercer County totaling 103.7 acres (0.16 square miles).

Surface mining of non-coal/industrial minerals is a major industry within Pennsylvania, one of the top 10 producing states in the country for aggregate/crushed stone. The most common non-coal mines in Pennsylvania produce aggregate (hard granular material used in

concrete, mortar, plaster, and blacktop). The types of rock used for these purposes are limestone/ dolomite, sandstone and argillite. Mineral deposits (that are not consolidated rock) of sand and gravel are also used. According to the *Mercer County Comprehensive Plan*, industrial mineral mining emerges as the dominant mining industry in Mercer County and accounts for 0.4% of land use (1,757.7 acres). The DEP lists thirty-eight active surface mining permits, mainly for sand, gravel, and slag within Mercer County.

2.15 Oil & Gas

Mercer County ranks 8th in the number of oil and gas wells drilled between 2000 and 2007 in Pennsylvania. This accounts for 5.2 percent (or 1,167 wells) of the total wells drilled in Pennsylvania in that time period. There were approximately 150 oil and gas well permits issued in 2007 alone. Drilling technology combined with modern hydraulic fracturing techniques has made oil and gas extraction from Marcellus shale an economically viable and marketable resource. Marcellus shale of the Appalachian Basin is from the Middle Devonian age and is located between 5,000 and 8,000 feet below the surface and ranges in thickness from 50-90 feet. It is a black carbonaceous (organic rich), low density shale.

Brine produced from oil and gas wells and other sources (such as brine treatment plants and brine wells) has shown promise for beneficial use as a dust suppressant and road stabilizer for unpaved secondary road systems. Brine is present in subsurface formations and is typically produced along with the oil and gas. Because there is potential for contaminants from the brine to leach into surface or ground waters, the DEP has developed guidelines that must be followed when spreading brine on unpaved roads. The guidelines were developed under the authority of Clean Streams Law and the Solid Waste Management Act.

Erosion and Sediment Control Plans and implementation of BMP's have been required of oil and gas operators in this Commonwealth since 1972. The purpose of the plans and BMP's are to minimize the potential for erosion and sedimentation and protect the waters of this Commonwealth. This is a long standing practice under the Clean

Streams Law, 25 Pa. Code Chapter 102 (relating to erosion and sediment control), the Oil and Gas Act, 25 Pa. Code Chapter 78 (relating to oil and gas wells) and is one of the core elements of the Department's program for regulating oil and gas activities. The Department's first Erosion and Sediment Control Manual for earth disturbance at oil and gas wells was published in 1981. It is now incorporated into the Department's ''Oil and Gas Operators Manual.''

2.16 Obstructions

Obstructions are man-made or natural encroachments within channels that can significantly limit the flow characteristics and capacity, in normal and/or flood flows, and can be a contributing factor in ponding and flooding. Examples of obstructions include dams, bridges, culverts, retaining walls, and storm sewer outfalls. For this reason municipalities were asked to identify obstructions within their boundaries that contributed to flooding issues. Of the twenty-five (25) Municipalities that responded to the questionnaire, thirteen (13) identified locations with channel obstructions. These obstructions may or may not be the cause of specific stormwater related problems. The effects of ponding behind a structure would need to be considered in weighing the benefits of structure modifications against the cost of modifications. However, due to the condensed planning process by DEP there was not sufficient time to conduct a comprehensive technical analysis.

2.17 Mapping

The primary resource for the geospatial data and information contained within this report is the Pennsylvania Spatial Data Access (PASDA). PASDA is managed by Penn State University and serves primarily as an interactive web geodata access portal. The Pennsylvania Office for Information Technology along with the Governor’s Office of Administration, Geospatial Technologies Office, and the Penn State University provide funding and support for PASDA.

Additional geospatial data in this report were obtained from Environmental Systems Research Institute, Inc. (ESRI) and from various federal data providers, including U.S. Geological Survey

(USGS), Pennsylvania Department of Environmental Protection (PADEP), U.S. Fish & Wildlife Service's Division of Habitat and Resource Conservation (DHRC), and U.S. Department of Agriculture's Natural Resource Conservation Service (USDA - NRCS).

The maps in this report were created using base data from the following sources:

- Background atlas data (roads, cities, railroads, etc.) derived from ESRI StreetMaps USA
- Designated stormwater management watersheds for the Act 167 program (PADEP)
- Pennsylvania county and municipal boundaries (PA Dept. of Transportation , Bureau of Planning & Research, Cartographic Information Division)
- Water bodies from the Federal National Wetlands Inventory (DHRC)
- General Ohio River drainage basin boundary from the National Hydrology Dataset (USGS)
- Soils (NRCS)
- Digital Elevation Model and Land Use Land Cover (PASDA)

Cartographic design, data analysis, and data storage were performed in ArcGIS, a GIS (geographic information systems) software package from ESRI.

The percent slopes indicated in the Figure 6 were calculated using a 2006 digital elevation model of Pennsylvania with a spatial resolution of 3.2 feet per pixel. This dataset was created from an aerial data collection process resulting in a dense network of elevation points covering the entire state. These points were then interpolated to form a continuous data surface, that can be used for elevation modeling or to produce topographic contours.

The farmland soils map in Figure 7 were classified into three categories based on attributes within the file. The farmland soil classifications were specified by the USDA NRCS division. The soil association classifications in the general soils map (Figure 8) were taken directly from the official Pennsylvania state soil survey. PA geologic

formations (Figure 4) were obtained directly from the official state geologic survey, based on the work of Berg *et al.* 1980. Potential karstic geological formations as shown in Figure 5 were obtained from a work-in-progress data layer developed by D.J. Weary of the U.S. Geological Survey in 2008.

Wetland classifications (Figure 9) were taken directly from the Federal National Wetlands Inventory classification system, based on the work of Cowardin *et al.* 1979. Act 167 stormwater management watersheds (Figure 1) were taken directly from the Pennsylvania DEP layer. These management units were comprised of smaller, named stream drainage basins, which were then grouped into regional, major drainage basins. Impaired stream designations (Figure 3) were obtained from the Pennsylvania DEP Office of Water Management's spatial data layer of non-use-attaining stream assessments for the Clean Water Act, sections 303(d) and 305(b).

The land use classifications were obtained from the official state land use/land cover data set of 2005, based on multiple satellite and aerial data sources. These sources were then classified into multiple categories based on the work of Homer *et al*. 2000 using the Anderson classification system. The state land-use dataset includes multiple fine-scale categories that were not required for this report, so the dataset was reclassified to simplify the number of categories into broader land use classes.

SECTION 3

3.0 NON-STRUCTURAL AND STRUCTURAL BMP'S

3.1 Non-Structural BMP's
3.2 Structural BMP's

3.0 NON-STRUCTURAL AND STRUCTURAL BMP's

3.1 Non-Structural BMP's

Non-Structural BMP terms like "Low Impact Development" and "Conservation Design" refer to an environmentally sensitive approach to site development and stormwater management that minimizes the effect of development on water, land and air. This emphasizes the integration of site design and planning techniques that preserve natural systems and hydrologic functions on a site through the use of Non-Structural BMP's. Non-Structural BMP deployment is not a singular, prescriptive design standard but a combination of practices that can result in a variety of environmental and financial benefits. Reliance on Non-Structural BMP's encourages the treatment, infiltration, evaporation, and transpiration of precipitation close to where it falls while helping to maintain a more natural and functional landscape (Appendix A).

3.2 Structural BMP's

Many so-called Structural BMP's are actually based on natural systems and rely upon vegetation and soil mechanisms in order to perform as intended. Others are considered more conventional "brick and mortar" techniques. The use of these mitigation techniques is not meant to replace the use of non-structural BMP's, but rather to work in tandem with those planning and design-based approaches to minimize unavoidable impacts.

The decision about which structural BMP's are most appropriate comes not as a post construction fix, but rather as a result of the Site Design Procedure for Comprehensive Stormwater Management.

The PA DEP Stormwater BMP Manual contains details on some 21 Structural BMP's, several of which offer variations on a central theme. Like the Non-Structural BMP's presented in the Manual, the list of Structural BMP's is expected to grow as stormwater management practices continue to evolve and mature (Appendix A).

SECTION 4

4.0 WATERSHED TECHNICAL ANALYSIS

4.0 WATERSHED TECHNICAL ANALYSIS

4.1 Watershed Modeling

Watershed analysis requires the integration of knowledge, data and simulation models to solve practical hydrological problems. Hydrologic models on this scale require detailed spatial information for the area under investigation. GIS technologies provide the tools to rapidly extract relevant data used to prepare model input files and evaluate model results. The modeling process chosen for this plan was the Hydrologic Modeling System (HEC-HMS). It is designed to simulate precipitation runoff processes of dendritic watershed systems. It is designed to be applicable in a wide range of geographic areas for solving the widest possible range of problems. This includes large river basin water supply and flood hydrology, and small urban or natural watershed runoff. Hydrographs produced by the program can be used directly or in conjunction with other software for studies of urban drainage, flow forecasting future urbanization impact and flood damage reduction.

PASDA with its cutting edge capabilities to utilize data resources, in conjunction local data collection would be the primary sources for the data necessary to run the models.

Information gathered for this for this plan is available on compact disc (CD) and can be requested at the following offices during normal business hours.

Mercer County Regional Planning Commission
2491 Highland Road
Hermitage, PA 16148
724-981-2412 ext.- 225

Wallace and Pancher, Inc.
1085 S. Hermitage Road
Hermitage, PA 16148
724-981-0155

Unfortunately, due to the reduced funding for the planning process by DEP, there was not sufficient time to address and analyze the capacities of the structures. This item should be a consideration in a future planning cycle.

4.2 Questionnaire Results

The questionnaire was developed to request information from participants concerning specific problems involving storm water management within their areas of jurisdiction. The questionnaire and a detailed map of the municipality were distributed to the corresponding participant during the initial WPAC meeting. The information from the questionnaire was not only used to determine the scope of planning for Phase II, but also as a means to determine levels of support from each municipality. Of the forty-eight (48) municipalities in Mercer County, thirty-six (36) returned their questionnaires. Additionally, three state agencies, one county agency, and one watershed group returned questionnaires. Overall, the primary stormwater concern in the County was increased runoff. Secondary issues were poor drainage and undersized culverts/structures. Following are the compiled results from the questionnaires by watershed. The actual questionnaires are included in Appendix C of the Phase I report.

4.3 French Creek Watershed

The following municipalities lie within the French Creek watershed: all of New Lebanon Township and portions of Mill Creek Township, French Creek Township, and Deer Creek Township.

Within the French Creek watershed, the primary stormwater related concern was increased runoff, with secondary issues being road flooding, erosion along roadways, and poor drainage.

The French Creek watershed is located in the northeast corner of Mercer County. It drains an area of approximately 430,665 acres (672.9 square miles), of which 21,409 acres (33.5 square miles) are located within Mercer County. This watershed's drainage flows out of the county to the east and into the Allegheny River watershed. In general, the French Creek watershed consists of poorly drained soils and underlying bedrock that has moderate to low porosity and

permeability, predisposing the area to excess runoff. Following is a detailed description of the portion of the French Creek watershed that lies within Mercer County:

Soils – The French Creek watershed is dominated by the Canfield-Ravenna association. This soil type is typically found on gently sloping to moderately steep hillsides underlain by glacial till. The soil varies from moderately well drained to somewhat poorly drained, depending on its location. A small portion of French Creek is also underlain by the Chenango-Braceville-Halsey association, a soil type found mainly on stream terraces and moraines. This soil type is found on gently sloping to moderately steep hillsides and is underlain by sand and gravel, therefore it can range from being well drained to very poorly drained. The remainder of the watershed consists of the Ravenna-Frenchtown association. This soil association can be found on nearly level to gently sloping uplands within the watershed. It is a somewhat poorly drained to poorly drained soil association (Figure 9, page 36). The French Creek watershed within Mercer County also contains approximately 11,560 acres (18 sq. mi.) of prime farmland soils, most of which is currently forested (Figure 8, page 33).

Geology – The section of the French Creek watershed underlying French Creek itself contains approximately 1,288 acres (2.0 square miles) of the Corry Sandstone through Riceville Formation, undivided, composed mainly of shale. This bedrock type has a moderate porosity and a moderate to low permeability. Surrounding that formation is approximately 815 acres (1.3 square miles) of the Cuyahoga formation, composed of sandstone. This bedrock type has low porosity and low permeability. Approximately 6,039 acres (9.4 square miles) of the Shenango formation, composed of siltstone, can be found underlying Deer Creek and Mill Creek. The Shenango formation has moderate to low porosity and moderate to low permeability. Approximately 13,155 acres (20.6 square miles) within the watershed consist of the Pottsville formation, composed of shale, siltstone, claystone, limestone and coal. This formation has variable porosity and moderate to low permeability. The remainder of the watershed contains 109 acres (0.17 square miles) of the Allegheny formation, a formation consisting mainly of limestone, clay and coal (Figure 5, page 28).

Slope – In general, the part of the French Creek watershed that lies within Mercer County is relatively hilly in topography. There are steeper slopes (9-15% and 16-25% grade) found around the streams, with relatively steep slopes (>25% grade) located along French Creek in the extreme northeast corner of the watershed. The western portion of the watershed is relatively flat, having 0-8% slopes (Figure 7, page 31).

Land Use – The following table presents coverage of the most dominant land uses within the watershed:

Land Use	Acres	Square Miles	Percent of Watershed
Forested	11,790	18.4	55%
Farmland	8,073	12.6	38%
Wetland	416	0.7	<1%
Low Density Urban	167	0.3	<1%
High Density Urban	138	0.2	<1%
Water	117	0.2	<1%

Stormwater Management Issues Identified as Significant by Each Municipality within the French Creek Watershed:

Borough of New Lebanon:

- Manage stormwater and field runoff causing damage to roads and the overflow of ditches (especially along Gorden Road).
- Stabilizing peak flow conditions.
- Decrease watershed pollution including dissolved and un-dissolved pollutants from increased runoff causing negative impacts to recreation, aesthetics, and in-stream habitat.
- Maintain groundwater supplies as increasing runoff decreases the amount of rain that becomes groundwater. Decreased groundwater supplies may have negative effects on well water supplies or dry up stream base flow in dry periods.
- Control stream and street flooding, soil erosion, stream bed and bank erosion, and damage to bridges and culverts caused by increased runoff.
- Control property flooding and damage.

Deer Creek Township:

- Finding funding to respond to stormwater related issues within Deer Creek Township including road flooding and berm erosion caused by excessive runoff, especially along Deer Creek Road.
- Poor drainage and infiltration due to existing soil types.
- Control erosion caused by excessive runoff entering the stream along Deer Creek Road north of the stream. Deer Creek Township is currently working with the county to improve road ditches.
- Stabilizing peak flow conditions.
- Maintain groundwater supplies as increasing runoff decreases the amount of rain that becomes groundwater. Decreased groundwater supplies may have negative effects on well water supplies or dry up stream base flow in dry periods.
- Control the erosion of stream beds and banks, undercut roads and utilities, damage to in-stream cover, and clogging of bridges and culverts during extreme storm events.
- Resolve street and stream flooding caused by increased runoff and poor drainage.

Agency Comments

- *Mercer County Conservation District:* North Deer Creek in French Creek Township along Creek Road to mouth has bank erosion, sedimentation, and flooding.
- *Mercer County Conservation District:* Powdermill Run in French Creek Township from the county line to the mouth has sedimentation, bank erosion, and flooding.

4.4 Sandy Creek Watershed

The following municipalities lie within the Sandy Creek watershed: all of Sandy Lake Borough, Sandy Lake Township, Sheakleyville Borough, and Stoneboro Borough , and portions of Deer Creek Township, New Vernon Township, Salem Township, Sandy Creek Township and Worth Township.

The primary stormwater concern in the Sandy Creek watershed was increased runoff. Secondary issues included poor drainage and road wash-outs. Other issues mentioned were: road flooding, undersized

culverts, acid mine drainage, sedimentation, stream bank erosion, flooding and beaver dams.

The Sandy Creek watershed is located in the northeast corner of Mercer County. It drains an area of approximately 102,839 acres (160.7 square miles), of which 50,772 acres (79.3 square miles) are located within Mercer County. This watershed's drainage flows out of the county to the east and into the Allegheny River watershed. In general, the watershed is flat in topography, with some steeper slopes around streams. It consists of moderately drained to poorly drained soils with underlying bedrock that has moderate to low porosity and permeability, predisposing the area to excessive pooling and runoff. Areas of high density urban land use within the watershed include Sandy Lake and Stoneboro, and small areas adjacent to Routes 258 and 358. This urban land use predisposes the area to increased runoff, flooding, sedimentation, and water pollution. The remainder of the Sandy Creek watershed consists mainly of farmland to the northwest and forested area to the east. The northern portion of the watershed is dotted with wetlands, some considerable in size. These wetlands provide flood storage and help water to infiltrate into the groundwater rather than running off into and flooding nearby creeks. Following is a detailed description of the portion of the Sandy Creek watershed that lies within Mercer County:

Soils – Sandy Creek is dominated by the Wayland, course variant-Papakating-Red Hook soil association. This association is found on nearly level slopes within the floodplains, is underlain by alluvium, and ranges from very poorly drained to moderately drained. The Sandy Creek floodplain consists of the Chenango-Braceville-Halsey association, a soil association found on gently sloping to moderately steep terraces and moraines underlain by glacial till. It ranges from well drained to very poorly drained. The remainder of the watershed consists of the Ravenna-Frenchtown association, a somewhat poorly drained to poorly drained association found on nearly level to gently sloping uplands (Figure 9, page 36). The Sandy Creek watershed within Mercer County also contains approximately 24,037 acres (37.56 square miles) of prime farmland soils, the majority of which remain forested (Figure 8, page 33).

Geology – Approximately 7,012 acres (11.0 square miles) of the Cuyahoga formation can be found underlying Sandy Creek in the northwest. This formation is composed of sandstone and has low porosity and low permeability. The Shenango formation makes up the floodplain of Sandy Creek, approximately 14,349 acres (22.4 square miles). This formation is composed of siltstone and has moderate to low porosity and moderate to low permeability. The Pottsville formation, composed of shale, siltstone, claystone, limestone, and coal, makes up the majority of the east, approximately 23,796 acres (37.2 square miles), has variable porosity and moderate to low permeability. The Pottsville formation is intermixed with approximately 5,579 acres (8.7 square miles) of the Allegheny formation, a formation composed of limestone, clay, and coal (Figure 5, page 28).

Slope – The watershed is relatively flat with 0-8% slopes in the southeast; however, steeper slopes (>25% in grade) can be found along Sandy Creek. The northern part of the watershed is relatively hilly, with slopes of 9-15% grade throughout. Some of the smaller streams are surrounded by slopes of 16-25% grade (Figure 7, page 31).

Land Use – The following table presents coverage of the most dominant land uses within the watershed:

Land Use	Acres	Square Miles	Percent of Watershed
Forested	27,206	42.5	54%
Farmland	15,747	24.6	31%
Wetland	2,271	3.5	<1%
Water	1,852	2.9	<1%
Low Density Urban	779	1.2	<1%
High Density Urban	718	1.1	<1%

Stormwater Management Issues Identified as Significant by Each Municipality within the Sandy Creek Watershed:

Deer Creek Township

- Finding funding to respond to stormwater related issues within Deer Creek Township
- Road flooding and berm erosion along roadways in Deer Creek Township caused by excessive runoff.
- Poor drainage and soil infiltration caused by existing soil types.
- Stabilizing peak flow conditions.
- Maintain groundwater supplies as increasing runoff decreases the amount of rain that becomes groundwater. Decreased groundwater supplies may have negative effects on well water supplies or dry up stream base flow in dry periods.
- Control the erosion of stream beds and banks, undercut roads and utilities, damage to in-stream cover, and clogging of bridges and culverts during extreme storm events.
- Resolve street and stream flooding caused by increased runoff and poor drainage.

New Vernon Township

- Stormwater controls and best management practices.
- Increased runoff entering Lake Wilhelm along Creek Road between Lake Wilhelm Road and Borland Road.
- Increased runoff from Tributary 58632 to Sandy Creek in the vicinity of the intersection of Borland Road and Irish Ridge Road.
- Control the erosion of stream beds and banks, undercut roads and utilities, damage to in-stream cover, and clogging of bridges and culverts during extreme storm events.
- Stabilizing peak flow conditions.
- Maintain groundwater supplies as increasing runoff decreases the amount of rain that becomes groundwater. Decreased groundwater supplies may have negative effects on well water supplies or dry up stream base flow in dry periods.
- Regulate and monitor overbank flows associated with extreme storm events.

Salem Township

- Control the erosion associated with roadways and keeping culverts free of obstructions.
- Stabilizing peak flow conditions.
- Control the erosion of stream beds and banks, undercut roads and utilities, damage to in-stream cover, and clogging of bridges and culverts during extreme storm events.
- Regulate stream flooding, soil erosion, stream bed and bank erosion, in-stream sedimentation, and bridge/culvert damage caused by increased runoff.

Sandy Creek Township

- Control stream bank erosion along Sandy Creek in the vicinity of Armour Road and Old Perry Road.
- Control stream bank erosion along Tributary 58652 to Sandy Creek in the Vicinity of Larimer Road.
- Control the erosion of stream beds and banks, undercut roads and utilities, damage to in-stream cover, and clogging of bridges and culverts during extreme storm events.
- Regulate stream flooding, soil erosion, stream bed and bank erosion, and bridge/culvert damage caused by increased runoff, undersized structures, and floodplain development.

Borough of Sandy Lake

- Sandy Lake Borough is situated in a low area, affected not only by situations within the borough, but also by conditions outside their corporate boundaries.
- Sandy Lake outlet to Sandy Creek – The Borough of Sandy Lake has suggested that the outlet is in need of dredging.
- Culverts under Pintree Drive have been plugged by a beaver. Pennsylvania Game Commission and PennDOT have been made aware of the problem.
- McCutchoen Run at Broad Street and Laura Drive – The box culvert under Broad Street has been obstructed. During storms the runoff along the course of Laura Drive can reach sufficient velocity to cause considerable damage.
- Hamilton Hill – Undersized culverts have caused culvert clogging and street flooding.
- Unnamed wet weather stream entering Sandy Lake Borough from the south – This stream originates at the outlet of a

pond on the east side of SR 173 south of town. This stream catches water from Lakeview and Oakview School properties, possibly two (2) churches, and state highway runoff. If one walks south from Elbow Street in the Borough, severe stream bank erosion will be observed. The Borough of Sandy Lake has suggested that a storm retention device and a trash rack upstream from Elbow Street would alleviate this situation.

- Flooding and property damage (basement flooding) has occurred in the vicinity of Elbow Street.
- Sandy Lake Borough has recently replaced approximately 250' of pipe and a box culvert at a crossing of Mercer Street.
- High Street – A wet weather stream crossing under High Street has the potential for washing out due to trash in the culvert crossing.
- Patton Road, (aka Coal Hill) – Patton Road is a one quarter (1/4) mile, of steep, paved roadway that has a high potential for wash out. The runoff contributes to storm water on North Main Street.
- Mill Street – Mill Street has the potential for washing due to its long, steep gradient and the collection of runoff from adjacent properties. Its ditches have been enclosed with culvert pipes with inlets at intervals along its length.
- Main Street – The elevation of the pavement on Main Street is 6"–8" higher than it was 40+ years ago. Currently, no curb exists on North Main Street (north of the traffic light). As a result, ponding occurs at many of the intersections. PennDOT storm sewers at the traffic light (intersection of SR 0062, SR 0358, and SR 0173) are inadequate. The Borough of Sandy Lake has suggested that a major storm water study be performed by PennDOT and appropriate action taken.
- Stabilizing peak flow conditions.
- Decrease watershed pollution including dissolved and un-dissolved pollutants from increased runoff causing negative impacts to recreation, aesthetics, and in-stream habitat.
- Maintain groundwater supplies as increasing runoff decreases the amount of rain that becomes groundwater. Decreased groundwater supplies may have negative effects on well water supplies or dry up stream base flow in dry periods.

- Control the erosion of stream beds and banks, undercut roads and utilities, damage to in-stream cover, and clogging of bridges and culverts during extreme storm events.
- Regulate and monitor overbank flows associated with extreme storm events.

Sandy Lake Township

- Haun Hill Road often washes out due to excessive runoff.
- Triple Link Road frequently floods due to obstructions in the stream. Sandy Lake Township has suggested the re-routing and cleaning of the stream.
- Regulate stream flooding, street flooding, soil erosion, in-stream sedimentation, property damage, pollution, and bridge/culvert damage caused by increased runoff, undersized structures, and floodplain development.

Borough of Stoneboro

- In-stream obstructions cause pooling and prevent water transport downstream.
- Stream flooding exists in the vicinity of the intersection of Mercer Road and Mine Road. The Borough of Stoneboro has suggested a rerouting of the stream.
- A beaver dam exists east of Sandy Lake in the vicinity of Linden Road backing up water and preventing normal drainage. The Borough of Stoneboro has suggested the removal of the beaver dam.
- A beaver dam exists south of Sandy Lake in the vicinity of Franklin Road backing up water and preventing normal drainage. The Borough of Stoneboro has suggested the removal of the beaver dam.
- A beaver dam exists south of Sandy Lake along Sawmill Run backing up water and preventing normal drainage. The Borough of Stoneboro has suggested the removal of the beaver dam.
- Regulate stream, street, and property flooding, in-stream sedimentation, and property damage caused by poor drainage.
- Stabilizing peak flow conditions.

- Decrease watershed pollution including dissolved and un-dissolved pollutants from increased runoff causing negative impacts to recreation, aesthetics, and in-stream habitat.
- Maintain groundwater supplies as increasing runoff decreases the amount of rain that becomes groundwater. Decreased groundwater supplies may have negative effects on well water supplies or dry up stream base flow in dry periods.
- Control the erosion of stream beds and banks, undercut roads and utilities, damage to in-stream cover, and clogging of bridges and culverts during extreme storm events.

Worth Township

- Regulate moderate stream bed and bank erosion.

Agency Comments

- *DCNR Bureau of State Parks:* "Yellow Boy" in seep run located 500 feet west of dam breast on Creek Road.
- *DCNR Bureau of State Parks:* Creek road is un-paved and the terrain to the south of the road is steep. Sediment is carried by small runs and road ditches directly into the lake.
- *DCNR Bureau of State Parks:* Considerable sedimentation enters the lake from existing tributaries, especially Dugan's Run and James Run. Need for the development of new Conservation Plans for farming in the park.
- *DCNR Bureau of State Parks:* Monitor the development of proposed natural gas wells within the park.
- *Mercer County Conservation District:* In Stoneboro Borough, Sawmill Run has sedimentation and bank erosion.
- *Mercer County Conservation District:* Un-named tributary of Sandy Creek from Lakeview High School to mouth experiences flooding and sedimentation. In the Borough of Sandy Lake, an un-named tributary to Sandy Creek from Oakview Elementary to US 62 has erosion, sedimentation, and flooding.
- *Mercer County Conservation District:* Stoneboro Lake at SR 845 has flooding issues.
- *Mercer County Conservation District:* McCutcheon Run from Lara Lane to mouth in Borough of Sandy Lake has sedimentation and flooding.

4.4 Wolf Creek Watershed

The following municipalities lie within the Wolf Creek watershed: all of Grove City Borough and , Pine Township , and portions of Liberty Township, Springfield Township, Wolf Creek Township, and Worth Township.

The primary stormwater concern in the Wolf Creek watershed was increased runoff. Secondary issues included poor drainage and stream flooding. Other issues mentioned were: bank erosion, inadequate stormwater facilities, and clogged culverts.

The Wolf Creek watershed makes up the southeast corner of Mercer County. It drains approximately 63,870 acres (99.8 square miles), of which 50,078 acres (78.2 square miles) are located within Mercer County. This watershed's drainage flows out of the county to the south and into Slippery Rock Creek which flows into the Beaver River, part of the Ohio River watershed. In general, the Wolf Creek watershed is relatively flat in topography. It consists of poorly drained soils with underlying bedrock that has moderate to low porosity and permeability, predisposing the area to excess runoff. Areas of high density urban land use within the watershed include Grove City and East Lackawannock. As development continues in these areas and in areas in the headwaters of the Wolf Creek watershed, runoff will increase due to the increase of impermeable surface (paving, structures, etc.) coupled with the impermeable soils and bedrock. The remainder of the watershed consists mainly of a mixture of forest and farmland. Wetlands are also noted in the vicinity of Wolf Creek. These wetlands provide flood storage and help water to infiltrate into the groundwater rather than running off into and flooding nearby creeks. Following is a detailed description of the French Creek watershed within Mercer County:

Soils – The primary soil association is the Ravenna-Frenchtown association. This association is found on nearly level to gently sloping uplands within the watershed and ranges from somewhat poorly drained to poorly drained. The Chenango-Braceville-Halsey association is prevalent along Wolf Creek and Swamp Run. This association can range from being well drained to very poorly drained and is found on gently sloping to moderately steep moraines and stream terraces and is underlain by sand and gravel deposits. A small

portion of the Canfield-Ravenna association can be found in the extreme south along Wolf Creek. This soil association can be moderately well drained and somewhat poorly drained, and is found on gently sloping to moderately steep uplands underlain by glacial till (Figure 9, page 36). This watershed also contains 25,250 acres (39.5 square miles) of prime farmland soils, of which approximately 1/3 are currently used for farming (Figure 8, page 33).

Geology – The main bedrock feature in this watershed is the Pottsville formation, encompassing 30,835 acres (48.2 square miles). This formation is composed of shale, siltstone, claystone, limestone, and coal. It has variable porosity and a moderate to low permeability. The northern part of the watershed contains 3,844 acres (6.0 square miles) of the Shenango formation, consisting of siltstone, and having moderate to low porosity and permeability. Approximately 15,400 acres (24.1 square miles) of the Allegheny formation, composed of limestone, clay and coal, and having low porosity and moderate to low permeability can be found in the southeast (Figure 5, page 28).

Slope – Though the majority of the watershed is relatively flat, having 0-8% grade, some of the areas around streams have steeper slopes ranging from 9%-25% grade. These areas are found mainly in the north (Figure 7, page 31).

Land Use – The following table presents coverage of the most dominant land uses within the watershed:

Land Use	Acres	Square Miles	Percent of Watershed
Forested	22,363	34.9	45%
Farmland	18,187	28.4	36%
Wetland	2,752	4.3	<1%
High Density Urban	1,932	3.0	<1%
Low Density Urban	940	1.5	<1%
Water	568	0.9	<1%

Stormwater Management Issues Identified as Significant by Each Municipality within the Wolf Creek Watershed

Borough of Grove City

- Completion of the East Pine Street storm water collection system to alleviate localized flooding and ponding concerns.
- Management of flooding increased by development and inadequate storm facilities**.** The construction of a new storm sewer from CN Railroad along East Pine Street to Wolf Creek may solve this problem.
- Stabilization of peak flow conditions.
- Control of stream, street, and property flooding issues associated with extreme storm events.
- Management of sediment transport issues including scour at outfalls, property damage, and in-stream sedimentation.
- Decrease watershed pollution including dissolved and un-dissolved pollutants from increased runoff causing negative impacts to recreation, aesthetics, and in-stream habitat.

Liberty Township

- Extreme storm events cause street flooding, soil erosion, and damage to bridges/ culverts. Increased runoff has caused these problems to escalate in particular in the areas of Old Mill Road and Plain Grove Road.

Pine Township

- Maintenance and control of culverts that have occasionally been clogged.
- Property flooding, property damage, and stream bed/bank erosion caused by increased surface runoff and poor drainage.
- Stabilization of peak flow conditions.
- Control the erosion of stream banks and beds, causing undercut roads and utilities, damage to in-stream habitat, and clogging to culverts and bridges.

Springfield Township

- Maintenance and control of stormwater caused by increased runoff along Route 208, near Prime Outlet Mall.
- Extreme storm events cause stream flooding, property damage, erosion of stream banks and beds, and bridge/culvert damage caused by increased surface runoff and poor drainage.

- Stabilization of peak flow conditions.
- Control the erosion of stream banks and beds, causing undercut roads and utilities, damage to in-stream habitat, and clogging to culverts and bridges.
- Decrease watershed pollution including dissolved and un-dissolved pollutants from increased runoff causing negative impacts to recreation, aesthetics, and in-stream habitat.

Wolf Creek Township

- Find and implement a solution to the Beaver Dam problem on Scrub Grass Road. This is a potentially very dangerous situation and lowering the Beaver Dam and installing guide rails may alleviate the danger.
- Maintenance and control of flooding associated with small tributaries during extreme storm events.
- Low areas prone to flooding exist at: Sophen Road near the eastern most tributary of the East Branch of Wolf Creek, at Patterson School Road at the southernmost tributary to the East Branch of Wolf Creek, and at Creek Road at a northern tributary to Wolf Creek.
- General stream flooding due to heavy rainfall occurs along Centertown Road at the East Branch of Wolf Creek.

Worth Township

- Regulate moderate stream bed and bank erosion.

Agency Comments

- *PA Fish & Boat Commission*: Direct access of storm drain into creek at Oregon Road in Springfield Township.
- *PA Fish & Boat Commission*: Wolf Creek is full of sediment downstream from site of dam removal.
- *Mercer County Conservation District:* Wolf Creek upstream of SR 108 through the Borough of Grove City to the Borough line has bank erosion and sedimentation.

4.5 Slippery Rock Creek

Only a small portion of Mercer County lies within Slippery Rock Creek watershed, including: portions of Liberty Township, and Springfield Township.

Within the Slippery Rock Creek watershed, the primary stormwater related concern was increased runoff, with the secondary issue being stream flooding.

A small portion of the Slippery Rock Creek watershed is located in the southeast part of the county. It drains an area of approximately 194,340 acres (303.7 square miles), of which 2,892 acres (4.5 square miles) are located within Mercer County. This watershed's drainage flows out of the county to the south into the Beaver River, part of the Ohio River watershed. In general, the Slippery Rock Creek watershed is relatively flat in topography with few slightly steeper slopes. The watershed consists of poorly drained soils with underlying bedrock that has moderate to low porosity and permeability, predisposing the area to excess runoff. Aside from a few small areas of low density urban areas, the majority of the Slippery Rock Creek watershed that lies within Mercer County consists primarily of forest and farmland. Following is a detailed description of the Slippery Rock Creek watershed within Mercer County.

Soils – The Canfield-Ravenna association makes up the small part of the Slippery Rock Creek watershed that lies within Mercer County. This association can be found on gently sloping to moderately steep uplands, and is underlain by glacial till. This association ranges from moderately well drained to somewhat poorly drained (Figure 9, page 36). The Slippery Rock Creek watershed also contains 1,508 acres (2.4 square miles) of prime farmland soils, the majority of which are currently forested (Figure 8, page 33).

Geology – The majority of this watershed is composed of approximately 2,171 acres (3.4 square miles) of the Allegheny formation. This formation consists of limestone, clay, and coal and has low porosity and moderate to low permeability. The remainder of the watershed is composed of the Pottsville formation, which consists

of shale, siltstone, claystone, limestone, and coal. It has variable porosity and moderate to low permeability (Figure 5, page 28).

Slope – In general, the part of the Slippery Rock Creek watershed that lies within Mercer County is relatively flat having a 0-8% grade. A small portion of the northern aspect of the watershed is hilly in topography, having a grade of 16%-25% (Figure 7, page 31).

Land Use – The following table presents coverage of the most dominant land uses within the watershed:

Land Use	Acres	Square Miles	Percent of Watershed
Forested	1,290	2.0	45%
Farmland	1,165	1.8	40%
Wetland	186	0.3	<1%
Low Density Urban	60	0.1	<1%
High Density Urban	38	0.1	<1%
Water	39	0.1	<1%

Stormwater Management Issues Identified as Significant by Each Municipality within the Slippery Rock Creek Watershed

Liberty Township

- There were no comments related to this watershed.

Springfield Township

- Extreme storm events cause stream flooding, property damage, erosion of stream banks and beds, and bridge/culvert damage caused by increased surface runoff and poor drainage.
- Stabilization of peak flow conditions.
- Control the erosion of stream banks and beds, causing undercut roads and utilities, damage to in-stream habitat, clogging to culverts and bridges.
- Decrease watershed pollution including dissolved and un-dissolved pollutants from increased runoff causing negative impacts to recreation, aesthetics, and in-stream habitat.

4.6 Neshannock Creek Watershed

The following municipalities lie within the Neshannock Creek watershed: all of Coolspring Township, Findley Township, Fredonia Borough, Jackson Center Township, Jackson Township and Mercer Borough, and portions of Delaware Township, East Lackawannock Township, Fairview Township, Jefferson Township, Lake Township, a Otter Creek Township, Perry Township, Springfield Township, Wilmington Township, Wolf Creek Township, and Worth Township.

Within the Neshannock Creek watershed, the primary stormwater related concern was increased runoff, with secondary issues being undersized culverts and poor drainage. Other issues included: stream flooding, stream erosion, ponding and road flooding, and floodplain development.

The Neshannock Creek watershed is located in the southeast portion of Mercer County, adjacent to and to the west of the Wolf Creek watershed. It drains an area of approximately 123,406 acres (192.8 square miles), of which 92,815 acres (145.0 square miles) are located within Mercer County. This watershed's drainage flows out of the county to the south and drains into the Beaver River, part of the Ohio River watershed. In general, the Neshannock Creek watershed is relatively flat in topography with some steep slopes along the southern reach of Neshannock Creek. The watershed consists of poorly drained soils with underlying bedrock that has moderate to low porosity and permeability, predisposing the area to excess runoff. High density urban areas exist in Mercer and Fredonia. There are several high density urban areas dotted along Route 62, and a low density urban/commercial area around Lake Latonka. All of the urban areas can cause increased runoff due to increased pavement from parking lots and roads. When mismanaged, this runoff will flood Neshannock Creek and its tributaries. The remainder of the watershed is forested in the south central portion and consists primarily of farmland in the north. Following is a detailed description of the Neshannock Creek watershed within Mercer County:

Soils – Neshannock Creek is underlain by the Wayland, coarse variant-Papakating-Red Hook association, found on nearly level floodplains underlain by alluvium. This soil association ranges from very poorly drained to moderately drained. The Chenango-Braceville-Halsey

association is found in the south in the floodplain of the creek. This association consists of well drained to very poorly drained soils found on gently sloping to moderately steep stream terraces and moraines underlain by sandy and gravelly deposits. In the north, the Canfield-Ravenna association is common. This association is moderately drained to somewhat poorly drained and is found on gently sloping to moderately steep uplands underlain by glacial till. The remainder of the watershed contains the Ravenna-Frenchtown association, somewhat poorly drained to poorly drained soils found on nearly level to gently sloping uplands (Figure 9, page 36). The Neshannock Creek watershed within Mercer County also contains 53,655 acres (83.8 square miles) of prime farmland soils, the majority of which are being farmed, especially in the north (Figure 8, page 33).

Geology – Underlying Neshannock Creek is approximately 12,046 acres (18.8 square miles) of the Shenango formation. This formation is composed of siltstone and has moderate to low porosity and moderate to low permeability. Approximately 1,358 acres (2.1 square miles) of the Cuyahoga group also underlies a small portion of the creek. This association is composed of sandstone and has low porosity and low permeability. Approximately 60,041 acres (93.81 square miles) of the Pottsville formation underlie this watershed. This formation consists of shale, siltstone, claystone, limestone, and coal. It has variable porosity and moderate to low permeability. Only 1,358 acres (2.1 square miles) of the Cuyahoga formation are found within this watershed. This formation is composed of sandstone and has low porosity, and low permeability (Figure 5, page 28).

Slope – In general, the part of the Neshannock Creek watershed that lies within Mercer County is somewhat flat with rolling hills having 0%-15% grade. There are some slopes >25% along the southern reach of Neshannock Creek (Figure 7, page 31).

Land Use – The following table presents coverage of the most dominant land uses within the watershed:

Land Use	Acres	Square Miles	Percent of Watershed
Farmland	39,832	62	43%
Forested	39,366	62	42%
Wetland	3,244	5.1	<1%
Low Density Urban	1,891	3.0	<1%
High Density Urban	1,512	2.4	<1%
Water	825	1.3	<1%

Stormwater Management Issues Identified as Significant by Each Municipality within the Neshannock Creek Watershed

Coolspring Township

- The maintenance of debris transported and collected by Tributary 35698 to Otter Creek. Coolspring Township has suggested cleaning the creek channel.
- Stabilizing peak flow conditions.
- Decrease watershed pollution including dissolved and un-dissolved pollutants from increased runoff causing negative impacts to recreation, aesthetics, and in-stream habitat.
- Maintain groundwater supplies as increasing runoff decreases the amount of rain that becomes groundwater. Decreased groundwater supplies may have negative effects on well water supplies or dry up stream base flow in dry periods.
- Control the erosion of stream beds and banks, undercut roads and utilities, damage to in-stream cover, and clogging of bridges and culverts during extreme storm events.
- Regulate and monitor overbank flows associated with extreme storm events.

Delaware Township

- Control the erosion of stream beds and banks, undercut roads and utilities, damage to in-stream cover, and clogging of bridges and culverts during extreme storm events.
- Stabilizing peak flow conditions.
- Regulate and monitor overbank flows associated with extreme storm events.

- Property damage, bridge/culvert damage, and street flooding have occurred along Redfoot Road as a result of poor drainage and undersized structures insufficiently transporting stormwater.
- Property damage, bridge/culvert damage, street flooding, and scour at outfalls has occurred along Kelso Road as a result of poor drainage and undersized structures insufficiently transporting stormwater.
- Delaware Township feels that current practices need to be made friendlier when replacing existing structures (i.e. bridges, large culverts); for instance, the permit process needs to be waived or expedited**.**

East Lackwannock Township

- Control the flooding of streams and streets, soil erosion, stream bed and bank erosion, in-stream sedimentation, habitat/resource damage caused by increased runoff from the development of parking lots, yards, streets, and roads.
- Decrease watershed pollution including dissolved and un-dissolved pollutants from increased runoff causing negative impacts to recreation, aesthetics, and in-stream habitat.
- Maintain groundwater supplies as increasing runoff decreases the amount of rain that becomes groundwater. Decreased groundwater supplies may have negative effects on well water supplies or dry up stream base flow in dry periods.
- Monitor and management of increased runoff from Gabany's proposed development near the borough of Mercer.

Findley Township

- The dredging and cleaning of the Pine Run tributary in several areas where they run adjacent to a township or state road.
- Noted a severe runoff issue one mile north of the intersection of Elliott Road and Springfield Church Road, on Springfield Church Road.
- Culverts or bridges are clogged due to increased runoff and poor drainage in Pine Run, Tributary 63829 to Pine Run, and Tributary 35770 to Mill Creek. Findley Township proposes clearing or dredging debris from Pine Run.
- A runoff problem exists on the properties between McMillan Road, Mariacher Road, Clintonville Road, Scrubgrass Road,

and Route 58. Findley Township proposes the implementation of a SWMP.
- Stormwater leeching from mismanaged driveways and private property during and after construction.
- Inadequate drainage culverts on state highways causing flooding during severe storm events.
- Stabilizing peak flow conditions.
- Decrease watershed pollution including dissolved and un-dissolved pollutants from increased runoff causing negative impacts to recreation, aesthetics, and in-stream habitat.
- Control the erosion of stream beds and banks, undercut roads and utilities, damage to in-stream cover, and clogging of bridges and culverts during extreme storm events.
- Stream flooding, increased sedimentation in streams, and bed and bank erosion caused by increased runoff and poor drainage.
- Findley Township would like to discuss the regulations associated with cleaning the streams, and would like to have a copy of the current watershed management procedures.

Borough of Fredonia
- Moderate stream flooding caused by increased runoff.

Jackson Township
- The property adjoining logged areas near intersection of Cape Horn Road and Cottage Road is prone to severe flooding and property damage after storm events. Jackson Township has contacted the DEP, the property owner, and the logging company with no result.
- The property surrounding Tributary 35820 to Cool Spring Creek has experienced flooding and property damage after severe storm events. Jackson Township has replaced and enlarged a culvert pipe and redirected the flow of water.
- Sewage drainage from Jackson Center Borough Sewer Plant has entered Yellow Creek creating concerns surrounding fish and wildlife health. Jackson Township has contacted the DEP, Pennsylvania Fish and Boat Commission, Pennsylvania Game Commission, and the Jackson Center Borough with no result.

- Flooding, bank erosion, property damage, and surface water/bridge concerns occur on South Foster Road following severe storm events.
- Flooding and bridge concerns occur on Millbrook Road following severe storm events.
- Water runoff following severe storm events causes safety concerns associated with culverts, berms, and ditches along South Foster Road. Jackson Township has attempted to fill ditches with oversized rock for drainage.
- Controlling runoff and stream erosion.
- Decrease watershed pollution including dissolved and un-dissolved pollutants from increased runoff causing negative impacts to recreation, aesthetics, and in-stream habitat.
- Maintain groundwater supplies as increasing runoff decreases the amount of rain that becomes groundwater. Decreased groundwater supplies may have negative effects on well water supplies or dry up stream base flow in dry periods.
- Regulate and monitor overbank flows associated with extreme storm events.

Jefferson Township

- Stabilizing peak flow conditions.
- Control the erosion of stream beds and banks, undercut roads and utilities, damage to in-stream cover, and clogging of bridges and culverts caused by increased surface runoff during extreme storm events.

Borough of Mercer

- Frequent flooding specific to inadequate state highway drainages exemplified by Maple Street. Storm culverts have been installed by the state in few areas.
- Poor stormwater controls surrounding the school. Stormwater (catch basin) facilities installed by the school.
- Management of stream, street, and property flooding caused by the natural terrain and topography of the eastern portion of Mercer Borough.
- Stabilizing peak flow conditions.
- Controlling stormwater from bordering municipalities.
- Controlling stormwater from the school district.

Otter Creek Township

- Control the erosion of stream beds and banks, undercut roads and utilities, damage to in-stream cover, and clogging of bridges and culverts caused by increased surface runoff during extreme storm events.
- Maintain groundwater supplies as increasing runoff decreases the amount of rain that becomes groundwater. Decreased groundwater supplies may have negative effects on well water supplies or dry up stream base flow in dry periods.
- Stabilizing peak flow conditions.
- Regulate and monitor overbank flows associated with extreme storm events.
- Property damage, bridge/culvert damage, stream, street, and property flooding have occurred as a result of poor drainage and undersized structures insufficiently transporting stormwater.

Springfield Township

- Extreme storm events cause stream flooding, property damage, erosion of stream banks and beds, and bridge/culvert damage caused by increased surface runoff and poor drainage.
- Stabilization of peak flow conditions.
- Control the erosion of stream banks and beds, causing undercut roads and utilities, damage to in-stream habitat, clogging to culverts and bridges.
- Decrease watershed pollution including dissolved and un-dissolved pollutants from increased runoff causing negative impacts to recreation, aesthetics, and in-stream habitat.

Wilmington Township

- Control the erosion of stream banks and beds, soil erosion, in-stream sedimentation, undercut roads and utilities, damage to in-stream habitat, clogging to culverts and bridges caused by increased runoff, poor drainage, and undersized structures.
- Control the erosion of farmland soils in the vicinity of White Chapel Road.
- Control the erosion of stream banks and beds, and scour at outfalls along Indian Run in the vicinity of Indian Run Road.

- Maintain groundwater supplies as increasing runoff decreases the amount of rain that becomes groundwater. Decreased groundwater supplies may have negative effects on well water supplies or dry up stream base flow in dry periods.
- Stabilizing peak flow conditions.

Wolf Creek Township

- Maintenance and control of flooding associated with small tributaries during extreme storm events.
- Regulate and monitor overbank flows associated with extreme storm events.
- Control the erosion of stream banks and beds, soil erosion, in-stream sedimentation, undercut roads and utilities, damage to in-stream habitat, clogging to culverts and bridges caused by increased runoff.

Worth Township

- Regulate moderate stream bed and bank erosion.

Agency Comments

- *PA Game Commission*: Acid Mine Drainage on State Game Land #284 east of Pennsy Road in Springfield Township.
- *PA Game Commission*: Possible runoff, pollution from the Old Fredonia Dump on State Game Lands #294 in Fairview Township.
- *PA Game Commission*: Potential Acid Mine Drainage from Old Mine #2 (out of Mercer County) could enter the county.
- *Shenango River Watchers*: Runoff from Auto Auction reached Coolspring Creek and caused trout kill.
- *PA Fish & Boat Commission*: Fertilizer run-off into Coolspring Creek and flowing into Lake Latonka is causing algae in the lake.
- *PA Fish & Boat Commission*: Acid Mine drainage in Neshannock Creek Watershed into Otter Creek near Scrubgrass Road.
- *Mercer County Conservation District:* Un-named tributary of Munnel Run from Lamor Road in East Lackawannock Township to mouth has flooding and sedimentation.

- *Mercer County Conservation District:* Un-named tributary of Neshannock Creek from US 62 to Brandy Springs Park in Mercer Borough has flooding and sedimentation.
- *Mercer County Conservation District:* Munnel Run from US 19 to mouth has flooding and bank erosion.
- *Mercer County Conservation District:* Otter Creek from ITT Reznor to mouth in Mercer Borough has flooding and bank erosion.
- *Mercer County Conservation District:* Coolspring Creek at SR 58 in Mercer Borough has flooding.
- *Mercer County Conservation District:* Neshannock Creek from SR 58 in Mercer Borough to Blacktown Road has bank erosion and flooding.
- *Mercer County Conservation District:* Coolspring Creek upstream of Lake Latonka has sedimentation and bank erosion.

4.7 Little Neshannock Creek Watershed

The following municipalities lie within the Little Neshannock Creek watershed: portions of East Lackawannock Township, City of Hermitage, Jefferson Township, Lackawannock Township, Shenango Township, and Wilmington Township.

The primary stormwater concern within the Little Neshannock Creek watershed was increased runoff. Secondary issues were undersized culverts, and poor drainage. Other issues mentioned included development within floodplains, field flooding, and stream bank erosion.

The Little Neshannock Creek watershed is located adjacent to and just west of the Neshannock Creek watershed. It drains an area of 32,410 acres (50.6 square miles), of which 26,768 acres (41.8 square miles) are located within Mercer County. This watershed's drainage flows out of Mercer County to the south and into Neshannock Creek which flows into the Beaver River, part of the Ohio River watershed. In general, the Little Neshannock Creek watershed is somewhat flat in topography, becoming steeper along Little Neshannock Creek. It consists of poorly drained soils with underlying bedrock that has moderate to low porosity and permeability, predisposing the area to

excess runoff. Areas of high density urban land use within the watershed include New Wilmington and small areas of high and low density urban land use dotted along Route 518. The remainder of the watershed consists mainly of a mixture of forest and farmland. Wetlands are also noted in the vicinity of Little Neshannock Creek. These wetlands provide flood storage and help water to infiltrate into the groundwater rather than running off into and flooding nearby creeks. Following is a detailed description of the Little Neshannock Creek watershed within Mercer County:

Soils – Little Neshannock Creek is surrounded by the Canfield-Ravenna association, found on gently sloping to moderately steep uplands underlain by glacial till. It is a moderately well drained and somewhat poorly drained soil association. Parts of this watershed also contain a small amount of the Chenango-Braceville-Halsey association, a well drained to very poorly drained soil type found on gently sloping to moderately steep stream terraces and moraines underlain by sandy and gravelly deposits. The remainder of the watershed contains the Ravenna-Frenchtown association, somewhat poorly drained to poorly drained soils found on nearly level to gently sloping uplands (Figure 9, page 36). This watershed also contains approximately 14,598 acres (22.8 square miles) of prime farmland soils, the majority of which are being farmed (Figure 8, page 33).

Geology – At the northern tip of the watershed is a small, 32 acre (.05 square mile) section of the Shenango formation, composed of siltstone, and having moderate to low porosity and moderate to low permeability. The majority of the watershed, 23,951 acres (37.4 square miles), is composed of the Pottsville formation, composed of shale, siltstone, claystone, limestone, and coal. This formation has variable porosity and moderate to low permeability. Approximately 2,794 acres (4.4 square miles) of the Allegheny formation is found within the Little Neshannock Creek watershed. This formation has moderate to low porosity and moderate to low permeability (Figure 5, page 28).

Slope – The majority of the watershed is flat, having 0%-8% grade. The watershed becomes relatively hilly around Little Neshannock Creek and its West Branch, having 16-25% grade. Part of the land along

Little Neshannock Creek, is very steep and has a >25% grade (Figure 7, page 31).

Land Use – The following table presents coverage of the most dominant land uses within the watershed:

Land Use	Acres	Square Miles	Percent of Watershed
Farmland	12,642	19.8	47%
Forested	10,065	15.7	38%
Wetland	1,176	1.8	<1%
Low Density Urban	791	1.2	<1%
High Density Urban	326	0.5	<1%
Water	48	0.1	<1%

Stormwater Management Issues Identified as Significant by Each Municipality within the Little Neshannock Creek Watershed.

East Lackwannock Township

- Control the flooding of streams and streets, soil erosion, stream bed and bank erosion, in-stream sedimentation, habitat/resource damage caused by increased runoff from the development of parking lots, yards, streets, and roads.
- Decrease watershed pollution including dissolved and un-dissolved pollutants from increased runoff causing negative impacts to recreation, aesthetics, and in-stream habitat
- Maintain groundwater supplies as increasing runoff decreases the amount of rain that becomes groundwater. Decreased groundwater supplies may have negative effects on well water supplies or dry up stream base flow in dry periods.
- Monitor and management of increased runoff from Gabany's proposed development near the borough of Mercer.

City of Hermitage

- Moderate stream flooding caused by increased runoff.
- Stabilizing peak flow conditions.

- Decrease watershed pollution including dissolved and un-dissolved pollutants from increased runoff causing negative impacts to recreation, aesthetics, and in-stream habitat.
- Control the flooding of streams and streets, soil erosion, stream bed and bank erosion, in-stream sedimentation, habitat/resource damage caused by increased runoff from the development of parking lots, yards, streets, and roads.
- Control the erosion of stream beds and banks, undercut roads and utilities, damage to in-stream cover, and clogging of bridges and culverts during extreme storm events.
- Maintenance and control of flooding associated with small tributaries during extreme storm events.
- Allocating the funding to maintain the existing stormwater system and to make improvements.

Jefferson Township

- Stabilizing peak flow conditions.
- Control the erosion of stream beds and banks, undercut roads and utilities, damage to in-stream cover, and clogging of bridges and culverts caused by increased surface runoff during extreme storm events.

Shenango Township

- Control the erosion of stream banks and beds, soil erosion, in-stream sedimentation, undercut roads and utilities, damage to in-stream habitat, clogging to culverts and bridges caused by increased runoff, poor drainage, and undersized structures.
- Monitor and management of increased runoff and field flooding on Fennel Road.
- Maintain groundwater supplies as increasing runoff decreases the amount of rain that becomes groundwater. Decreased groundwater supplies may have negative effects on well water supplies or dry up stream base flow in dry periods.
- Control the erosion of stream beds and banks, undercut roads and utilities, damage to in-stream cover, and clogging of bridges and culverts caused by increased surface runoff during extreme storm events.

Wilmington Township

- Control the erosion of stream banks and beds, soil erosion, in-stream sedimentation, undercut roads and utilities, damage to in-stream habitat, clogging to culverts and bridges caused by increased runoff, poor drainage, and undersized structures, especially along Bend Road, Garrett Road, Orchard Road, Means Road, and Ferris Road.
- East and West branch of Little Neshannock Creek have flooding, erosion, and sediment deposition issues, especially at the Gilliland and Campbell properties.
- Scouring at outfalls along Garrett Road, with soil erosion and culvert problems also noted.
- Maintain groundwater supplies as increasing runoff decreases the amount of rain that becomes groundwater. Decreased groundwater supplies may have negative effects on well water supplies or dry up stream base flow in dry periods.
- Stabilizing peak flow conditions.
- Monitor and manage the potential for soil runoff, animal waste and fertilizer contamination into streams due to primary land use within the township being agricultural.

Agency Comments

- *Mercer County Conservation District:* Little Neshannock Creek in Wilmington Borough from SR 158 south to county line has bank erosion, sedimentation, and flooding.

4.8 Little Shenango River Watershed

The following municipalities lie within the Little Shenango River watershed: Portions of Fairview Township, Greene Township, Greenville Borough, Hempfield Township, Lake Township, New Vernon Township, Otter Creek Township, Perry Township, Salem Township, Sandy Creek Township, and all of Sugar Grove Township.

Within the Little Shenango River watershed, the primary stormwater related concern was increased runoff, with secondary issues being undersized culverts, development in the floodplains, poor drainage, and ponding on roads. Other issues included stream flooding, and sediment buildup in streams.

The Little Shenango River watershed is in the north central portion of the county. It drains an area of 69,240 acres (108.2 square miles), of

which 47,309 acres (73.9 square miles) are within Mercer County. This watershed's drainage flows into the county from the north and drains into the Shenango River, which merges with the Beaver River to form the Mahoning River, part of the Ohio River watershed. In general, the Little Shenango River watershed is relatively flat in topography with some steep slopes along the river. The watershed consists of poorly drained to moderately drained soils with underlying bedrock that has moderate to low porosity and permeability, predisposing the area to runoff. High density urban land uses are dotted along Route 358 intermixed with small areas of low density urban land use (residential areas). Only a small portion of Greenville lies within the Little Shenango River watershed. Greenville is a moderately sized, high density, urban area. The portion of Greenville within the Little Shenango watershed lies on relatively flat topography; therefore, it does not have the same runoff issues that the western portion of the municipality has. The remainder of the Little Shenango River watershed consists of mainly forested area and farmland. A considerable amount of wetlands can be found in the northwest section of the watershed. These wetlands are important because they provide flood storage and help water to infiltrate into the groundwater rather than running off into and flooding nearby creeks. Following is a detailed description of the Little Shenango River watershed within Mercer County:

Soils – The River itself is surrounded by the Wayland, course variant-Papakating-Red Hook association. This association consists of very poorly drained to moderately drained soils, found on nearly level floodplains and underlain by alluvium. Immediately surrounding that association is the Chenango-Braceville-Halsey association. This association can be well drained to very poorly drained, and is found on gently sloping to moderately steep stream terraces and moraines. It can range from being well drained to very poorly drained. A small amount of the Canfield-Ravenna association is found in the northeast, on gently sloping to moderately steep uplands underlain by glacial till. The remainder of the watershed consists of the Ravenna-Frenchtown association, somewhat poorly drained to poorly drained soils, found on nearly level to gently sloping uplands (Figure 9, page 36).

Geology – The Little Shenango River is underlain by 5,226 acres (8.2 square miles) of the Berea sandstone through Venango formation,

undivided. This bedrock formation is composed of a shale conglomerate and has moderate to low porosity and moderate to low permeability. Approximately 12,371 acres (19.3 square miles) of the Cuyahoga formation can be found underlying the floodplains. This formation is comprised of sandstone and has low porosity and low permeability. Surrounding the Cuyahoga formation is approximately 14,686 acres (23.0 square miles) of the Shenango formation, composed of siltstone and having moderate to low porosity and moderate to low permeability. The east is composed of 14,672 acres (23.0 square miles) of the Pottsville formation. This formation is composed of shale, siltstone, claystone, limestone, and coal and has variable porosity and moderate to low permeability (Figure 5, page 28).

Slope – This watershed is very flat, having 0%-8% grade throughout the majority of the north. Along the river, the watershed becomes relatively hilly with some steeper slopes 16%-25% grade to the south. Directly around the river can be found some slopes that have >25% grade (Figure 7, page 31).

Land Use – The following table presents coverage of the most dominant land uses within the watershed:

Land Use	Acres	Square Miles	Percent of Watershed
Farmland	19,314	30.2	28%
Forested	21,441	33.5	31%
Wetland	1,702	2.7	2%
Low Density Urban	1,058	1.7	2%
High Density Urban	888	1.4	1%
Water	124	0.2	>1%

Stormwater Management Issues Identified as Significant by Each Municipality within the Little Shenango River Watershed

Borough of Greenville

- Funding to upgrade existing storm water system.
- Controls and standards for issues that affect the runoff, erosion.

- Erosion of outflow drainage at Penn Power sub station off North Mercer Street – Replace outflow pipe and stabilize outflow area.
- Stabilizing peak flow conditions.
- Decrease watershed pollution including dissolved and un-dissolved pollutants from increased runoff causing negative impacts to recreation, aesthetics, and in-stream habitat
- Maintain groundwater supplies as increasing runoff decreases the amount of rain that becomes groundwater. Decreased groundwater supplies may have negative effects on well water supplies or dry up stream base flow in dry periods.
- Control the erosion of stream beds and banks, undercut roads and utilities, damage to in-stream cover, and clogging of bridges and culverts during extreme storm events.
- Regulate and monitor overbank flows associated with extreme storm events.

Hempfield Township

- New commercial development and stormwater runoff from PennDOT owned and maintained roadways.
- Stabilizing peak flow conditions.
- Control the erosion of stream beds and banks, undercut roads and utilities, damage to in-stream cover, and clogging of bridges and culverts during extreme storm events.

New Vernon Township

- Stormwater controls and best management practices.
- Control the erosion of stream beds and banks, undercut roads and utilities, damage to in-stream cover, and clogging of bridges and culverts during extreme storm events.
- Stabilizing peak flow conditions.
- Maintain groundwater supplies as increasing runoff decreases the amount of rain that becomes groundwater. Decreased groundwater supplies may have negative effects on well water supplies or dry up stream base flow in dry periods.
- Regulate and monitor overbank flows associated with extreme storm events.

Otter Creek Township

- Control road flooding and ponding north of the intersection of Route 358 and Freeland/Henry Road during heavy rain events.
- Control road flooding and ponding on Hughley Road north of the intersection of Hughley Road and Lyn Tyro Road during heavy rain events.
- Control the erosion of stream beds and banks, undercut roads and utilities, damage to in-stream cover, and clogging of bridges and culverts caused by increased surface runoff during extreme storm events.
- Maintain groundwater supplies as increasing runoff decreases the amount of rain that becomes groundwater. Decreased groundwater supplies may have negative effects on well water supplies or dry up stream base flow in dry periods.
- Stabilizing peak flow conditions.
- Regulate and monitor overbank flows associated with extreme storm events.
- Property damage, bridge/culvert damage, stream, street, and property flooding have occurred as a result of poor drainage and undersized structures insufficiently transporting stormwater.

Salem Township

- Because of the hills in Salem Township, the most important issues are wash outs on the roads and keeping the culverts open.
- Regulate stream flooding, soil erosion, stream bed and bank erosion, in-stream sedimentation, and bridge/ culvert damage caused by increased runoff.
- Control the erosion associated with roadways and keeping culverts free of obstructions.
- Stabilizing peak flow conditions.
- Control the erosion of stream beds and banks, undercut roads and utilities, damage to in-stream cover, and clogging of bridges and culverts during extreme storm events.

Sandy Creek Township

- Control stream bank erosion along Tributary 36226 to Morrison Run along Pearson Road south of the intersection of Pearson Road and Petersburg Road.
- Control the erosion of stream beds and banks, undercut roads and utilities, damage to in-stream cover, and clogging of bridges and culverts during extreme storm events.
- Regulate stream flooding, soil erosion, stream bed and bank erosion, and bridge/ culvert damage caused by increased runoff, undersized structures, and floodplain development.

Agency Comments

- *PA Fish & Boat Commission*: Erosion and flooding on Werner Road and Leech Road. Pasture flooding onto the road.
- *Mercer County Conservation District*: Flooding problems on Log Cabin Road and Leech Road in Sugar Grove Township.

4.9 Shenango River Watershed

The following municipalities lie within the Shenango River watershed: portions of Delaware Township, Greene Township, Greenville Borough, Hempfield Township, East Lackawannock Township, City of Hermitage, Jefferson Township, Lackawannock Township, Shenango Township , Wilmington Township and all of Jamestown Borough, Pymatuning Township, West Salem Township, Clark, City of Farrell, City of Sharon, Sharpsville Borough, South Pymatuning Township, West Middlesex Borough and Wheatland Borough.

The primary stormwater concern in the Shenango River watershed was increased runoff. Secondary issues included poor drainage, stream erosion, street flooding, and undersized culverts. Other issues mentioned were development in the floodplains, field flooding, and scouring at outfalls.

The Shenango River watershed drains approximately the western 1/3 of the county, an area of 279,107 acres (436.1 square miles) of which 144,500 acres (226.0 square miles) lie within Mercer County. In general, the Shenango River watershed is very flat in topography, becoming steeper along the river, with some very steep slopes along the southern portion of the river. It consists of moderately drained to

poorly drained soils with underlying bedrock that has moderate to low porosity and permeability, predisposing the area to runoff. Areas of high density urban land use within the northern half of the watershed include the majority of Greenville, the Transfer/Reynolds area, and small areas dotted along route 18. The highest density of urban and commercial land use in the county is found in the southern half of the watershed in an area called the "Shenango Valley", containing the Cities of Sharon, Hermitage, and Farrell, and the Boroughs of Sharpsville, Wheatland and West Middlesex. This dense urban land use predisposes an area to increased runoff, flooding, sedimentation, and water pollution. Because the Shenango River flows through the western portion of the Borough of Greenville, the topography is steeper along the river than in the remainder of the municipality. Route 18 into Greenville closely follows the Shenango River; therefore, that portion of Greenville has steeper slopes and extreme runoff problems after rain events. The reminder of the northern Shenango River watershed consists mainly of farmland with some forested areas, especially around the Shenango Lake Reservoir. The northwest corner of the watershed contains wetlands, some considerable in size. These wetlands provide flood storage and help water to infiltrate into the groundwater rather than running off into and flooding nearby creeks. The area surrounding the Shenango Valley consists mainly of farmland and forest, with some low density urban areas adjacent to the major county and state roads.

Municipal Separate Storm Sewer Systems (MS4s) are designed to collect polluted storm water runoff and discharge it, untreated, into local streams and rivers. The Environmental Protection Agency established Phase I of the National Pollutant Discharge Elimination System (NPDES) stormwater program in 1990 to implement a stormwater management program as a means to control polluted discharges. Phase I of NPDES requires the operators of MS4s that serve populations of 100,000 or greater to implement a stormwater management program as a means to control polluted discharges from those MS4s.

The Stormwater Phase II Rule extends coverage of the NPDES stormwater program to certain "small" MS4s but takes a slightly different approach to how the stormwater management program is developed and implemented.

EPA's Stormwater Phase II Rule establishes an MS4 stormwater management program that is intended to improve the Nation's waterways by reducing the quantity of pollutants that stormwater picks up and carries into storm sewer systems during storm events. Common pollutants include oil and grease from roadways, pesticides from lawns, sediment from construction sites, and carelessly discarded trash, such as cigarette butts, paper wrappers, and plastic bottles. When deposited into nearby waterways through MS4 discharges, these pollutants can impair the waterways, thereby discouraging recreational use of the resource, contaminating drinking water supplies, and interfering with the habitat for fish, other aquatic organisms, and wildlife (Environmental Protection Agency Website).

The DEP is responsible for administering the state's stormwater management program. Under this program, operators of small MS4 systems are required to develop and implement storm water management plans to reduce pollutant loadings to the maximum extent practicable, and must investigate and eliminate illicit connections to the storm sewer system. Implementation of the storm water management plan typically requires the development of BMP's and the achievement of measurable goals to satisfy each of the following six (6) minimum control measures: Public Education and Outreach, Public Participation and Involvement, Illicit Discharge Detection and Elimination, Construction Site Runoff Control, Post-Construction Runoff Control, and Pollution Prevention/Good Housekeeping. The Phase II Model Ordinance details BMP's that are effective in Mercer County and suggests recommendations on how the municipalities with MS4 NPDES permits can amend their current ordinances to incorporate BMP's that will be consistent with the specific requirements of their MS4 NPDES permit.

The only MS4 municipalities within Mercer County lie within the Shenango River watershed. They include the Cities of Sharon, Farrell, and Hermitage, and the Borough of Sharpsville.

Following is a detailed description of the Shenango River watershed within Mercer County:

Soils – The soils surrounding the Shenango River in the north consist mainly of the Canfield-Ravenna association, a soil association that

ranges from having moderately well drained to somewhat poorly drained characteristics. This association can be found on gently sloping to moderately steep uplands underlain by glacial till. Surrounding the Shenango River in the south is the Wayland, coarse variant-Papakating-Red Hook soil association, a very poorly drained to moderately drained association found on nearly level floodplains underlain by alluvium. Surrounding is the Canfield-Ravenna association, found on gently sloping and moderately steep uplands underlain by glacial till. This association ranges from being moderately well drained to being somewhat poorly drained. The far northern river and the southern river also are surrounded by the Wayland, course variant-Papakating-Red Hook association. This association consists of very poorly drained to moderately drained soils found on nearly level floodplains underlain by alluvium. The soils around Big Run, and in the floodplains of the southern portion of the Shenango River consist of the Chenango-Braceville-Halsey association, soils that range from being well drained to very poorly drained, and are found on gently sloping to moderately steep stream terraces and moraines and are underlain by sandy and gravelly deposits. The majority of the watershed consists of the Ravenna-Frenchtown association, a composition that is somewhat poorly drained to poorly drained and is found on the nearly level to gently sloping uplands surrounding the rivers (Figure 9, page 36).

Geology – The northern part of the river and the Shenango Reservoir is underlain by 8,016 (12.5 square miles) of the Berea Sandstone through Venango formation, undivided. This formation is composed of a shale conglomerate and has moderate to low porosity and permeability. The remainder of the river and the streams in this watershed are underlain by 55,315 acres (86.4 square miles) of the Cuyahoga group, composed of sandstone. This formation has low porosity and low permeability. Approximately 30,430 acres (47.6 square miles) of the Shenango formation, composed of siltstone is found surrounding the Cuyahoga group. The Shenango formation has moderate to low porosity and moderate to low permeability. Approximately 50,429 acres (78.9 square miles) of the Pottsville formation is found in this watershed. This formation consists of shale, siltstone, claystone, limestone, and coal. This formation has variable porosity and moderate to low permeability (Figure 5, page 28).

Slope – The general topography of the watershed is very flat, having 0%-8% grade. The land around the river is hillier, having 16%-25% grade. These slopes become steeper along the Shenango River, especially in the south where slopes can exceed 25% grade in places (Figure 7, page 31).

Land Use – The Shenango River watershed contains the highest percentage of urban land use of any watershed in Mercer County as it contains the Shenango Valley, Greenville and the Transfer/Reynolds areas. The majority of the northern portion of the watershed is farmland, intermixed with forested areas, with a forested buffer around the Shenango Lake Reservoir to the south. In the rural areas surrounding the Shenango Valley, sprawl is occurring into farmland and forested areas. The following table presents coverage of the most dominant land uses within the watershed:

Land Use	Acres	Square Miles	Percent of Watershed
Farmland	55,324	86.0	38%
Forested	53,618	83.0	37%
High Density Urban	10,930	17.0	8%
Low Density Urban	4,798	7.5	3%
Wetland	3,298	5.2	3%
Water	4,185	6.6	2%

Stormwater Management Issues Identified as Significant by Each Municipality within the Shenango River Watershed

Clark Borough

- Regulate and monitor overbank flows associated with extreme storm events.
- Stabilizing peak flow conditions.
- Decrease watershed pollution including dissolved and un-dissolved pollutants from increased runoff causing negative impacts to recreation, aesthetics, and in-stream habitat
- Control the erosion of stream beds and banks, undercut roads and utilities, damage to in-stream cover, and clogging of bridges and culverts during extreme storm events.

- Monitor and management of increased runoff from upstream municipalities into the Borough and into the Shenango Reservoir.
- Control the flooding of streams and streets, soil erosion, stream bed and bank erosion, in-stream sedimentation, habitat/resource damage caused by increased runoff from the development of parking lots, yards, streets, and roads.
- Finding the funding to pay for necessary improvements.
- Runoff causing channeling on properties between Charles Street and Valley View Road, between Charles Street and Milton Street, and between Nora Street and Winner Road. Also, noted problems on Route 258 at a culvert crossing (site shown on map).
- Flooding issues along Clay Furnace Road between Route 258 and Neshannock Road.

Delaware Township

- Property damage and soil erosion has occurred along Rock School Road, Beil Road, and Line Road as a result of increased runoff and poor drainage.
- Property damage and flooding has occurred along Stull Road as a result of poor drainage and undersized structures.
- Street flooding, bridge and culvert damage, and scour at outfalls has occurred along Quarry Road as a result of undersized structures.
- Bridge, culvert, and property damage has occurred along Heckman Road as a result of poor drainage and undersized structures.
- Control the erosion of stream beds and banks, undercut roads and utilities, damage to in-stream cover, and clogging of bridges and culverts during extreme storm events.
- Stabilizing peak flow conditions.
- Regulate and monitor overbank flows associated with extreme storm events.
- Delaware Township feels that current practices need to be made friendlier when replacing existing structures (i.e. bridges, large culverts); for instance, the permit process needs to be waived or expedited.

East Lackwannock Township

- Control the flooding of streams and streets, soil erosion, stream bed and bank erosion, in-stream sedimentation, habitat/resource damage caused by increased runoff from the development of parking lots, yards, streets, and roads.
- Decrease watershed pollution including dissolved and un-dissolved pollutants from increased runoff causing negative impacts to recreation, aesthetics, and in-stream habitat
- Maintain groundwater supplies as increasing runoff decreases the amount of rain that becomes groundwater. Decreased groundwater supplies may have negative effects on well water supplies or dry up stream base flow in dry periods.
- Monitor and management of increased runoff from private golf course along Route 62.

City of Farrell

- Stabilizing peak flow conditions.
- Decrease watershed pollution including dissolved and un-dissolved pollutants from increased runoff causing negative impacts to recreation, aesthetics, and in-stream habitat
- Control the erosion of stream beds and banks, undercut roads and utilities, damage to in-stream cover, and clogging of bridges and culverts during extreme storm events. The Route 60 North storm sewer has a heavy accumulation of debris and partial obstruction of a 60" culvert pipe.
- Monitor and management of increased runoff between Pershing Drive, Landay Lane, and DeBrakeleer Avenue.
- Correction of significant ditch erosion between Pershing Drive and DeBrakeleer Avenue

Borough of Greenville

- Funding to upgrade existing storm water system.
- Controls and standards for issues that affect the runoff, erosion.
- Flooding of Stewart Avenue several times a year. Dredge the Erie Canal detention of runoff during the development of Trinity site.
- Flooding of Lancaster, Lebanon, and York Street area several times a year. Increasing drainage sizing and dredge Erie Canal.

- Flooding and erosion of road drainage in the area of East Greenville Drive and Hempfield Drive. Re-channel water upstream or detention of water, or increase and extend piping.
- Plum and Union Street - sewer cannot be cleared causing flooding. Replace old storm sewer.
- Bracken Alley - storm sewer is undermined and sink holes appear annually. Replace rusted out pipe.
- West Drive - erosion of the road side in the area west of Clarksville Street. Flooding of Clarksville Street. Dredge and drain ditches, riprap or possibility of piping ditch.
- Saul Run at Lancaster Bridge – silt and gravel build up. Could block bridge causing damage and flooding. Dredge Channel.
- Lebanon Avenue Bridge – silt and sand build up. Could block bridge causing damage and flooding. Dredge Channel.
- Saul Run – concrete channel, silt buildup; has to be dredged every couple of years.
- Henry Camp – road floods over banks every couple of years. Dike Saul Run banks to increase capacity.
- Flooding behind the Greenville Municipal building annually. Unknown solution.
- Flooding and silt and gravel build in small streams crossing North Third Street ext. Detention ponds up stream in West Salem Township.
- Flooding at the Borough line along Orangeville Road. Detention ponds up stream in West Salem Township.
- North Second Street 24” storm sewer is caving in. It could clog and cause flooding. Upgrade the old stone and clay pipe.
- Harrison Street Storm is old and undersized. Replace the sewer system in the area of Pringles.
- York Street Flooding. This will increase as the Trinity site is developed. Dredge the Erie Canal biannually; incorporate detention measures in any new development.
- Billing Alley drainage – The drainage goes onto private property in an undersized broken pipe. The pipe needs upgraded and put on a public easement.
- Stewart Avenue and Columbia Avenue – Ponding on Columbia every time it rains.
- East Avenue and Columbia Avenue – Ponding every time it rains.

- Main Street and Grant Street Ponding – Up size the pipe under the railroad crossing.
- Clinton Street and Canal Street - Up size the pipe under the railroad crossing.
- Stabilizing peak flow conditions.
- Decrease watershed pollution including dissolved and un-dissolved pollutants from increased runoff causing negative impacts to recreation, aesthetics, and in-stream habitat
- Maintain groundwater supplies as increasing runoff decreases the amount of rain that becomes groundwater. Decreased groundwater supplies may have negative effects on well water supplies or dry up stream base flow in dry periods.
- Control the erosion of stream beds and banks, undercut roads and utilities, damage to in-stream cover, and clogging of bridges and culverts during extreme storm events.
- Regulate and monitor overbank flows associated with extreme storm events.

Hempfield Township

- New commercial development and stormwater runoff from PennDOT owned and maintained roadways.
- On Cedar Drive and Birch Drive: PennDOT has culverted the water off of Conneaut Lake Road under municipal roads and into municipal culverts. This has caused increased runoff of water into the ditches and is causing erosion of the ditches along these two residential roads. Residents are losing portions of their front yards due to wash-outs.
- Control the problem associated with the intersection of Donation and Eighth Avenue caused by an undersized pipe.
- Control ponding in the vicinity of Saul Avenue and Woodbine Avenue.
- Waugh Avenue is located in the flood plain of the Shenango River and is prone to flooding during extreme storm events.
- An undersized culvert causes problems along Saint Glory Road.
- Stabilizing peak flow conditions.
- Control the erosion of stream beds and banks, undercut roads and utilities, damage to in-stream cover, and clogging of bridges and culverts during extreme storm events.

City of Hermitage

- Flooding, sedimentation and erosion of stream banks of Baker Run, washing out residential yards.
- Moderate stream flooding caused by increased runoff.
- Stabilizing peak flow conditions.
- Decrease watershed pollution including dissolved and un-dissolved pollutants from increased runoff causing negative impacts to recreation, aesthetics, and in-stream habitat
- Control the flooding of streams and streets, soil erosion, stream bed and bank erosion, in-stream sedimentation, habitat/ resource damage caused by increased runoff from the development of parking lots, yards, streets, and roads.
- Control the erosion of stream beds and banks, undercut roads and utilities, damage to in-stream cover, and clogging of bridges and culverts during extreme storm events.
- Erosion of stream banks of Bobby Run.
- Maintenance and control of flooding associated with small tributaries during extreme storm events.
- Allocating the funding to maintain the existing stormwater system and to make improvements.

Jefferson Township

- Stabilizing peak flow conditions.
- Control the erosion of stream beds and banks, undercut roads and utilities, damage to in-stream cover, and clogging of bridges and culverts caused by increased surface runoff during extreme storm events. Erosion and culvert problems on Ballpark Road, Charleston Road, Skyline Drive, and Bend Road. Ponding on Ballpark Road and Skyline Drive.

City of Sharon

- Control the erosion of stream beds and banks, undercut roads and utilities, damage to in-stream cover, and clogging of bridges and culverts during extreme storm events.
- Decrease watershed pollution including dissolved and un-dissolved pollutants from increased runoff causing negative impacts to recreation, aesthetics, and in-stream habitat
- Maintenance and control of flooding associated with small tributaries during extreme storm events.
- Stabilizing peak flow conditions.

- Ponding noted at the Fire Station, at the corner of Dock Street and the entrance to the former Flower Lumber, on South Irvine Avenue, and at corner of East State Street and Forker Blvd. Erosion along Bay Way, along Pine Run, and beneath the 24" pipe at St. Joe's parking lot.
- A fallen tree lays across the outfall at Budd Street and Sterling Avenue.

Sharpsville Borough

- Monitor and management of increased runoff from upstream municipalities.
- Monitor and management of water quality at Buhl Farm Lakes.
- Control the erosion of stream beds and banks, undercut roads and utilities, damage to in-stream cover, and clogging of bridges and culverts caused by increased surface runoff during extreme storm events. Undersized culverts at Twitmeyer Avenue and along Thornton Run, and erosion along the channel at High Street.
- Stabilizing peak flow conditions.
- Regulate and monitor overbank flows associated with extreme storm events.
- Decrease watershed pollution including dissolved and un-dissolved pollutants from increased runoff causing negative impacts to recreation, aesthetics, and in-stream habitat
- Allocating the funding to maintain the existing stormwater system and to make improvements.

Shenango Township

- Control the erosion of stream banks and beds, soil erosion, in-stream sedimentation, undercut roads and utilities, damage to in-stream habitat, clogging to culverts and bridges caused by increased runoff, poor drainage, and undersized structures.
- Monitor and management of increased runoff and field flooding on Koncar Road and road flooding on Frampton Road where a culvert is washing out.
- Maintain groundwater supplies as increasing runoff decreases the amount of rain that becomes groundwater. Decreased

groundwater supplies may have negative effects on well water supplies or dry up stream base flow in dry periods.
- Control the erosion of stream beds and banks, undercut roads and utilities, damage to in-stream cover, and clogging of bridges and culverts caused by increased surface runoff during extreme storm events.

South Pymatuning

- Flooding and erosion issues: Buckeye Drive between Tamarack Drive and Hunter Street, Springwood Drive, erosion on Colt Road and Town Line, Buckeye Drive and Calahan, McCullough Run flooding onto Tamarack Drive and onto private properties, flooding from fields onto Tamarack Drive, flooding on Buckeye Drive, erosion at Saranac Drive and Huron, flooding on Hartford Road, flooding on Seneca Road, undersized culverts on Kane Road Seneca Drive, Tamarack Drive, Hummingbird Way, Blue Jay Way, and Maplewood Drive.
- Stabilizing peak flow conditions.
- Control the erosion of stream banks and beds, soil erosion, in-stream sedimentation, undercut roads and utilities, damage to in-stream habitat, clogging to culverts and bridges caused by increased runoff, poor drainage, and undersized structures.
- Decrease watershed pollution including dissolved and un-dissolved pollutants from increased runoff causing negative impacts to recreation, aesthetics, and in-stream habitat
- Regulate and monitor overbank flows associated with extreme storm events.
- Maintain groundwater supplies as increasing runoff decreases the amount of rain that becomes groundwater. Decreased groundwater supplies may have negative effects on well water supplies or dry up stream base flow in dry periods.

West Middlesex Borough

- Stabilizing peak flow conditions.
- Decrease watershed pollution including dissolved and un-dissolved pollutants from increased runoff causing negative impacts to recreation, aesthetics, and in-stream habitat

- Regulate and monitor overbank flows associated with extreme storm events.
- Control the erosion of stream banks and beds, soil erosion, in-stream sedimentation, undercut roads and utilities, damage to in-stream habitat, clogging to culverts and bridges caused by increased runoff, poor drainage, and undersized structures. Cited problems with erosion of the drainage ditch at Penn Avenue, drainage problems at the West Middlesex United Methodist Church parking lot, problems on Rt. 318 between School Street and Kiwanis Road, drainage problems on Route 18 in front of the High School, and increased flow on Hogback Run.
- Maintain groundwater supplies as increasing runoff decreases the amount of rain that becomes groundwater. Decreased groundwater supplies may have negative effects on well water supplies or dry up stream base flow in dry periods.
- Monitor and management of increased runoff from upstream municipalities.
- Allocating the funding to maintain the existing stormwater system and to make improvements.

West Salem Township

- Stabilizing peak flow conditions.
- Decrease watershed pollution including dissolved and un-dissolved pollutants from increased runoff causing negative impacts to recreation, aesthetics, and in-stream habitat
- Maintain groundwater supplies as increasing runoff decreases the amount of rain that becomes groundwater. Decreased groundwater supplies may have negative effects on well water supplies or dry up stream base flow in dry periods.
- Control the erosion of stream beds and banks, undercut roads and utilities, damage to in-stream cover, and clogging of bridges and culverts during extreme storm events.
- Control stream and property flooding, soil erosion, in-stream sedimentation, stream bed and bank erosion, and scour at outfalls caused by increased runoff.
- Control habitat/ resource damage from unknown causes.

Wheatland

- Stabilizing peak flow conditions.

- Decrease watershed pollution including dissolved and un-dissolved pollutants from increased runoff causing negative impacts to recreation, aesthetics, and in-stream habitat
- Regulate and monitor overbank flows associated with extreme storm events.
- Control flooding on Council Avenue just north of the Shenango River.

Wilmington Township

- Stabilizing peak flow conditions.
- Decrease watershed pollution including dissolved and un-dissolved pollutants from increased runoff causing negative impacts to recreation, aesthetics, and in-stream habitat
- Regulate and monitor overbank flows associated with extreme storm events.
- Control the erosion of stream banks and beds, soil erosion, in-stream sedimentation, undercut roads and utilities, damage to in-stream habitat, clogging to culverts and bridges caused by increased runoff, poor drainage, and undersized structures.
- Maintain groundwater supplies as increasing runoff decreases the amount of rain that becomes groundwater. Decreased groundwater supplies may have negative effects on well water supplies or dry up stream base flow in dry periods.
- Allocating the funding to maintain the existing stormwater system and to make improvements

Agency Comments

- *Shenango River Watchers*: Flooding across Route 18 North into Greenville after rain events.
- *Mercer County Conservation District:* Un-named tributaries to Big Run in Reynolds between 10th and 20th streets have flooding issues.
- *Mercer County Conservation District:* Lowango Run in New Hamburg from the mouth to SR 58 has sedimentation and bank erosion.
- *Mercer County Conservation District:* Saul Run in Greenville from CN RR to mouth has bank erosion, sedimentation, and flooding.

- *Shenango River Watchers*: Increased runoff – road flooding on State Street between Taylor Avenue and Stambaugh Avenue during rain events.
- *Shenango River Watchers*: Bank erosion issues on Shenango River near Budd Street and Shenango Valley Freeway.
- *Shenango River Watchers*: Sedimentation into river from construction of new waste water treatment plant in Sharon.
- *Shenango River Watchers*: Scrap metal along banks of river and runoff of oil into river from Mercer Company property in Sharon.
- *Shenango River Watchers*: Flooding at parking lot over Baker Run in Hermitage after every rain event.
- *Shenango River Watchers*: Flooding, bank erosion to Pine Hollow Run along Shenango Valley Freeway in Sharon.
- *Shenango River Watchers*: Flooding down streets on West Hill in Sharon during rain events.
- *Shenango River Watchers*: Flooding after every rain event at corner of Connelly Blvd. and Chestnut Street.
- *PA Fish & Boat Commission*: Flooding issues on Lamor Road in Jefferson Township.
- *PA Fish & Boat Commission*: River Road in Jefferson Township is washed out.
- *PA Fish & Boat Commission*: High sediment load in Booth Run, South Pymatuning Township.
- *PA Fish & Boat Commission*: Storm drain flows directly into stream causing erosion and pollution, especially at I-80 and Route 60 interchange, and on Dutch Lane in Hermitage.
- *PA Fish & Boat Commission*: Flooding on Edgewood Drive in Pymatuning Township.
- *Mercer County Conservation District*: Un-named tributary to the Shenango River in the west side of the campground in West Middlesex has increased sediment load, bank erosion and flooding.
- *Mercer County Conservation District:* Turkey Run in Shenango Township at Campground Road has bank erosion and increased sedimentation.
- *Mercer County Conservation District:* Hogback Run from source in Hermitage to mount has bank erosion, increased sediment load, and flooding.

- *Mercer County Conservation District:* Bobby Run from source to mount has bank erosion, sediment, and flooding.
- *Mercer County Conservation District:* In South Pymatuning Township east of Tamarack Road and Seneca Road down slope from Dean Dairy and Brookfield Farms, flooding and sedimentation noted along roadway.
- *Mercer County Conservation District:* Booth Run in West Salem Township and South Pymatuning Township from source to mouth has sedimentation, bank erosion, and flooding.
- *PA Fish & Boat Commission*: Increased sedimentation in Pine Hollow Run in Hermitage.
- *US Army Corps of Engineers (Shenango Lake Reservoir)*: Extreme sedimentation problem entering reservoir from Pine Hollow Run in Hermitage.
- *Shenango River Watchers*: Ponding on Highland Road near corner of Highland Road and Boyd Drive.
- *Mercer County Conservation District*: Flooding of Pine Hollow Run at Shenango Valley Freeway near the Honda Shop.
- *Mercer County Conservation District*: Flooding on Dutch Lane near the entrance to the trailer park.

SECTION 5

5.0 STANDARDS AND CRITERIA

5.1 Standards
5.2 Pennsylvania Department of Transportation (PennDOT)

5.0 STANDARDS AND CRITERIA

5.1 Standards

The standards and criteria contained in this SWM plan are intended to provide a program of stormwater management designated to preserve and restore the flood carrying capacity of Commonwealth streams; to preserve to the maximum extent practicable the natural stormwater runoff regime and the natural course, current and cross section of Waters of the Commonwealth; and to protect and conserve groundwater and groundwater recharge areas. Specifically, the criteria and standards that follow are intended to control stormwater runoff from existing and new development as necessary to minimize dangers to property and life, and carry out the purposes of Act 167.

Watershed preservation is based on maintaining the hydrologic balance within a watershed. The balance is achieved when ground water recharge is maintained, peak discharges for all stormwater events are not increased at any point within the watershed, and water quality is not compromised.

Site designs shall reduce the increase in stormwater by minimizing impervious areas and promoting groundwater infiltration.

Stormwater runoff from development that discharges directly into wetlands or waters of the Commonwealth shall be treated through the use of water quality BMP's.

Infiltration systems will be designed to maintain the existing condition recharge to ground water. These systems attempt to replicate the natural hydrologic regime during periods of rainfall and also serve to provide base flow to streams and maintain in-stream water quality.

The post-development peak discharge rate shall be less than or equal to the pre-development discharge rate.

Structural and non-structural BMP's shall be utilized to preserve the integrity of stream channels and protect the physical, biological and chemical qualities of the receiving surface water.

Stormwater discharges to waters of the Commonwealth classified as High Quality (HQ) and Exceptional Value (EV) streams will be subject to State regulations and guidelines for development in Special Protection Waters.

All structural BMP's shall have an enforceable operation and maintenance agreement to ensure that the system functions as designed.

The following thresholds for "total impervious area" are recommended as they have been regionally accepted by DEP:

- 2,500 square feet or less, your project is exempt from the Peak Rate Control and Stormwater Management Site Plan requirements, unless the municipality determines that project is not eligible for an exemption.

- 1,000 square feet to 2,500 square feet you are required to submit the application to the municipality and you can then proceed with your construction as planned, (Note: Municipalities can require additional information if it is determined that there exists a possible threat to property, health or safety from the increased stormwater runoff);

- 2,500 square feet to 5,000 square feet you are required to submit the application to the municipality, along with details on how you will manage the increase in runoff (implement volume controls);

- 5,000 square feet or more your project requires a SWM Plan prepared by a Pennsylvania Registered Design Professional experienced in the design of such control measures and to the requirements of the Stormwater Management Ordinance.

5.2 Pennsylvania Department of Transportation (PennDOT)

For purposes of Act 167 Stormwater Management Plan (Plans), design policy pertaining to stormwater management facilities for PennDOT roadways and associated facilities are provided in Section 13.7 (Antidegradation and Post Construction Stormwater Management Policy), of PennDOT Publication No. 13M, Design Manual Part 2 (August 2009), as developed, updated, and amended in consultation with PADEP. As stated in DM-2.13.7.D (Act 167 and Municipal Ordinances), PennDOT and PTC roadwas and associated facilities shall be consistent with Act 167 Plans. DM-2.13.7.B (Policy on Antidegradation and Post Construction Stormwater Management) was developed as a cooperative effort between PennDOT and PADEP. DM-2.13.7.C (Project Categories) discusses the anticipated impacted on the quality, volume, and rate of stormwater runoff.

Where standards in Act 167 Plans are impracticable, PennDOT may request assistance from DEP, in consultation with the county, to develop and alternative strategy for meeting state water quality requirements and the goals and objectives of the Act 167 Plans.

For purposes of the Act 167 Plan, road maintenance activities are regulated under 25 Pa Code Chapter 102.

SECTION 6

6.0 REFERENCES

6.0 REFERENCES

1. *Mercer County Comprehensive Plan*. Adopted April, 2006.

2. *Shenango River Watershed Comprehensive Plan*, Western Pennsylvania Conservancy. July, 2005.

3. United States Department of Agriculture Soil Conservation Service, *Soil Survey of Mercer County, Pennsylvania*, year?

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APPENDIX A

NON-STRUCTURAL AND STRUCTURAL BMP's

NON-STRUCTURAL BMP's

Protect Sensitive and Special Value Features

To minimize stormwater impacts, land development should avoid affecting and encroaching upon areas with important natural stormwater functional values (floodplains, wetlands, riparian areas, drainage ways, etc.) and with stormwater impact sensitivities (steep slopes, adjoining properties, etc.) wherever practical. This avoidance should occur site-by-site and on an area wide basis. Development should not occur in areas where sensitive/special value resources exist so that their valuable natural functions are not lost, thereby doubling or tripling stormwater impacts. Resources may be weighted according to their functional values specific to their municipality and watershed context.

Protect / Conserve / Enhance / Riparian Areas

The Executive Council of the Chesapeake Bay Program defines a Riparian Forest Buffer as "an area of trees, usually accompanied by shrubs and other vegetation, that is adjacent to a body of water and which is managed to maintain the integrity of stream channels and shorelines, to reduce the impact of upland sources of pollution by trapping, filtering and converting sediments, nutrients, and other chemicals, and to supply food, cover, and thermal protection to fish and other wildlife."

Protect/Utilize Natural Flow Pathways in Overall Stormwater Planning and Design

Identify, protect, and utilize the site's natural drainage features as part of the stormwater management system. Avoid the installation of storm sewer culverts that can increase flow velocity and create erosive point source discharges.

Cluster Uses at Each Site; Build on the Smallest Area Possible

As density is held constant, lot size is reduced, disturbed area is decreased, and undisturbed open space is increased. Clustering reduces infrastructure costs as there are fewer roadways and utilities to construct.

Concentrate Uses Area wide through Smart Growth Practices

On a municipal, multi-municipal or area wide basis, use of "smart growth" planning techniques, including neo-Traditional/New Urban planning principles, to plan and zone for concentrated development. Patterns can accommodate reasonable growth and development. These practices direct growth to areas or groups of parcels in the municipality that are most desirable and away from areas or groups of parcels that are undesirable. BMP 5.5.2 can be thought of as Super Clustering that transcends the reality of the many different large and small parcels that exist in most Pennsylvania municipalities.

Clustering parcel by parcel simply cannot accomplish the growth management that is so essential to conserve special environmental and cultural values and protect special sensitivities. These smart growth techniques include but are not limited to, transfer of development rights (TDR), urban growth boundaries, effective agricultural zoning, purchase of development rights (PDR) by municipalities, donation of conservation easements by owners, limited development and bargain sales by owners, and other private sector landowner options. "Desirability" is defined in terms of environmental, historical and archaeological, scenic and aesthetic, "sense of place," and quality of life sensitivities and values.

Minimize Total Disturbed Area - Grading

Without changing the building program, you can reduce site grading, reduce the removal of existing vegetation (clearing and grubbing) and decrease total soil disturbance. This eliminates the need for re-establishment of a new maintained landscape for the site and lot-by-lot, by modifying the proposed road system and other relevant infrastructure as well as the building location and elevations to better fit the existing topography.

Minimize Soil Compaction in Disturbed Areas

Minimizing Soil Compaction and Ensuring Topsoil Quality is the practice of enhancing, protecting, and minimizing damage to soil quality caused by land development.

Re-Vegetate and Re-Forest Disturbed Areas, Using Native Species

Sites that require landscaping and re-vegetation should select and use vegetation (i.e., native species) that does not require significant chemical maintenance by fertilizers, herbicides, and pesticides.

Reduce Street Imperviousness

Reduce impervious street areas by minimizing street widths and lengths.

Reduce Parking Imperviousness

Minimize imperviousness associated with parking areas.

Rooftop Disconnection

Minimize stormwater volume by disconnecting roof leaders and directing rooftop runoff to vegetated areas to infiltrate.

Disconnection from Storm Sewers

Minimize stormwater volume by disconnecting impervious roads and driveways and directing runoff to grassed swales and/or bioretention areas to infiltrate.

Street Sweeping

Use of one of several modes of sweeping equipment (e.g., mechanical, regenerative air, or vacuum filter sweepers) on a programmed basis to remove larger debris material and smaller particulate pollutants, preventing this material from clogging the stormwater management system and washing into receiving waterways/waterbodies.

STRUCTURAL BMP's

Pervious Pavement with Infiltration Bed

Pervious pavement consists of a permeable surface course underlain by a uniformly-graded stone bed which provides temporary storage for peak rate control and promotes infiltration. The surface course may consist of porous asphalt, porous concrete, or various porous structural pavers laid on un-compacted soil.

Infiltration Basin

An Infiltration Basin is a shallow impoundment that stores and infiltrates runoff over a level, un-compacted, (preferably undisturbed area) with relatively permeable soils.

Subsurface Infiltration Bed

Subsurface Infiltration Beds provide temporary storage and infiltration of stormwater runoff by placing storage media of varying types beneath the proposed surface grade. Vegetation will help to increase the amount of evapo-transpiration taking place.

Infiltration Trench

An Infiltration Trench is a "leaky" pipe in a stone filled trench with a level bottom. An Infiltration Trench may be used as part of a larger storm sewer system, such as a relatively flat section of storm sewer, or it may serve as a portion of a stormwater system for a small area, such as a portion of a roof or a single catch basin. In all cases, an Infiltration Trench should be designed with a positive overflow.

Rain Garden/Bioretention

A Rain Garden (also called Bioretention) is an excavated shallow surface depression planted with specially selected native vegetation to treat and capture runoff.

Dry Well / Seepage Pit

A Dry Well, or Seepage Pit, is a variation on an Infiltration system that is designed to temporarily store and infiltrate rooftop runoff.

Constructed Filter

Filters are structures or excavated areas containing a layer of sand, compost, organic material, peat, or other filter media that reduce pollutant levels in stormwater runoff by filtering sediments, metals, hydrocarbons, and other pollutants.

Vegetated Swale

A Vegetated Swale is a broad, shallow, trapezoidal or parabolic channel, densely planted with a variety of trees, shrubs, and/or grasses. It is designed to attenuate and in some cases infiltrate runoff volume from adjacent impervious surfaces, allowing some pollutants to settle out in the process. In steeper slope situations, check dams may be used to further enhance attenuation and infiltration opportunities.

Vegetated Filter Strip

The EPA defines a Vegetated Filter Strip as a "permanent, maintained strip of planted or indigenous vegetation located between non-point sources of pollution and receiving water bodies for the purpose of removing or mitigating the effects of non-point source pollutants such as nutrients, pesticides, sediments, and suspended solids."

Infiltration Berm & Retentive Grading

An Infiltration Berm is a mound of compacted earth with sloping sides that is usually located along a contour on relatively gently sloping sites. Berms can also be created through excavation/removal of upslope material, effectively creating a berm with the original grade. Berms may serve various stormwater drainage functions including: creating a barrier to flow, retaining flow and allowing infiltration for volume control, and directing flows. Grading may be designed in some cases to prevent rather than promote stormwater flows, through creation of "saucers" or "lips" in site yard areas where temporary retention of stormwater does not interfere with use.

Note: For more information on Non-Structural and Structural BMP's, refer to the Pennsylvania Stormwater Best Management Practices Manual. Document Number 363-0300-002, effective 12-30-2006.

APPENDIX B

MUNICIPAL QUESTIONAIRRE

Mercer County Watersheds
Act 167 Stormwater Management Plan
Questionnaire

PLEASE COMPLETE THE FOLLOWING AND RETURN THE QUESTIONNAIRE AND MARKED UP MAP TO:	
Mr. Daniel P. Wallace, P.E. Wallace & Pancher, Inc. 1085 S. Hermitage Road Hermitage, PA 16148	Please return this form and additional material by January 18, 2008
Questions can be directed to:	Daniel P. Wallace, P.E. 724-981-0155 Lisa Holm-Shrader (MCRPC) 724-981-2412 Ext 225

PERSON COMPLETING QUESTIONNAIRE:	
Municipality	
Name	
Phone	
e-mail	

1. DOES YOUR MUNICIPALITY HAVE:

	Yes	No	Location/Date
Comprehensive Plan	☐	☐	
Zoning Ordinance	☐	☐	
Subdivision/Land Development Ordinance	☐	☐	
Floodplain Regulations*	☐	☐	
Stormwater Management Regulations*	☐	☐	
Erosion Control Regulations*	☐	☐	
Drainage Regulations*	☐	☐	

*For the above regulations, please list where the regulation is found in the "Location" column.

Use the following abbreviations:

CP	Comprehensive Plan
BC	Building Code
SL	Subdivision and Land Development Ordinance
ZO	Zoning Ordinance
SO	Separate Ordinance

2. IS YOUR MUNICIPALITY CONSIDERED A SMALL MS4 MUNICIPALITY UNDER THE CURRENT NPDES PHASE II STORMWATER REGULATIONS?	Yes ☐	No ☐
If yes, is your small MS4 Municipality currently in compliance with the NPDES Phase II Permit?	Yes ☐	No ☐

3. THE WATERSHED PLAN WILL ADDRESS FIVE KEY STORMWATER CONSIDERATIONS.
THESE FIVE ARE LISTED BELOW. PLEASE INDICATE HOW IMPORTANT YOU BELIEVE IT IS TO ADDRESS EACH CONSIDERATION.

CONSIDERATION		Very Important 5	4	3	2	Not Important 1
Peak Flows	Increase flows from stormwater runoff contribute to stream erosion, localized ponding and flooding, may cause damage to infrastructure (roads, sewers, etc.).	☐	☐	☐	☐	☐
Water Quality	Dissolved and un-dissolved pollutants washed off the land surface - negative impacts to recreation, aesthetics and in-stream habitat.	☐	☐	☐	☐	☐
Groundwater Recharge	Increase runoff decreases amount of rain that becomes groundwater; decreased groundwater supplies may have negative effects on well water supplies and decrease or dry up stream baseflow in dry periods.	☐	☐	☐	☐	☐
Stream Erosion	Eroding banks and beds may undercut roads and utilities, damages in-stream habitat, clog culverts and bridges.	☐	☐	☐	☐	☐
Flooding	Larger scale overbank flows such as the 100-year flood associated with extreme storm events.	☐	☐	☐	☐	☐

4. WOULD YOU LIKE TO SEE INFORMATION ON ANY OF THE FOLLOWING PRESENTED AT A WATERSHED PLAN ADVISORY COMMITTEE MEETING?

	Yes	Maybe	No
Stormwater Controls and Best Management Practices	☐	☐	☐
Model/Implemented Ordinances	☐	☐	☐
Current Stormwater Regulations	☐	☐	☐
Other topics you would like to have considered:			

5. WHAT IS THE MOST IMPORTANT STORMWATER RELATED ISSUE TO YOUR MUNICIPALITY?

6. THE FOLLOWING LISTS THE TYPES OF STORMWATER RELATED PROBLEMS YOUR MUNICIPALITY MAY BE EXPERIENCING. FOR EACH PROBLEM TYPE, PLACE A CHECK MARK IN THE COLUMN THAT BEST DESCRIBES THE SEVERITY, FREQUENCY AND CAUSE. IF YOUR MUNICIPALITY IS EXPERIENCING A PROBLEM NOT LISTED, PLEASE LIST IT IN THE SPACE MARKED "OTHER". FOR YOUR USE, A DEFINITION SHEET IS ATTACHED WHICH DESCRIBES EACH PROBLEM

Problem	Severity			Frequency (years)				Cause
	Severe	Moderate	None	<1	1-2	3-6	>6	*
Stream Flooding	☐	☐	☐	☐	☐	☐	☐	
Street Flooding	☐	☐	☐	☐	☐	☐	☐	
Property Flooding	☐	☐	☐	☐	☐	☐	☐	
Soil Erosion	☐	☐	☐	☐	☐	☐	☐	
Sediment in Streams	☐	☐	☐	☐	☐	☐	☐	
Stream Bed/ Bank Erosion	☐	☐	☐	☐	☐	☐	☐	
Scour at Outfalls	☐	☐	☐	☐	☐	☐	☐	
Property/ Infrastructure Damage	☐	☐	☐	☐	☐	☐	☐	
Pollution	☐	☐	☐	☐	☐	☐	☐	
Habitat/Resource Damage	☐	☐	☐	☐	☐	☐	☐	
Bridge/Culvert Damage	☐	☐	☐	☐	☐	☐	☐	
Other	☐	☐	☐	☐	☐	☐	☐	

*Use the following abbreviations to list the causes in the "Causes" column.

IN	Increased Runoff
PD	Poor/No Drainage
US	Undersized Structure
FD	Floodplain Development
UN	Unknown

7. STORMWATER MANAGEMENT PLANS ARE REQUIRED UNDER THE PENNSYLVANIA STORMWATER MANAGEMENT ACT, ACT 167. AUTHORIZATION TO PROCEED WITH THIS PLAN AS REQUIRED BY ACT 167 HAS BEEN GIVEN BY THE COUNTY COMMISSIONERS. THE LONG-TERM GOAL OF THIS PLAN WILL BE TO MAINTAIN EXISTING HYDROLOGIC CONDITIONS INCLUDING GROUNDWATER LEVELS, WATER QUALITY, STREAM BASE FLOW AND STREAM STORM FLOWS. WITH THIS IN MIND, WHAT LEVEL OF SUPPORT WILL YOUR MUNICIPALITY OR AGENCY PROVIDE FOR THIS PROJECT?

Strongly Support				Strongly Oppose
5	4	3	2	1
☐	☐	☐	☐	☐

8. WILL YOUR MUNICIPALITY/AGENCY ATTEND WATERSHED PLAN ADVISORY COMMITTEE MEETINGS (WPAC)?		Yes ☐	No ☐
If yes, who will attend:	Name		
	Address		
	Phone		
	e-mail		

9. WOULD YOU SUGGEST ANY OTHER AGENCIES OR ORGANIZATIONS THAT SHOULD BE INCLUDED ON THE WPAC?		Yes ☐	No ☐
If yes, provide contact:	Name		
	Organization		
	Address		
	Phone		
	e-mail		

10. DO YOU KNOW OF ANY EXISTING OR PROPOSED FLOOD CONTROL PROJECTS IN YOUR MUNICIPALITY?	Yes ☐	No ☐
If yes, please describe the project(s) below:		

11. ARE EXISTING (PUBLIC OR PRIVATE) STORMWATER MANAGEMENT FACILITIES (OUTFALLS, BASINS, ETC.) BEING MAINTAINED (I.E. REMOVAL OF DEBRIS FROM OUTLET STRUCTURES, ADEQUATE CONTROL OF VEGETATION, CAPACITY MAINTENANCE, ETC.)?	Yes ☐	No ☐
If yes, please describe the location(s) below:		

12. PLEASE PROVIDE ANY INPUT YOU FEEL IS RELEVANT REGARDING CURRENT WATERSHED MANAGEMENT PROCEDURES

13.
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14. THE FOLLOWING REQUESTS INFORMATION ON EXISTING OR PROPOSED STORM SEWER SYSTEMS OR MANAGEMENT FACILITIES. THESE ARE STORM SEWER SYSTEMS, PERMANENT STORMWATER DETENTION PONDS, UNDERGROUND DETENTION FACILITIES OR OTHER SYSTEMS OR FACILITIES INTENDED TO COLLECT, CONVEY OR DETAIN STORMWATER. PLEASE LETTER EACH SITE SEQUENTIALLY AND PLACE THE LETTER CORRESPONDING TO EACH SITE AT THE APPROPRIATE LOCATION ON THE ENCLOSED MAP OF YOUR MUNICIPALITY. PLEASE COPY THIS SHEET IF ADDITIONAL SPACE IS NEEDED.

Letter	Description
A	
B	
C	
D	
E	
F	
G	
H	
I	
J	
K	
L	
M	
N	

Please copy this sheet if additional space is needed.

APPENDIX C

COMPLIATION OF RESPONSES FROM MUNICIPAL QUESTIONNAIRES

APPENDIX D

WATERSHED PLAN ADVISORY COMMITTEE

WPAC Municipalities and Municipal Representatives

Municipality / Organization	WPAC Members Phase I	WPAC Members Phase II	Final County Plan Meeting June 2010
CITIES			
City of Farrell	Mark Yersky, Jim Branca	Ricky Oatis	
City of Hermitage	Marcia Hirschmann, Ian Garfoli		Marcia Hirschmann
City of Sharon	Joe Kurtanich		Joe Kurtanich
BOROUGHS			
Clark Borough	Ed Winslow	Larry McKnight, Lee Loutzenhiser, Clark Eberhart	Larry McKnight, Lee Loutzenhiser
Fredonia Borough	Sue Ringer		
Greenville Borough	Paul Boyer		
Grove City Borough	Vance Oaks		
Mercer Borough	Denny Heasley, Jerry Johnson	Debbie Scruci, Jerry Johnson	John Zohoranacky, Debbie Scruci, Veronica Smith
New Lebanon Borough	Ron Metzgar, Brent Miller		
Sandy Lake Borough	Curtis O. Kerns	Curtis O. Kerns	Curtis O. Kerns
Sharpsville Borough	Ed Winslow		
Stoneboro Borough	John Sweet		
West Middlesex Borough	Dave George, Mabel Selby		
TOWNSHIPS			
Coolspring Township	Robert McGhee, Paul Minner Dr. Robert Addison	Robert McGhee	Robert McGhee, Bill Finney
Deer Creek Township	Pat Campbell		
Delaware Township	Daniel Micsky, Melissa Osborne	Daniel Micsky, Lawrence Miscky	Daniel Micsky, Bill Anthony

Municipality / Organization	WPAC Members Phase I	WPAC Members Phase II	Final County Plan Meeting June 2010
East Lackawannock Township	James Ammen	Lee Miller	Lee Miller
Fairview Township			Jane Clark, Mont Clark
Findley Township	Elliott Lengel	Andrew Tomson	Andrew Tomson
Green Township			Sandra Royal
Hempfield Township	Todd Hittle	Todd Hittle	
Jackson Township	Linda Baun		
Jefferson Township	Robin Snyder		
Liberty Township	Ronald Faull	Ronald Faull, David Beatty	Ronald Faull
New Vernon Township	Ken Dodson		
Otter Creek Township	Carl Swartz		
Perry Township			Rick Marshall
Pine Township	Joseph Goncz, Thomas Paxton		George Hagstrom
Pymatuning Township		Jim Rowe Rick Whitten	Rick Whitten
Sandy Creek Township	Donald Guthrie		
Sandy Lake Township	Edwin Olsen		
Salem Township	John McCurdy		
Shenango Township	David Garrett		
South Pymatuning Township	Mike Nashtock		
Springfield Township	Barbara Brown	Barbara Brown, James Addison	Barbara Brown
Wilmington Township	Wendy Campbell	Christopher Engelsiepen, Wendy Campbell	Christopher Engelsiepen, Wendy Campbell
Wolf Creek Township	Jim Morton		
Worth Township	Denny Geibel, Dale Armstrong, Jeff Wheeler	Al Warehouse	
OTHERS			

Municipality / Organization	WPAC Members Phase I	WPAC Members Phase II	Final County Plan Meeting June 2010
Mercer County Commissioners			John Lechner, Ken Ammann
Mercer County Regional Planning Commission			Bob Kochems
DCNR – Bureau of State Parks	William Wasser		
Mercer County Conservation District	Jim Mondok		
Pennsylvania Fish & Boat Commission	Jeff Giardina		
Pennsylvania Game Commission	James Donatelli		
Shenango River Watchers	Jennifer Barborak		
Mercer County Joint Sewage Agency		Patrick Kelley	Jim Ellenberger
Mercer County Builders Association			Dot Hillman
Engineers/Surveyors		Joe Kurtanich, Jon Synder, Dennis DeSilvey	Joe Kurtanich, Jon Synder, Dennis DeSilvey

APPENDIX E

MODEL STORMWATER MANAGEMENT ORDINANCE