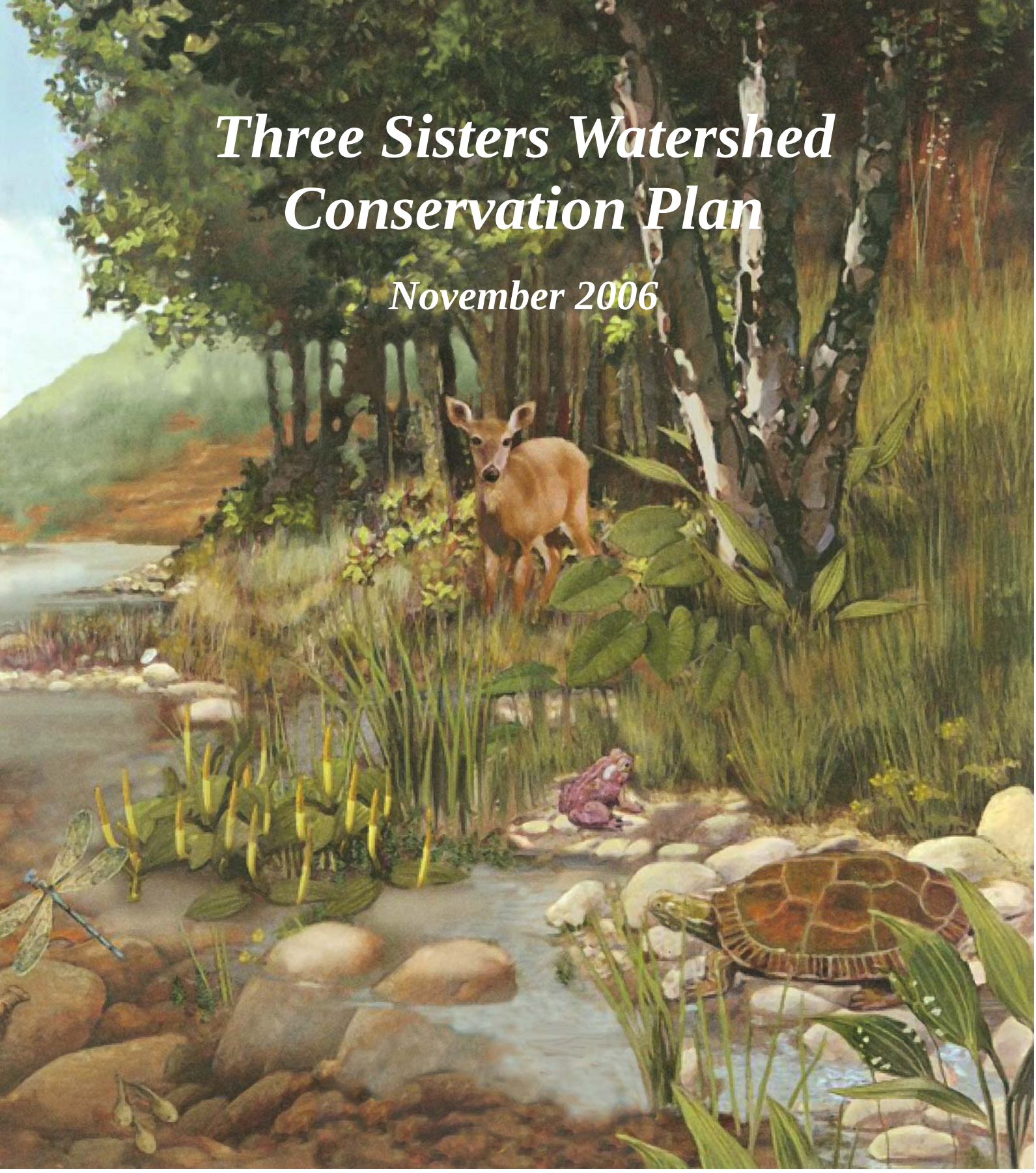
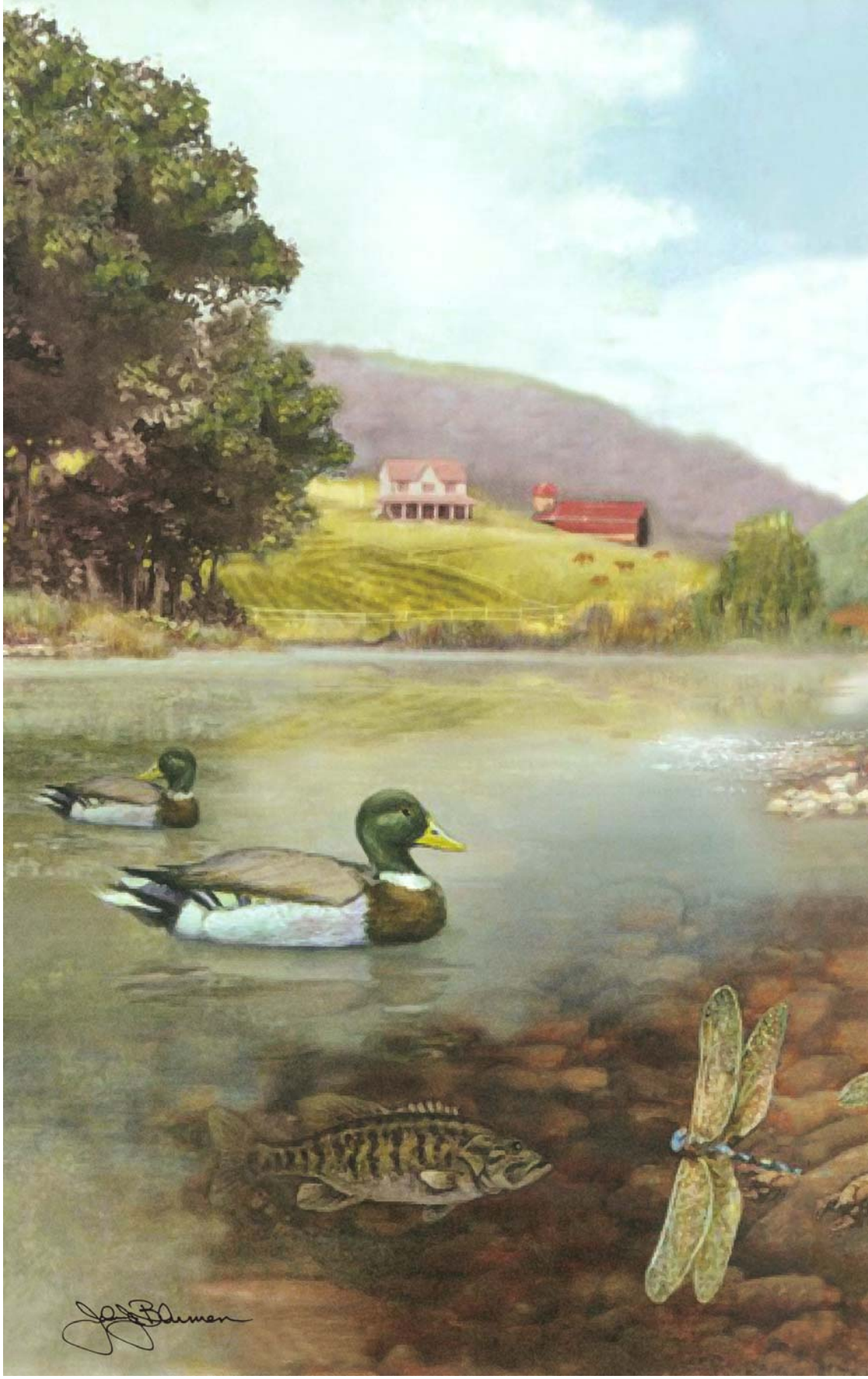


Three Sisters Watershed Conservation Plan

November 2006

A Plan for the Sideling Hill, Fifteenmile, and Town Creek Watersheds



This project was financed in part by a grant from the Keystone Recreation, Park and Conservation Fund under the administration of the Pennsylvania Department of Conservation and Natural Resources, Bureau of Recreation and Conservation.

The Pennsylvania Rivers Conservation Program

Three Sisters Watershed Conservation Plan:

A Plan for the Sideling Hill, Fifteenmile, and Town Creek Watersheds

November 2006

Prepared for:

Three Sisters Watershed Community

Prepared by:

Western Pennsylvania Conservancy
Freshwater Conservation Program
246 South Walnut Street
Blairsville, PA 15717

This project was financed in part by a grant from the Community Conservation Partnership Program under the administration of the Pennsylvania Department of Conservation and Natural Resources, Bureau of Recreation and Conservation.

Page intentionally left blank

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACKNOWLEDGEMENTS

A sincere acknowledgement and thank you goes out to all of the organizations, agencies, and individuals who dedicated their time and resources to make this project a success. Our apologies to anyone inadvertently omitted.

- Bethel Church, Purcell
- Flintstone Elementary School
- Artemas Community Center
- Chaneysville Fire Hall
- Little Orleans Fire Hall
- Mann Township
- Monroe Township
- Southampton Township
- Green Ridge State Forest
- Buchanan State Forest
- Bedford County Conservation District
- Bedford County Planning Commission
- Fulton County Conservation District
- The Nature Conservancy
- Ridge and Valley Streamkeepers
- Potomac Conservancy
- Pennsylvania Fish and Boat Commission
- Pennsylvania Game Commission
- Allegany County Soil and Water Conservation District
- Roadkill Café and Cabins
- Eloise Vance
- Maryland Department of Planning
- Interstate Commission on the Potomac River Basin

- Three Sisters Watershed Conservation Plan Steering Committee:
  - Scott Alexander
  - Mark Beals
  - Dan Hedderick
  - Tolif Hunt
  - Donnelle Keech
  - Jeff Kloss
  - Michael Knoop
  - Georgene McLaughlin
  - Dave Scamardella
  - Dave Schreffler
  - Mary Stanley
  - Guy Stottlemyer
  - Dave Trail
  - Francis Zumbrun

- Three Sisters Watershed Conservation Plan Advisory Committees:
  - Annabelle Barkman
  - David Cotton
  - Jim Cummins
  - Larry Glass
  - Ted Kane
  - Rick Latshaw
  - Bill Plank
  - Ken Roberts
  - Steve Saari
  - Ron Stanley
  - Dave Steele
  - Ed Thompson

Western Pennsylvania Conservancy provided all of the photographs unless otherwise noted.

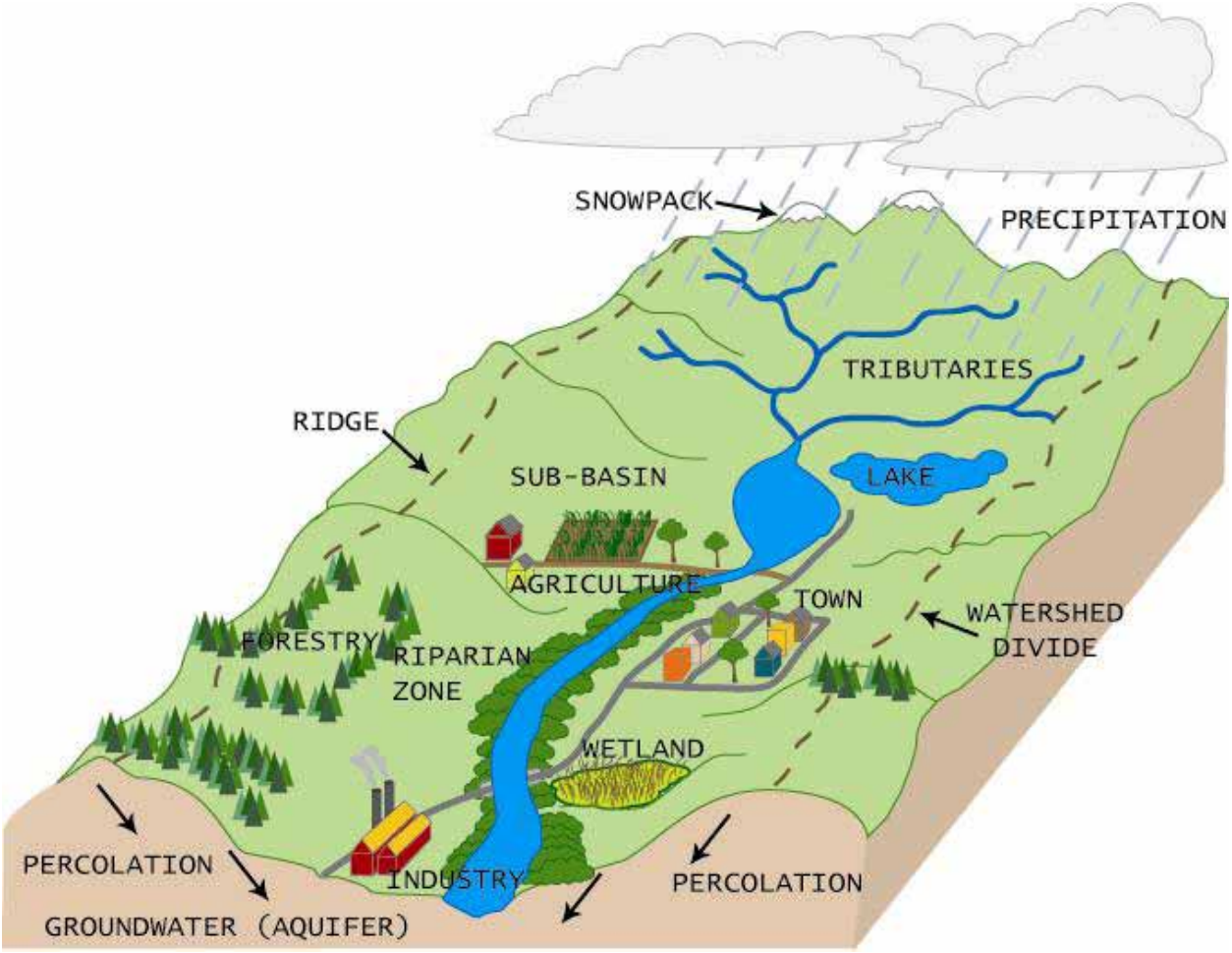
ACRONYMS

AMD	Abandoned Mine Drainage
ASA	Agricultural Security Area
ATV	All-Terrain Vehicle
BDA	Biological Diversity Area
BMP	Best Management Practices
C&O	Chesapeake and Ohio
CAFO	Concentrated Animal Feeding Operation
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CESQG	Conditional Exempt Small Quantity Generator
COMAR	Code of Maryland Regulations
CREES	Cooperative State Research, Education, and Extension Service
CWA	Clean Water Act
CWF	Cold Water Fishery
DA	Diversity Area
EV	Exceptional Value
FEMA	Federal Emergency Management Agency
HQ	High Quality
HUC	Hydrologic Unit Code
IBA	Important Bird Area
III-P	National Trout Waters and Public Water Supply
IPM	Integrated Pest Management
IV-P	Recreational Trout Waters and Public Water Supply
LCA	Landscape Conservation Area
LQG	Large Quantity Generator
MBSS	Maryland Biological Stream Survey
MD DNR	Maryland Department of Natural Resources
MDE	Maryland Department of the Environment
MHT	Maryland Historic Trust
NEEAC	National Environmental Education Advisory Committee
NFIP	National Flood Insurance Program
NHI	Natural Heritage Inventory
NOMA	Nutrient and Odor Management Act
NO_x	Nitrogen Oxides
NPDES	National Pollution Discharge Elimination System
NPL	National Pollutant List
NRMA	Natural Resource Management Area
NWI	National Wetland Inventory
OHV	Off-Highway Vehicle

ORV	Off-Road Vehicle
PA CODE	Pennsylvania Code of Regulation
PA DCNR	Pennsylvania Department of Conservation and Natural Resources
PA DER	Pennsylvania Department of Environmental Resources
PA DEP	Pennsylvania Department of Environmental Protection
PDE	Pennsylvania Department of Education
PennDOT	Pennsylvania Department of Transportation
PENNVEST	Pennsylvania Infrastructure Investment Authority
PFBC	Pennsylvania Fish and Boat Commission
PGC	Pennsylvania Game Commission
PIF	Partners in Flight
PNHP	Pennsylvania Natural Heritage Program
PNMP	Pennsylvania Nutrient Management Program
RCRA	Resource Conservation Recovery Act
RVS	Ridge and Valley Streamkeepers
SARA	Superfund Amendment Reauthorization Act
TDR	Transferable Development Rights
TMDL	Total Maximum Daily Loads
TNC	The Nature Conservancy
U.S. EPA	United States Environmental Protection Agency
UNT	Unnamed Tributary
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USGS	United States Geological Survey
WMA	Wildlife Management Area
WPC	Western Pennsylvania Conservancy
WWF	Warm Water Fishery

WATERSHED DEFINITION

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



EXECUTIVE SUMMARY

Project Background

In 2002, WPC submitted a grant application to the Pennsylvania Department of Conservation and Natural Resources (PA DCNR) to complete a River Conservation Plan (hereinafter referred to as watershed conservation plan) for the Three Sisters watershed. The name "Three Sisters" refers to three individual watersheds—Sideling Hill Creek, Fifteenmile Creek, and Town Creek—located in southcentral Pennsylvania and northwestern Maryland. The watersheds were combined in this study because they share similar features, including topography, geology, and drainage patterns. Funding was awarded in 2003.

Old bridge abutment over Sweet Root Creek

The Pennsylvania Rivers Conservation Program operates through PA DCNR's Community Conservation Partnership Program. The program aids groups in accomplishing their local initiatives through planning, implementation, acquisition, and development activities. As part of the program, PA DCNR has established the Pennsylvania Rivers Registry to validate the completion of approved watershed conservation plans. The registry serves to promote public awareness of completed plans while fostering support for future projects that will enhance the overall quality of the watershed. With the completion of this plan, the Three Sisters watershed (Sideling Hill Creek, Fifteenmile Creek, and Town Creek) will be placed on the Pennsylvania Rivers Registry, which is available on the Internet at http://www.dcnr.state.pa.us/brc/rivers/riversoncservation/registry/. A complete copy of the Three Sisters Watershed Conservation Plan can be accessed on the Internet at http://www.paconserve.org/rc/wac-rcp.html.

Purpose

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

One objective of this plan is to enhance the watershed's natural resources and regional assets. This can be achieved by implementing solutions and recommended actions identified in this plan and by working with a variety of organizations. Another objective is to increase environmental education within the watershed. Many residents and stakeholders are still unaware of basic watershed functions, how they are affected by these natural processes, or how their actions affect the watershed. Educating youth, residents, and stakeholders about environmental issues will be a key component to preserving the quality of life within the region. Actively involving stakeholders increases the pride they have for their community and their willingness to become further involved with conservation efforts.

Planning Process

In March 2005, the watershed conservation plan process was initiated at a set of three public meetings held at various locations within the watershed. Local citizens were invited to come together to voice their opinions about local conservation issues and the need to protect and improve the watershed.

Community members discuss and prioritize comments at one of the public meetings

Municipal and county officials were encouraged to participate in the planning process. Invitations for each of the public meetings were sent, along with a survey for each municipality and county to complete. Municipal officials were also invited to a meeting to review the draft plan before it was released to the public.

Members of the project steering committee distributed surveys to local residents and conducted interviews with key individuals. Advisory committees, composed of local residents, were also formed to review and provide additional local insight into the conservation plan.

With the completion of the draft plan, a series of public meetings were held in July 2006. Stakeholders were given the opportunity to review the plan and provide additional comments. Public comments were collected for 30 days and incorporated into the final plan.

Implementation

Any citizen, group, or agency interested in improving the quality of life within the Sideling Hill Creek, Fifteenmile Creek, and Town Creek watersheds could benefit from the use of the Three Sisters Watershed Conservation Plan. This document serves as a reference and educational tool to promote the conservation of natural resources, monitor and improve water quality, and advocate sound community-planning practices.

Implementation of this plan is the responsibility of the entire watershed community and depends upon cooperation and collaboration among many different organizations. Although Western Pennsylvania Conservancy, The Nature Conservancy, Ridge and Valley Streamkeepers, and other conservation-minded groups would likely spearhead many of the projects throughout the watershed, numerous partnerships are needed for success. Partnering among organizations is invaluable in implementing and completing projects.

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

Community partnerships and communication are essential for project implementation

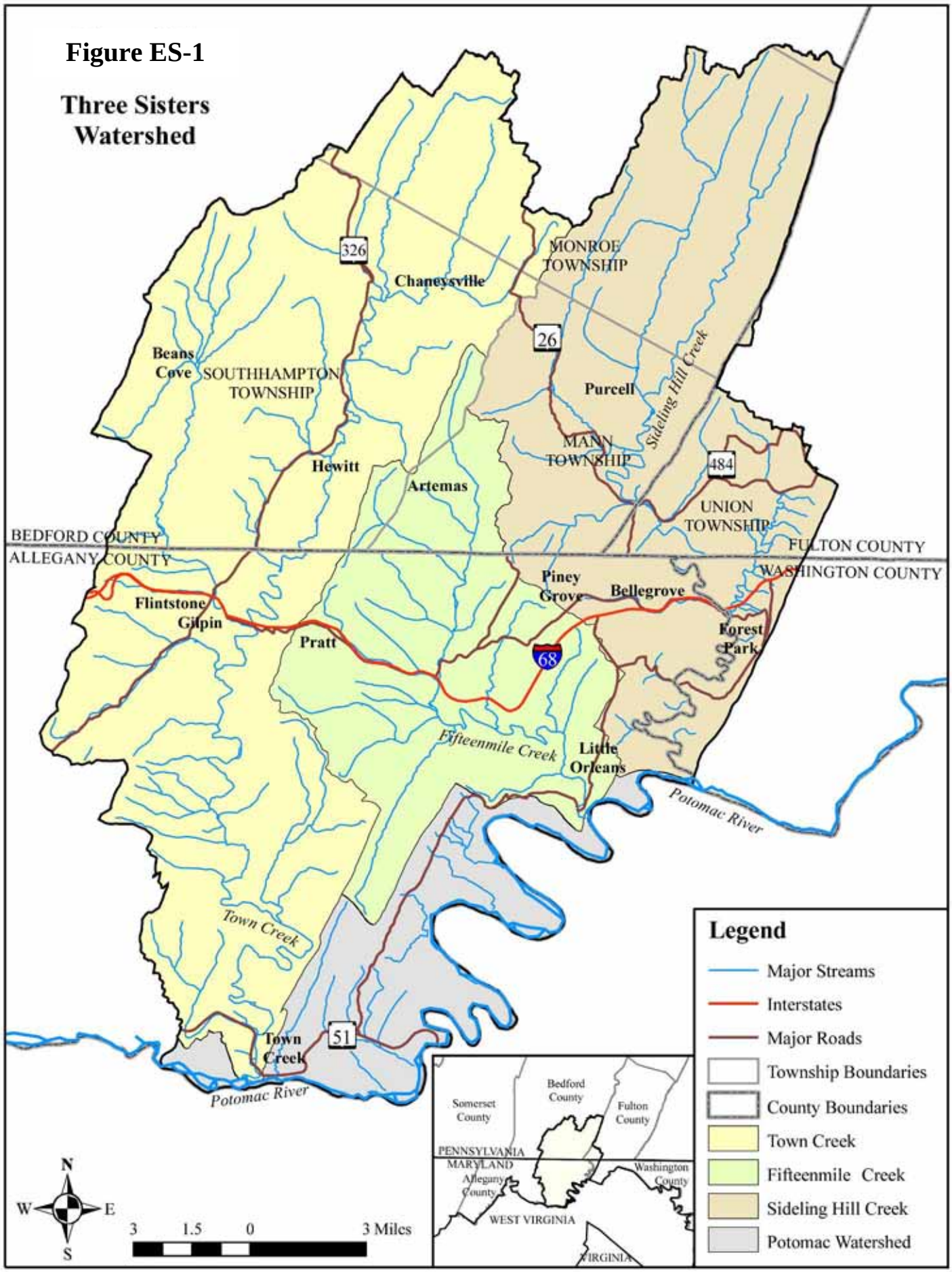


Figure ES-1
Three Sisters Watershed
326
Chaneysville
MONROE TOWNSHIP
26
Beans Cove
SOUTHHAMPTON TOWNSHIP
Purcell
Sideling Hill Creek
MANN TOWNSHIP
484
Hewitt
Artemas
UNION TOWNSHIP
BEDFORD COUNTY
ALLEGANY COUNTY
FULTON COUNTY
WASHINGTON COUNTY
Piney Grove
Bellegrove
Flintstone
Gilpin
Pratt
Forest Park
68
Fifteenmile Creek
Little Orleans
Potomac River
Town Creek
51
Town Creek
Potomac River
Somerset County
Bedford County
Fulton County
PENNSYLVANIA
MARYLAND
Allegany County
Washington County
WEST VIRGINIA
VIRGINIA
N
W
E
S
3 1.5 0 3 Miles
Legend
Major Streams
Interstates
Major Roads
Township Boundaries
County Boundaries
Town Creek
Fifteenmile Creek
Sideling Hill Creek
Potomac Watershed

Chapter Summaries

Project Area Characteristics

The Three Sisters watershed encompasses 355 square miles. The streams flow from southern Bedford and Fulton counties, in Pennsylvania, across the Mason-Dixon Line entering northern Allegany and Washington counties, in Maryland, to where they empty into the Potomac River.

Town Creek is the largest of the three watersheds, accounting for 153 square miles, while Sideling Hill Creek accounts for 104 square miles, and Fifteenmile Creek accounts for 64 square miles. Figure ES-1 identifies the project area.

A variety of governmental bodies govern the region. In Pennsylvania, municipalities are the local form of government, while in Maryland, counties are the local form of government. The majority of governing bodies are utilizing land-use controls and regulations. All four counties, and three out of the four municipalities, have completed non-regulatory comprehensive plans, guiding land-use decisions in their jurisdictions. Zoning is being utilized in Maryland and efforts are underway in Pennsylvania to establish subdivision and land-use ordinances in some townships.

The watershed experiences a temperate continental climate with average temperatures of 72.5° F in the summer and 33.0° F in the winter. Yearly precipitation is between 37 and 39 inches with a yearly snowfall of 27 to 34 inches.

Public water and sewage is limited. A majority of the residents utilize individual septic systems, since there are only two wastewater treatment facilities. Currently, there are no public water suppliers, so residents rely on wells and springs for drinking water, which is challenging due to limited groundwater supplies, expanding development, and the geology of the region.

The Road Kill Café is one of the few businesses located within the watershed

The economy is sluggish. The average median household income was below the national median income for 1999 in three of the four counties. The unemployment rate in each county was also below the national rate. There are no major businesses employing 200 or more people. The population increased by 1,805 residents from 1990 to 2000, to a total population of 7,575 residents in 2000.

Transportation is limited to area roadways. While there are numerous secondary and state roads, only one interstate traverses the watershed and it does so in an east–west direction.

There are four school districts and nine schools. There are no institutions of higher education, technical, or trade schools available for area residents.

Land Resources

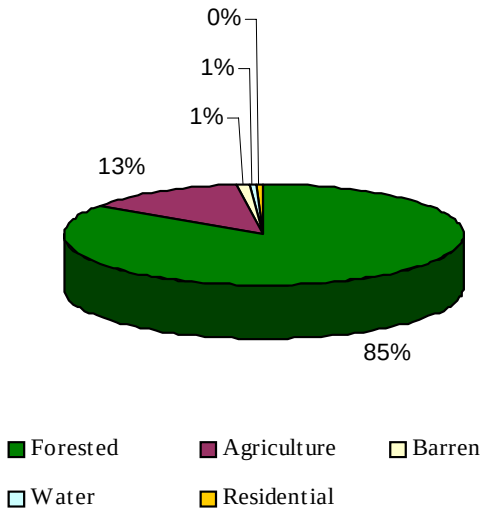
Located in the Ridge and Valley Physiographic Province in Pennsylvania and Maryland, the area is characterized by numerous long and narrow ridges separated by valleys. The project area also contains a unique type of geological formation known as the shale barren. The area is rural with forests overwhelmingly dominating the land use at 85 percent. Figure ES-2 displays the land usage.

Agriculture is the second-leading land use. There are 15 soil associations, 82 prime agricultural soils, and 95 soils designated as farmland of statewide importance. Each state has its own agricultural preservation program to promote and conserve agricultural lands.

Over 60 percent of the project area is privately owned, including residential, forested, and agricultural areas.

Critical areas include riparian corridors, wetlands, and floodplains. Several hazardous areas also exist, including illegal dumpsites and waste sites.

Figure ES-2. Land Use



Water Resources

The folded and faulted shale rock layers that comprise the Ridge and Valley Province largely dictate the movement of water. Most of the groundwater is stored between layers of shale and is transmitted through fractures or breaks. Groundwater yields are low and tend to deplete quickly and hold less water.

Many streams have almost no flow during summer months and extremely high flooding events in the spring, which impacts the aquatic life. This makes it hard to determine if changes in hydrology are a result of natural conditions or changes from human alterations. Due to the underlying geology, wetlands are a rare occurrence, although small wetlands created by topographic depressions in the landscape are present.

Overall, the water quality is first-rate. Sideling Hill Creek has been designated an Exceptional Value Cold Water Fishery in Pennsylvania and a Recreational Trout Waters/Public Water Supply in Maryland. Fifteenmile Creek has been designated a Warm Water Fishery in Pennsylvania and Recreational Trout Waters/Public Water Supply in Maryland. Town Creek has been designated a High Quality Cold Water Fishery in Pennsylvania and a Recreation Trout Waters/Public Water Supply in Maryland, while its tributaries in Maryland are designated as Natural Trout Waters.

Table ES-1. Watershed Tributaries

Subwatershed	# Major Tributaries	% Watershed
Sideling Hill Creek	9	9%
Fifteenmile Creek	13	44%
Town Creek	20	29%
The Potomac Bends	2	17%

However, the waterways are still susceptible to degradation because of the low alkalinity, acid rain, and low flow regimes that amplify the effects of nutrient and sediment addition. To its benefit, the watershed is largely forested and relatively undeveloped. It does not have the negative environmental effects associated with mineral resource extraction industries, like many of Pennsylvania's watersheds.

The primary pollutants affecting the water quality are from acid rain and the runoff associated with agriculture practices, timber harvesting, and roadways.

Best management practices (BMPs) are techniques utilized for the reduction of groundwater and surface pollution, while allowing the productive use of resources for agriculture, forestry, and other activities. When used correctly, BMPs can greatly reduce pollution loading. For example, when contour techniques are utilized, crops are planted along the natural contours of the land, helping to prevent wind

and water erosion. Another BMP that can be used are cover crops, which are placed alongside crops to prevent erosion and add nutrients to the soil. Areas of natural vegetation along waterways, called riparian zones, can be maintained for the purpose of stabilizing the streambank, filtering pollutants from storm and flood events, and providing habitat for birds, amphibians, and other wildlife.

In order to protect the watershed, a variety of federal and state watershed protection laws are in place. They include:

- Clean Water Act (federal)
- Impaired Waterbody (federal)
- National Pollution Discharge Elimination System (federal)
- Concentrated Animal Feeding Operations (federal)
- Pennsylvania Clean Streams Law (Pa.)
- Soil and Erosion Control (Pa.)
- Municipal Sewage Plans (Pa.)
- Nutrient Management Program (Pa.)
- Water Quality Protection Legislation (Md.)
- Soil and Erosion Control (Md.)
- Sewage Enforcement (Md.)
- Nutrient Management (Md.)

Fifteenmile Creek flows under this bridge built by WPA in the 1930s

Biological Resources

As suggested by the number of existing studies that have been completed, the biological diversity of the area has drawn the attention of many groups, agencies, and experts to the region. The region is home to numerous species of avian, aquatic, and terrestrial wildlife species, as well as a number of moths and butterflies specific to the shale barren communities. Local residents also recognize the value that the natural resources present to their communities and the need for their protection.

The watershed is located in the Central Appalachian Broadleaf Forest-Coniferous Forest-Meadow ecoregion and the Northern Ridge and Valley subregion. With their exposed south-facing terraces of Devonian shale, and dry, sunny conditions for the majority of the year, the shale barrens are a unique habitat. Only a few species can withstand these stressful conditions and the majority of the biologic communities that tend to be present are rare.

Three federally endangered species are found within the watershed: green floater mussel, brook floater mussel, and harperella. The plant harperella is found within the Sideling Hill and Fifteenmile Creek watersheds, but currently only in Maryland and in the Chesapeake and Ohio Canal National Historical Park (C&O Canal NHP). A variety of species that are rare, threatened, or endangered in Pennsylvania and Maryland, also exist. There are 63 state-threatened and -endangered plant species; three state-threatened and -endangered bird species; one state-endangered mammal species; three state-threatened and -endangered mussel species; and seven state-threatened and -endangered miscellaneous invertebrates.

Invasive species, like *Mycrostegium,* are nuisance plant or animal species that spread quickly and out-compete native or resident species, like harperella. They have a negative impact on the biodiversity of the region. Other negative impacts include development pressure, current and historical land uses, deer overbrowsing, and acid rain.

A variety of important areas for conservation, including 39 natural heritage areas, two state forests, two Pennsylvania state game lands, private holdings, four wildland areas, and four wildlife management areas, and a National Historic Park also exist.

Cultural Resources

When the first European settlers arrived around 1630, the Three Sisters watershed was utilized as hunting and farming grounds for various Native American tribes and nations. No European settlers made claim to the area until the 1700s, when they were attracted here by the natural resources, waterways, rich farmland, and free land grants.

The site of the Sweet Root Civilian Conservation Corps Camp from 1933-1935

Significant development of the region occurred after the Civil War, and was based around the timber industry. Once the timber was removed, agriculture became the predominant activity during the early settlement period.

During the early settlement period, Warriors Path, one of the longest Native American trails, was the primary transportation route through the region. U.S. Route 40, the first highway built entirely with federal money, traverses the watershed and was completed to Wheeling, West Virginia in 1818. With the new road, many new towns and villages along the roadway began to prosper.

The construction of the Chesapeake and Ohio Canal, originally envisioned by President George Washington, began in 1828. The canal was going to transport materials and goods west. Plagued with many shortcomings, the canal struggled to compete against the railroad. It was not long after the completion of the railroad in 1852 that the canal ceased operation. After a disastrous flood destroyed parts of the canal in 1924, it was never rebuilt. The towpath has been dedicated as the Chesapeake and Ohio Canal National Historic Park and is utilized as a hiking trail. Using the Chesapeake and Ohio Canal, and other trails, a hiking trail has been established from Washington, D.C. to Pittsburgh, Pa.

Transportation along Route 40 also competed with the railroad. Residents fought the establishment of the railroad for fear of what impact it would have on the businesses and towns along Route 40. The once-thriving businesses along the road corridor closed, isolating many parts of the region from the rest of the world. Route 40 was given a reprieve with the invention of the automobile during the 20th century.

The National Register was established in 1966 in order to identify districts, sites, buildings, structures, or other objects significant to American history. There are 10 sites identified in the National Register of Listed and Eligible Properties. Seven of the properties are listed, while three are eligible.

The region is fortunate to have numerous recreational opportunities and natural areas. Recreational opportunities for hiking, biking, fishing, hunting, horseback riding, boating, camping, wildlife watching, and off-road or all-terrain vehicle riding, are available. Areas such as Green Ridge State Forest, Buchanan State Forest, Pennsylvania state game lands, Maryland's wildlife management areas, and the C&O Canal NHP provide the resources available to enjoy these activities.

A variety of organizations, including agencies, non-profits, and civic organizations provide environmental educational opportunities for school students, landowners, and stakeholders within the watershed. With the rapid changes in the environment, the education of stakeholders to increase their awareness of environmental issues is an ongoing process.

Issues and Concerns

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

- Developmental Pressure
- Water Quality
- Public Awareness and Education
- Municipal Cooperation
- Agriculture
- Recreation
- Alternative Energy

Surveys

One method for compiling issues and concerns was the use of public and municipal surveys. The surveys were used to determine how watershed stakeholders and municipal officials perceive the watershed. For the most part, their responses were very similar.

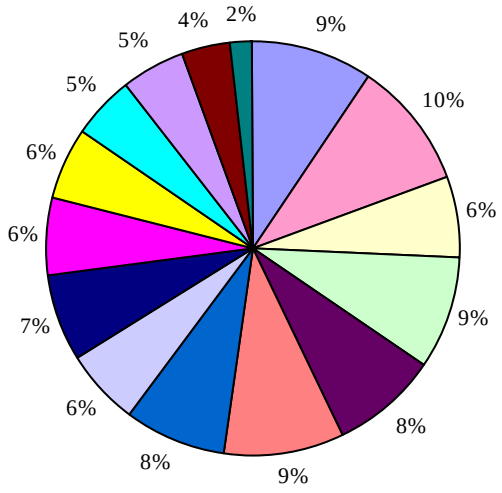
Those surveyed agreed that water quality improvements, attractive natural settings, and historical site preservation are the top three watershed attributes. They also agreed that forestry and agriculture are the two most common land uses within the watershed.

When asked to rank recreational opportunities in order of importance, respondents felt that hunting was the most important recreational activity. Municipal officials felt that horseback riding was also the most important recreational activity, while residents ranked it fourth. Residents felt that hiking was the second-most important recreational opportunity, while municipal officials ranked it third. The public ranked bike trails third, which received a rank of seventh from the municipal officials.

The undeveloped natural beauty, scenic vistas, rural landscape, and peacefulness ranked among the top positive aspects. Ethics, sprawl, and commercial agricultural practices ranked among the top negative aspects.

In addition to questions asked on the public surveys, municipal officials were given the opportunity to identify projects they envision for the future of their municipality. Suggestions included an array of projects dealing with agricultural preservation, illegal dumping, maintaining the rural character of the watershed, dirt and gravel roads programs, environmental education, and improving water resources for recreation.

Figure ES-3. Recreational opportunities of importance among residents and municipal officials



Key Individual Interviews

Another method of obtaining issues and concerns was interviewing local watershed residents identified by the project steering committee. Eleven people were asked a variety of questions regarding recreational opportunities, changes in the watershed, and the services and economics of the region.

Public meeting workshop participants prioritizing issues brought up during the evening's visioning session

According to participants, increases in residential development, timbering operations, and concentrated animal feeding operation (CAFO) permits have been noticed. Concern for the watershed's health and watershed issues, and programs promoting BMPs have also increased over the past 10 years. According to interviewees, another noticeable change is the weather patterns. They said that streams no longer flow all year long, winters are not as harsh as they used to be, and precipitation does not infiltrate into the ground.

While they felt the number of roadways is sufficient, they also think that conditions need improvement. Little infrastructure currently exists. There are no public sewage systems currently available and a majority of residents rely on springs and wells for drinking water.

According to participants, employment opportunities are limited, especially high-quality jobs. The majority of residents commute 40 minutes or more to work. Of those interviewed, many residents do not want to attract too many employment opportunities for fear of increasing sprawl.

Land-use controls are poor and inadequate according to those interviewed. The challenge with this is that most residents would not accept land-use controls. Further efforts need to be conducted to educate citizens about the consequences of not having land-use ordinances.

For the most part, recreational opportunities are adequate, but area residents would like to increase the number of sites. Some recreational areas exist but are under-marketed and therefore unknown to many residents. The illegal use of all-terrain vehicles is a major concern, as mentioned by the majority of those interviewed.

Interviewees feel that land and water resources are being impacted by the development of gas wells and residential dwellings. In addition to development, they mentioned that agricultural and logging practices are increasing the amount of sediment entering waterways. Many felt that poorly maintained riparian areas, poorly maintained roadways, and all-terrain vehicle usage have added to the increased amounts of sedimentation.

Biological resources are being impacted by invasive species and the over-population of whitetail deer, according to interviewees. They felt that invasive species are out-competing native species, acid rain is decreasing the pH in waterways, and deer overbrowsing is destroying the undergrowth in forests.

Management Recommendations

This section of the plan provides a matrix of the various issues identified in each of the subject areas. The recommendations were compiled from municipal and public surveys, public meetings, and key individual interview comments. The matrix of recommendations includes goals, recommended approaches, potential partners, potential funding sources, and priority ratings. The goals refer to issues, concerns, situations, or projects deemed important by watershed stakeholders. The recommended

approaches are the action steps, or objectives necessary to address the goal. Potential partners are groups with the resources best suited to assist in meeting the objectives. Potential funding sources identify possible avenues to finance identified projects. The priority rankings were determined in response to public comments, input from the steering and advisory committees, and was based on need, feasibility, and probability of funding.

Management recommendations are suggestions to maintain or improve the conditions within the watershed, human and otherwise. The recommendations cover a broad range of topics, but should not be considered all encompassing. It is important to note that the suggestions are non-regulatory in nature and are best used as a guide to conserving, restoring, or improving important characteristics. No limitation to the number or types of issues, actions, approaches, partners, or funding opportunities should be assumed due to ever-changing circumstances. Creativity in implementing the identified recommendations or developing additional suggestions is highly encouraged.

CHAPTER 1. PROJECT AREA CHARACTERISTICS

Project Area

Town Creek below Hewitt Covered Bridge

Location and Size

Sideling Hill, Fifteenmile, and Town creeks, or "Three Sisters," as they have been termed, encompass 355 square miles. They flow from southeastern Bedford County, across the Mason-Dixon Line into western Maryland, and on to the Potomac River. The Three Sisters watershed is located in Bedford and Fulton counties in Pennsylvania and Allegany and Washington counties in Maryland. Figure 1-1 shows the Three Sisters watershed.

Sideling Hill Creek

The Sideling Hill Creek watershed is approximately 104 square miles. It is considered one of the highest quality streams of the Pennsylvania and Maryland Ridge and Valley Province. There are over 287 stream miles within the watershed, most of which are small perennial and intermittent streams. The majority of the watershed—77 percent—is located in Pennsylvania.

The mainstem of Sideling Hill Creek begins in Purcell, Pa., where the East Branch and West Branch merge. It flows 41.6 miles southeast until it empties into the Potomac River west of Pearre, Md. Figure 1-2 shows the Sideling Hill Creek watershed.

Fifteenmile Creek

Fifteenmile Creek is approximately 64 square miles in size, with 81 percent of the watershed located in Maryland. Beginning in Pennsylvania at the Buchanan State Forest, Fifteenmile Creek flows in a southerly direction, passing through the town of Artemas, Pa. It continues to flow south, crossing into Maryland and under Interstate 68 and U.S. Route 40, where it then flows southeast until it empties 19.2 miles later into the Potomac River in Little Orleans, Md. Figure 1-3 shows the Fifteenmile Creek watershed.

Town Creek

Town Creek is approximately 153 square miles and flows approximately 30 miles. It is also considered one of the most pristine streams of the Pennsylvania and Maryland Ridge and Valley Province. There are a total of 339 stream miles within the Town Creek watershed.

Town Creek begins in Chaneysville, Pa., where headwater tributaries of Sweet Root Creek and Elk Lick Creek merge. Flowing in a southerly direction, Town Creek passes through the town of Hewitt, Pa. It enters the Potomac River in the community of Town Creek, Md. Fifty-seven percent of the watershed is located within Pennsylvania. Figure 1-4 shows the Town Creek watershed.

Governmental Bodies

Pennsylvania and Maryland differ in the ways in which they govern their communities. In Pennsylvania, counties are divided into townships, cities, and boroughs as local forms of government. In Maryland, the county is the overarching form of local government. The municipalities and counties that cover the watershed are listed in Table 1-1 and shown in Figure 1-1.

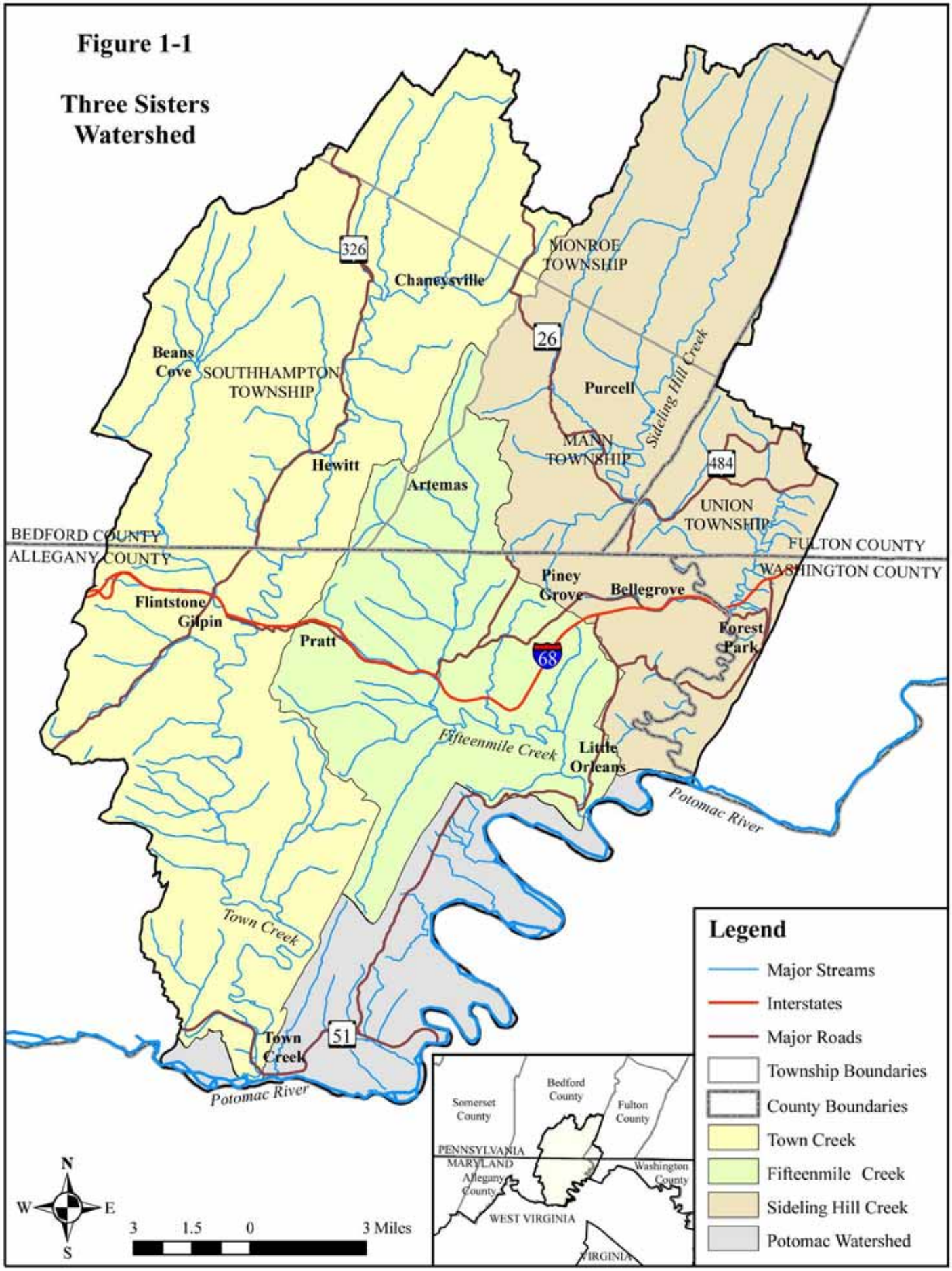


Figure 1-1
Three Sisters Watershed
326
Chaneysville
MONROE TOWNSHIP
26
Beans Cove
SOUTHHAMPTON TOWNSHIP
Purcell
Sideling Hill Creek
MANN TOWNSHIP
484
Hewitt
Artemas
UNION TOWNSHIP
BEDFORD COUNTY
ALLEGANY COUNTY
FULTON COUNTY
WASHINGTON COUNTY
Piney Grove
Bellegrove
Flintstone
Gilpin
Pratt
68
Forest Park
Fifteenmile Creek
Little Orleans
Potomac River
Town Creek
51
Town Creek
Potomac River
Legend
Major Streams
Interstates
Major Roads
Township Boundaries
County Boundaries
Town Creek
Fifteenmile Creek
Sideling Hill Creek
Potomac Watershed
Somerset County
Bedford County
Fulton County
PENNSYLVANIA
MARYLAND
Allegany County
Washington County
WEST VIRGINIA
VIRGINIA
N
W
E
S
3 1.5 0 3 Miles

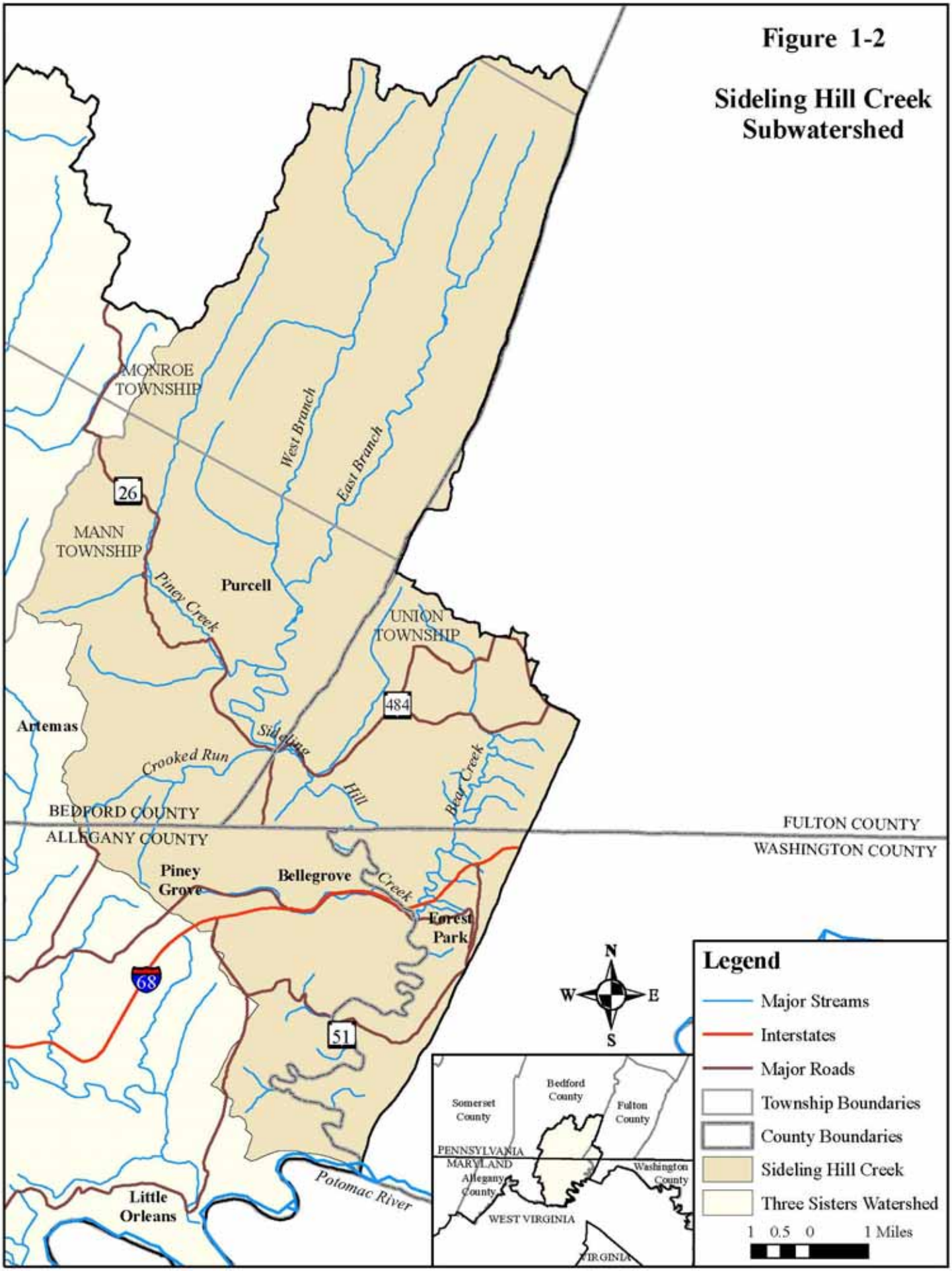


Figure 1-2
Sideling Hill Creek Subwatershed
MONROE TOWNSHIP
MANN TOWNSHIP
UNION TOWNSHIP
Purcell
Artemas
Piney Grove
Bellegrove
Forest Park
Little Orleans
West Branch
East Branch
Piney Creek
Crooked Run
Sideling Hill
Bear Creek
Creek
Potomac River
BEDFORD COUNTY
ALLEGANY COUNTY
FULTON COUNTY
WASHINGTON COUNTY
26
484
68
51
N
W
E
S
Somerset County
Bedford County
Fulton County
PENNSYLVANIA
MARYLAND
Allegany County
Washington County
WEST VIRGINIA
VIRGINIA
Legend
Major Streams
Interstates
Major Roads
Township Boundaries
County Boundaries
Sideling Hill Creek
Three Sisters Watershed
1 0.5 0 1 Miles

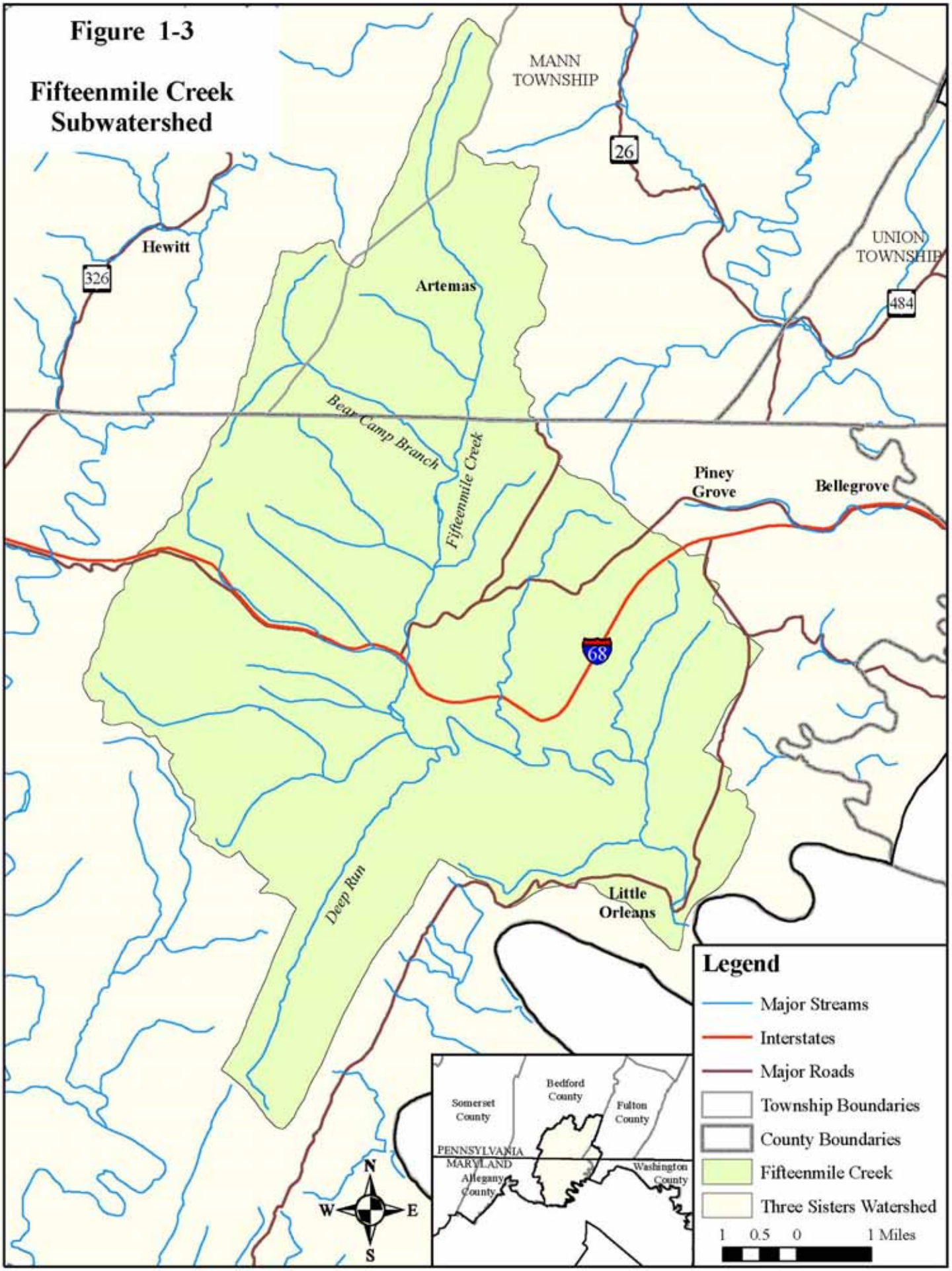


Figure 1-3
Fifteenmile Creek Subwatershed
MANN TOWNSHIP
26
Hewitt
326
Artemas
UNION TOWNSHIP
484
Bear Camp Branch
Fifteenmile Creek
Piney Grove
Bellegrove
68
Deep Run
Little Orleans
Legend
Major Streams
Interstates
Major Roads
Township Boundaries
County Boundaries
Fifteenmile Creek
Three Sisters Watershed
1 0.5 0 1 Miles
Somerset County
Bedford County
Fulton County
PENNSYLVANIA
MARYLAND
Allegany County
Washington County
N
W
E
S

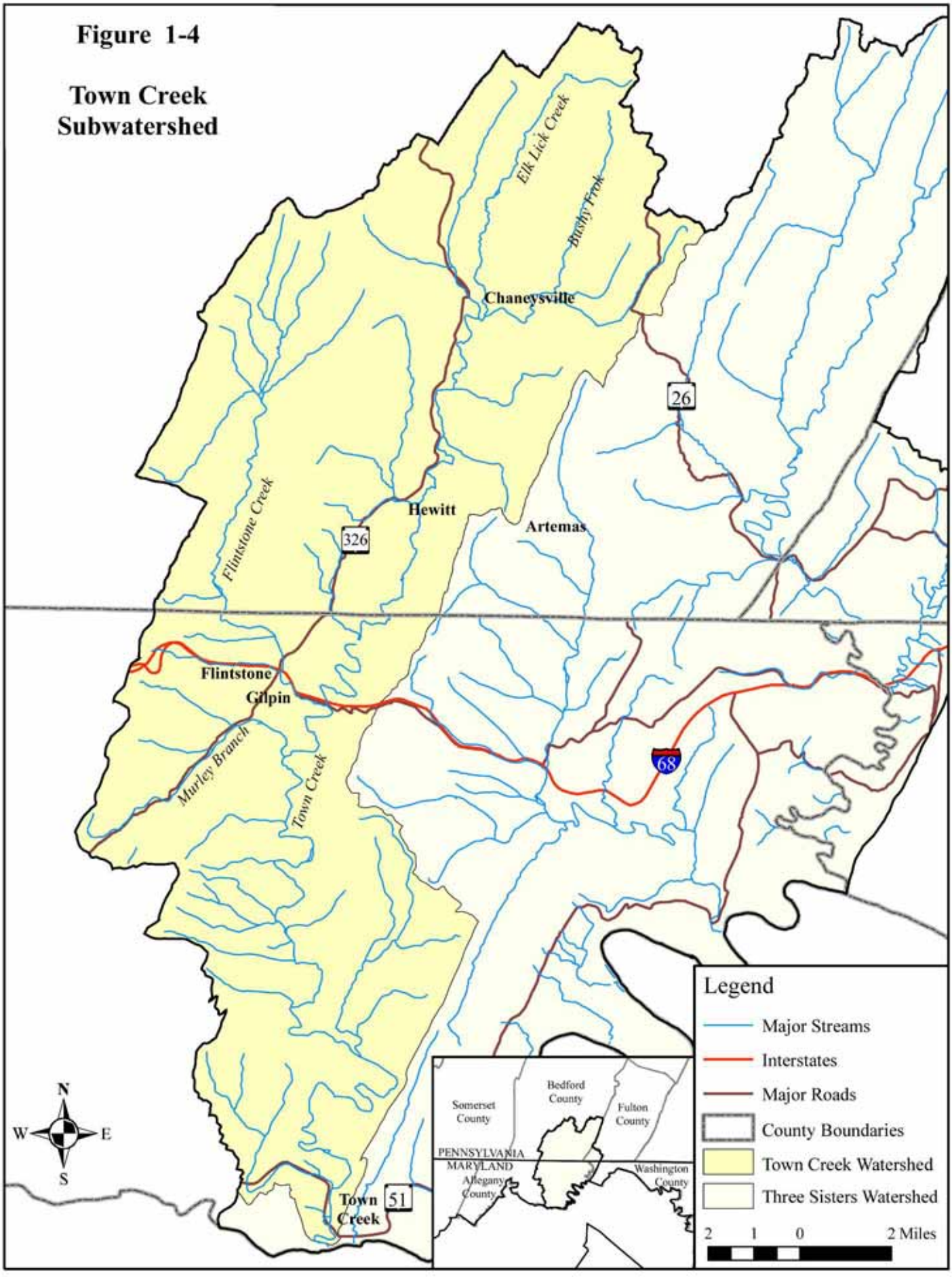


Figure 1-4
Town Creek Subwatershed
Elk Lick Creek
Bushy Frok
Chaneysville
26
Flintstone Creek
Hewitt
326
Artemas
Flintstone
Gilpin
Murley Branch
Town Creek
68
N
W
E
S
Town Creek
51
Somerset County
Bedford County
Fulton County
PENNSYLVANIA
MARYLAND
Allegany County
Washington County
Legend
Major Streams
Interstates
Major Roads
County Boundaries
Town Creek Watershed
Three Sisters Watershed
2 1 0 2 Miles

Climate

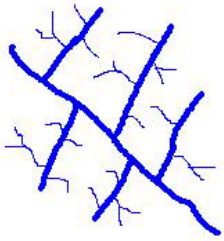
The watershed has a temperate continental climate. The average summer temperature in the Three Sisters watershed is 72.5˚ F and winter temperatures average 33.0˚ F. The statewide average temperatures for Pennsylvania are 86.2˚ F in the summer, and 18˚ F in the winter. The watershed is in the rain shadow, where precipitation amounts drop significantly on the leeward side of the mountains, making this area the driest region in the state of Maryland. Yearly precipitation is between 36.5 and 38.84 inches, with a yearly snowfall of 26.9 to 34.1 inches. The highest average monthly precipitation occurs in June, while the lowest is in February (The Weather Channel 2005). The average growing season is approximately 154 days.

Table 1-1. Municipalities

Municipality	Square Miles	% of Watershed
Bedford County, Pa.	164.53	46.4
Mann Township	35.77	10.1
Monroe Township	53.71	15.1
Southampton Township	75.05	21.2
Fulton County, Pa.	16.09	4.5
Union Township	16.09	4.5
Allegany County, Md.	166.05	46.8
Washington County, Md.	8.15	2.3

Topography

The Three Sisters watershed is located in the Ridge and Valley Physiographic Province in Pennsylvania and Maryland. Pennsylvania and Maryland each have six physiographic provinces, and each province is divided into physiographic sections.



An example of a trellis drainage pattern

In Pennsylvania, the Three Sisters watershed is located in the Appalachian Mountain Section, which is comprised of long, narrow ridges and broad to narrow valleys with some karst. It is underlain by sandstone, siltstone, shale, conglomerate, limestone, and dolomite. The drainage follows a trellis, angulate pattern with some karsts. A trellis drainage pattern occurs when channels travel parallel to structures in the bedrock and short tributaries meet the mainstem streams at right angles.

In Maryland, the Three Sisters watershed is located in the Folded Appalachian Mountain Section of the Ridge and Valley Province. The strongly folded and faulted sedimentary rocks that are present characterize the Appalachian Mountain Section. Sedimentary rocks present in the province yield small to moderate groundwater supplies. Figure 1-5 displays the topography of the Three Sisters watershed.

Sweet Root Run, a tributary to Town Creek, travels through the Sweet Root Natural Area

Major Tributaries

Sideling Hill Creek

Sideling Hill Creek is an Exceptional Value waterway as designated by the Pennsylvania Department of Environmental Protection (PA DEP). In Maryland, it is designated for use as Recreational Trout Waters and Public Water Supply. There are five major named tributaries to Sideling Hill Creek: West Branch Sideling Hill Creek, East Branch Sideling Hill Creek, Piney Run, Crooked Run, and Bear Creek.

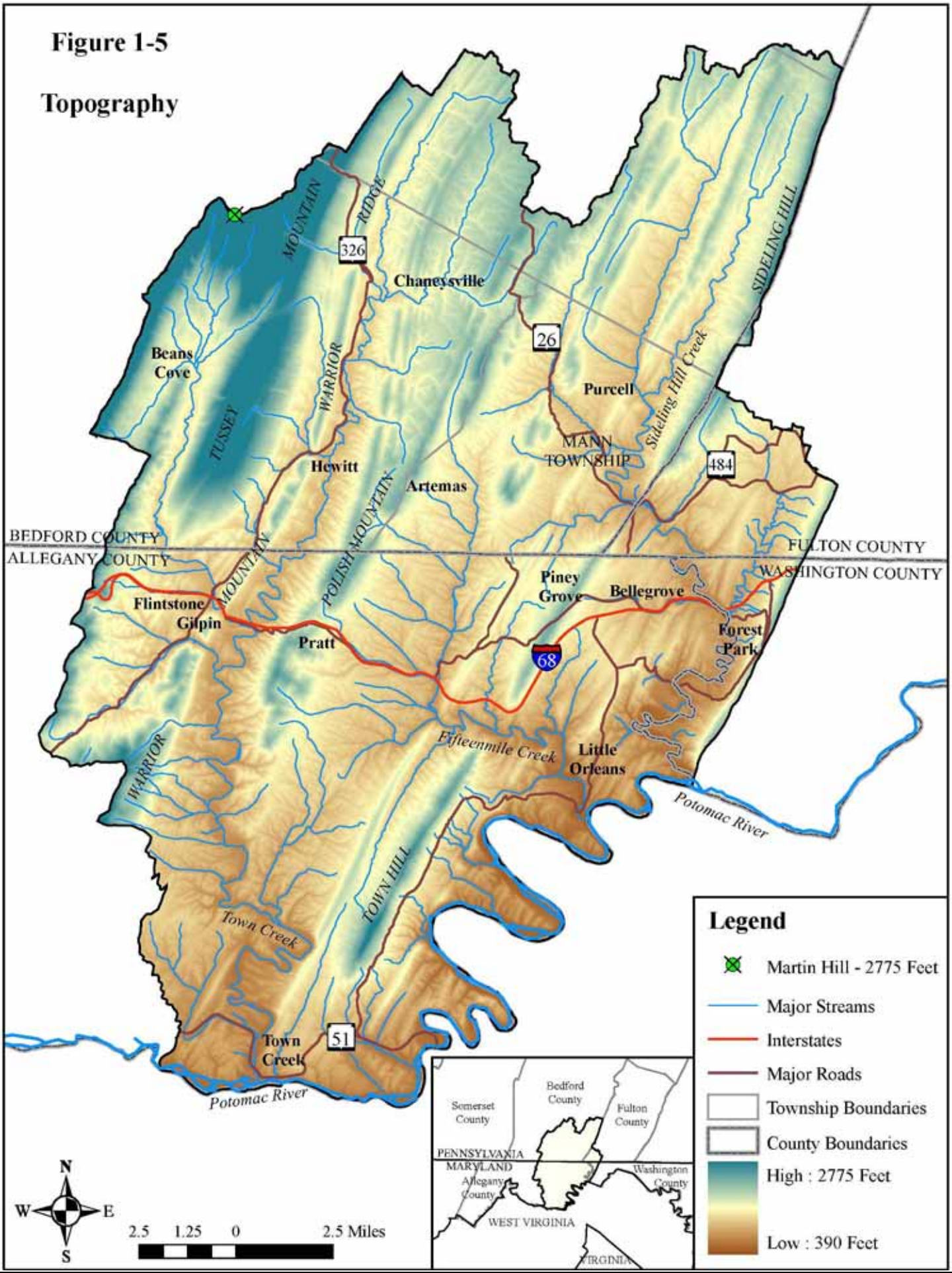


Figure 1-5
Topography
MOUNTAIN
RIDGE
326
Chaneysville
SIDELING HILL
26
Beans Cove
WARRIOR
TUSSEY
Purcell
Sideling Hill Creek
MANN TOWNSHIP
484
Hewitt
Artemas
POLISH MOUNTAIN
BEDFORD COUNTY
ALLEGANY COUNTY
FULTON COUNTY
WASHINGTON COUNTY
Piney Grove
Bellegrove
Flintstone
Gilpin
Pratt
68
Forest Park
Fifteenmile Creek
Little Orleans
Potomac River
TOWN HILL
Town Creek
Town Creek
51
Potomac River
Somerset County
Bedford County
Fulton County
PENNSYLVANIA
MARYLAND
Allegany County
Washington County
WEST VIRGINIA
VIRGINIA
N
W
E
S
2.5 1.25 0 2.5 Miles
Legend
Martin Hill - 2775 Feet
Major Streams
Interstates
Major Roads
Township Boundaries
County Boundaries
High : 2775 Feet
Low : 390 Feet

Fifteenmile Creek

PA DEP designates Fifteenmile Creek as a Warm Water Fishery. In Maryland, it is designated for use as Recreational Trout Waters and Public Water Supply. It has seven named tributaries: Bear Camp Branch, Big Divide Run, Piclic Run, White Sulfur Run, Deep Run, Terrapin Run, Flat Run, and Pine Lick Creek.

Town Creek

Town Creek is designated as a High Quality Cold Water Fishery, except for a portion of Flintstone Creek, from Lost Creek to the Pennsylvania–Maryland border, which is designated as a High Quality Trout Stocked Fishery. In Maryland, Town Creek is designated for use as Recreational Trout Waters and Public Use and its tributaries are designated for use as Natural Trout Waters and Public Water Supply. Amorine Branch, Murley Branch, and Flintstone Creek are the only major named tributaries to Town Creek.

Air Quality

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

Scenic overview of the Three Sisters watershed

Airborne pollutants can travel very long distances. They can fall to the ground in raindrops, fog and dew, dust, or simply due to gravity. Identifying sources of airborne pollutants to a body of water can be complicated. Pollutants can enter waterways through direct deposition (falling directly into waterways) or through indirect deposition (falling onto land and being washed into waterbodies as runoff). Researchers developed the concept of airsheds to assist in the study of atmospheric deposition, which is the process of airborne pollutants falling to the ground [United States Environmental Protection Agency (U.S. EPA) 2003].

Airsheds are geographic areas responsible for emitting 75 percent of the air pollution reaching a body of water (U.S. EPA 2003). Different pollutants have different airsheds because of their varying behaviors in the atmosphere (U.S. EPA 2003). Airsheds are determined using mathematical models of atmospheric deposition, as opposed to watersheds, which utilize physical features of the landscape (U.S. EPA 2003).

Atmospheric Deposition

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

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

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

Critical Pollutants

Six critical pollutants have been identified nationally as affecting air quality. They include carbon monoxide, lead, nitrogen oxides, ozone, particular matter, and sulfur dioxide.

Carbon monoxide

Carbon monoxide is a poisonous compound that results from the incomplete burning of fuels, such as motor vehicle exhaust, industrial processes, and wood stoves (PA DEP[2]). It can impair vision, alertness, and other mental and physical functions when inhaled (PA DEP[2]). Individuals suffering from cardiovascular disease are at the highest risk, but healthy individuals can also be affected. Carbon monoxide poisoning can be fatal when high enough levels are present, because it replaces the oxygen in blood and inhibits the delivery of oxygen to body tissues (PA DEP[2]).

Lead

Lead is emitted into the atmosphere through the burning of leaded fuel and industrial processes, such as battery manufacturers and lead smelters (PA DEP[2]). Metal processing is the major source of lead emissions. Lead poisoning reduces mental abilities, damages blood, nerves, and organs, and raises blood pressure when ingested or inhaled (PA DEP[2]). Lead is highly toxic and accumulates in the body; even small doses are harmful.

Nitrogen Oxides

Nitrogen oxides (NO_x) are produced when fossil fuels are burned at temperatures greater than 1,200˚ F (PA DEP[2]). Automobiles, trucks, buses, airplanes, industries, and power plants emit NO_x into the atmosphere. They contribute to the deposition of nitrogen in soil and water through acid rain and play a major role in the formation of ground-level ozone (PA DEP[2]). Human health is impacted when NO_x enter the lungs and make breathing more difficult.

Ozone

Ozone is a colorless, odorless gas that forms in the atmosphere. Depending on where it is located in the atmosphere, it can be beneficial or harmful. When located in the upper atmospheric layer, it is called the ozone layer and it filters the sun's harmful ultraviolet rays. When it is located in the lowest atmosphere it is called ground-level ozone. Ground-level ozone is a secondary pollutant—a pollutant that is formed in the atmosphere instead of being directly emitted from a specific source. It forms when NO_x combine and react with volatile organic compounds in the presence of sunlight and warm temperatures (PA DEP[2]). Ozone, and the pollutants that cause it, can be transported from hundreds of miles away.

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

Particular Matter

Particulates are tiny drops of liquid or small particles of dust, metal, or other materials that float in the air (PA DEP[2]). A mixture of these particles is known as particular matter. Four different types and

sizes of particular matter exist. These particles travel into the lungs and become trapped. They can cause respiratory ailments and can carry cancer-causing chemicals, producing health problems (PA DEP[2]).

Total suspended particulates vary in size up to 45 micrometers in diameter. They can remain suspended in the air for a few seconds, or up to several months (PA DEP[2]). There are no federal or state air-quality standards for total suspended particulates.

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

Particular matter 2.5 ($PM_{2.5}$) are fine particles with diameters less than 2.5 micrometers. They can accumulate in the respiratory system and are associated with numerous adverse health effects, especially among children, the elderly, and individuals with asthma or cardiopulmonary disease (PA DEP[2]).

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

Sulfur Dioxide

Sulfur dioxide is emitted into the atmosphere by industrial processes burning coal or oil containing sulfur. Trees, plants, and agricultural crops are damaged by sulfur dioxide and it can accelerate the corrosion of materials, such as monuments, buildings, and iron-containing metals (PA DEP[2]). Sulfur dioxide is the main component of acid rain, joining with water vapor in the atmosphere to form sulfuric acid. Children, the elderly, and individuals with asthma, chronic lung disease, and cardiovascular disease, are more susceptible to negative health effects from this pollutant.

Mercury

Although mercury is not identified as a national critical pollutant, it is an important one. Mercury occurs naturally in air, water, and soil. Many rocks, including coal, release mercury into the atmosphere when burned. It is estimated that half of all mercury deposition within the United States comes from sources within the United States (U.S. EPA 2005). Approximately 40 percent of the domestic mercury released is from coal-burning power plants. Of the mercury emissions from coal-burning power plants, only one-third is deposited in the United States.

Pollutants dispersed at power plants, such as the Homer City Generating Station, Homer City, Pa., are being deposited over a hundred miles away in the Three Sisters watershed and surrounding areas

Mercury emitted into the atmosphere eventually settles into water or onto land, where it can be carried to water by runoff. Once deposited, certain microorganisms can change it into methylmercury, a highly toxic form that builds up in fish, shellfish, and animals that eat fish (U.S. EPA 2005). Some species of fish and shellfish build up more methylmercury than others and, depending on what they eat, how long they live, and where they are located in the food chain, the level of methylmercury varies.

Humans are exposed to methylmercury primarily through the consumption of fish and shellfish. At high levels, mercury exposure can harm the brain, heart, kidneys, lungs, and immune system (U.S. EPA 2005). In unborn babies, newborns, and young children, high levels of methylmercury can affect the development of the nervous system and impair learning.

The U.S. EPA, United States Food and Drug Administration, and individual states work together to establish local fish advisories for certain types of commercially harvested fish and shellfish. These advisories suggest how often women who may become pregnant, pregnant women, nursing mothers, and young children should eat certain types of fish. Advisories for men, women, and children of all ages are also issued when appropriate.

Within the Three Sisters watershed, the only advisories currently in place are statewide advisories. In Pennsylvania, it is recommended that individuals eat no more than eight ounces of sport fish per week (PA DEP 2006). In Maryland, a general fish advisory is issued for striped bass, depending on the time of year and size of the fish (MDE 2005). Additional advisories are in place for women who may become pregnant, pregnant women, nursing mothers, and children. The advisories include freshwater pan fish, freshwater game fish, canned light tuna, certain store-bought fish, and canned albacore (MDE 2005). It is also recommended that they avoid shark, swordfish, king mackerel, and tilefish (MDE 2005).

Impacts of Air Pollution

Air pollution not only affects the quality of the air, but the economy, health, and environment. It contributes to land and water pollution by altering the chemical makeup of streams and soils. It can lead to impairment or destruction of habitats (through the loss of trees, plants, and animals), decreasing property values and incomes, and increasing medical expenses and employee absenteeism (Kling 2003). Approximately 25 percent of nitrogen compounds entering the Chesapeake Bay are deposited from the air (Mosier 2002).

Socioeconomic Profile

Demographics and Population Patterns

The population of the Three Sisters watershed was calculated using census block group data from the U.S. Census Bureau. Five census tracts and seven census block groups are located within the watershed. Between the 1990 census and 2000 census, the population in the watershed increased by 1,805 residents. The most noteworthy changes occurred in Fulton County, Pa. and Allegany County, Md. Table 1-2 and Figures 1-6 and 1-7 illustrate the population and the population changes in the watershed.

The majority of the residents living within the Three Sisters watershed have historical or ancestral ties to the area. According to the 2000 census, 63 percent of the residents were born in the state in which they currently reside, while 36 percent were born in a different state, and one percent of watershed residents were born out of the country.

Table 1-2. Population and Population Change by Census Block Groups

County	1990 Population	2000 Population	% Change in Population
Bedford	2,706	2,863	5.48
Fulton	1,167	1,906	38.77
Allegany	1,133	2,022	43.97
Washington	764	784	2.55
Total	**5,770**	**7,575**	**23.83**

Future planning efforts should consider the need to maintain the rural characteristic and charm residents want for their community. Areas deserving special consideration include those along the major roadways and interchanges, as they are susceptible to development.

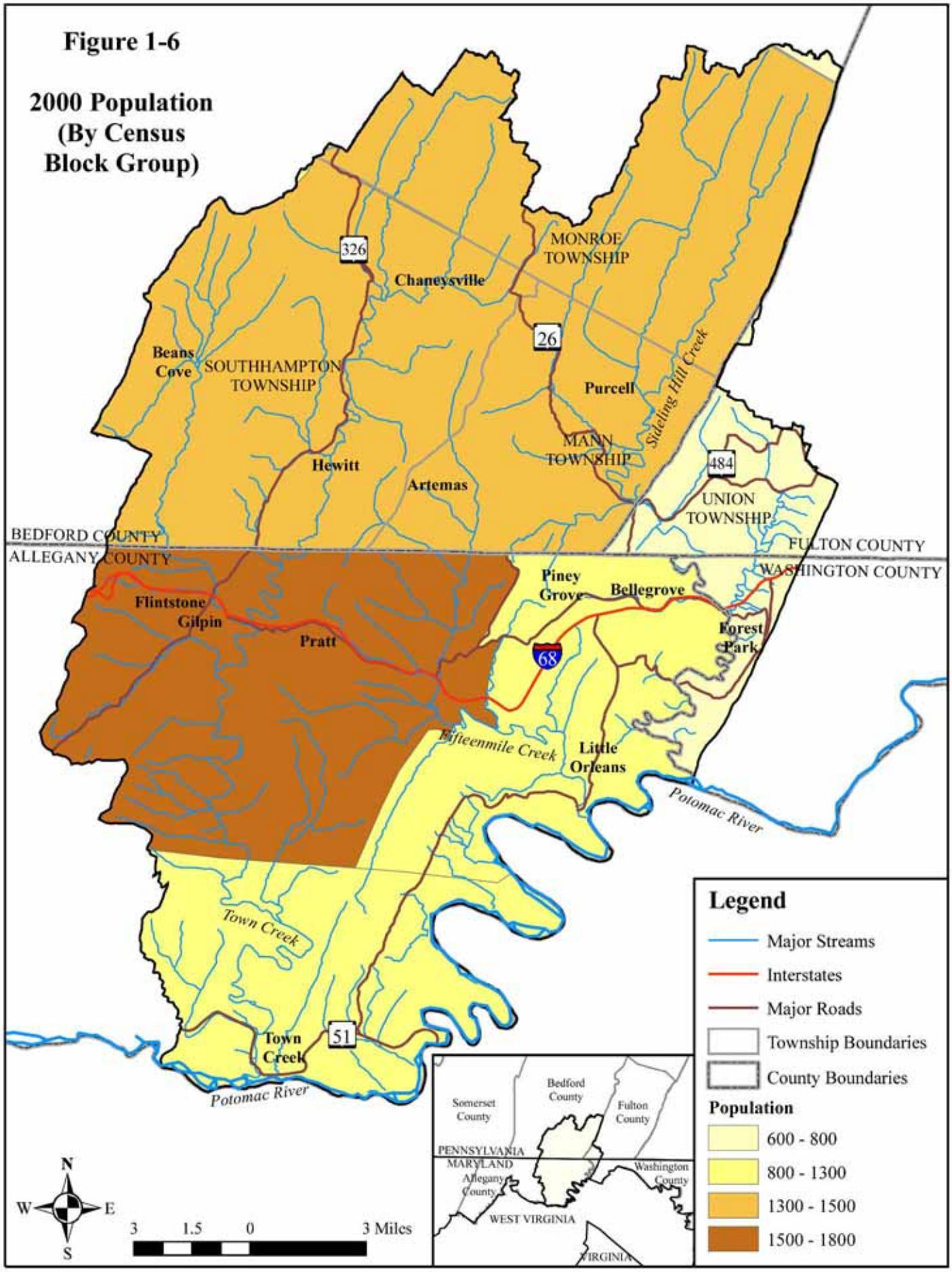


Figure 1-6
2000 Population (By Census Block Group)
326
Chaneysville
MONROE TOWNSHIP
26
Beans Cove
SOUTHHAMPTON TOWNSHIP
Purcell
Sideling Hill Creek
MANN TOWNSHIP
Hewitt
Artemas
484
UNION TOWNSHIP
BEDFORD COUNTY
ALLEGANY COUNTY
FULTON COUNTY
WASHINGTON COUNTY
Piney Grove
Bellegrove
Flintstone
Gilpin
Pratt
68
Forest Park
Fifteenmile Creek
Little Orleans
Potomac River
Town Creek
Town Creek
51
Potomac River
Legend
Major Streams
Interstates
Major Roads
Township Boundaries
County Boundaries
Population
600 - 800
800 - 1300
1300 - 1500
1500 - 1800
Somerset County
Bedford County
Fulton County
PENNSYLVANIA
MARYLAND
Allegany County
Washington County
WEST VIRGINIA
VIRGINIA
N
W
E
S
3 1.5 0 3 Miles

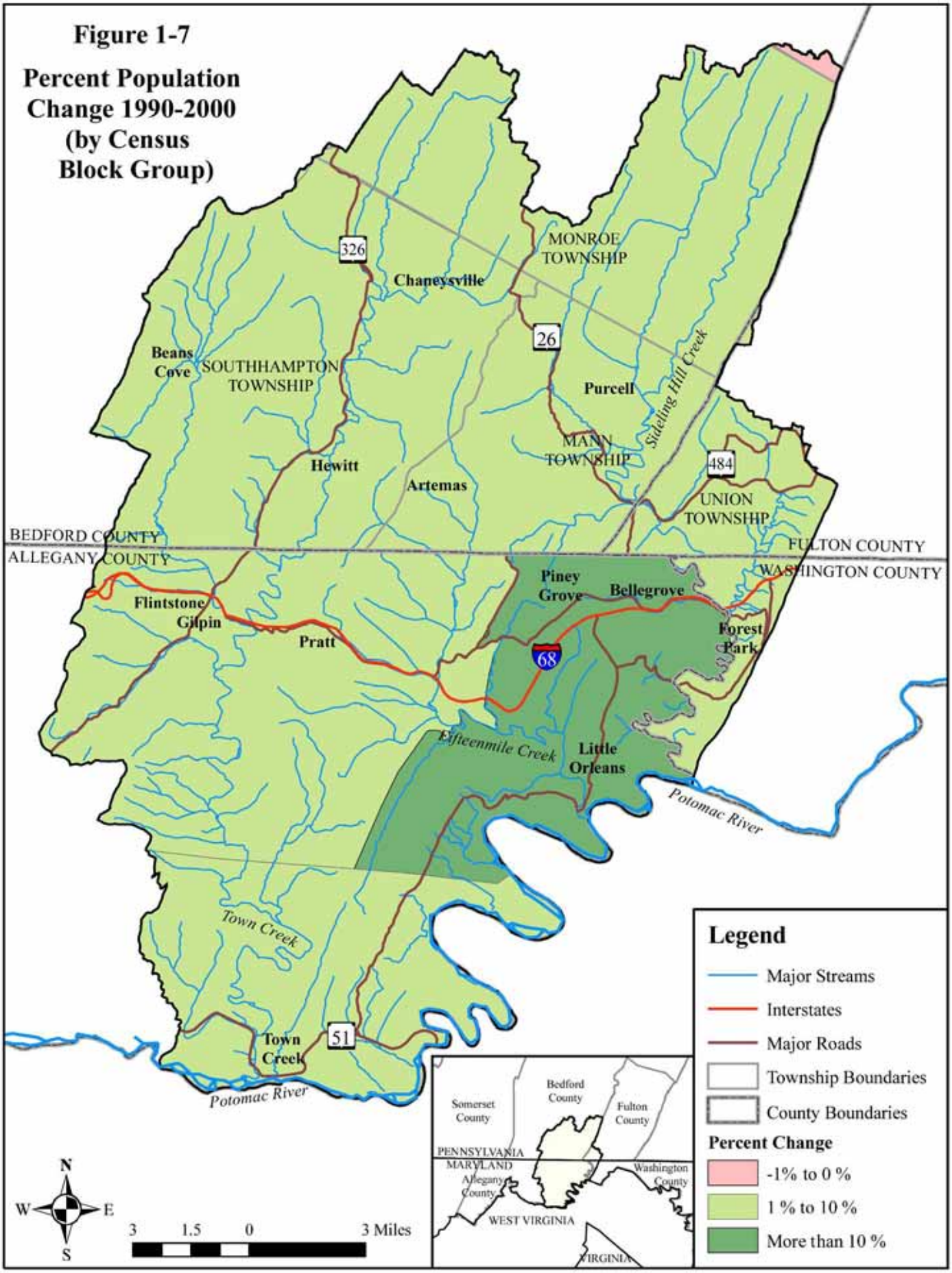


Figure 1-7
Percent Population Change 1990-2000 (by Census Block Group)
326
Chaneysville
MONROE TOWNSHIP
26
Beans Cove
SOUTHHAMPTON TOWNSHIP
Purcell
Sideling Hill Creek
MANN TOWNSHIP
Hewitt
Artemas
484
UNION TOWNSHIP
BEDFORD COUNTY
ALLEGANY COUNTY
FULTON COUNTY
WASHINGTON COUNTY
Piney Grove
Bellegrove
Flintstone
Gilpin
Pratt
Forest Park
68
Fifteenmile Creek
Little Orleans
Potomac River
Town Creek
Town Creek
51
Potomac River
Somerset County
Bedford County
Fulton County
PENNSYLVANIA
MARYLAND
Allegany County
Washington County
WEST VIRGINIA
VIRGINIA
N
W
E
S
3 1.5 0 3 Miles
Legend
Major Streams
Interstates
Major Roads
Township Boundaries
County Boundaries
Percent Change
-1% to 0 %
1 % to 10 %
More than 10 %

Land-Use Planning and Regulation

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

In Maryland, counties have land-use regulation control powers. Each county has a land-use plan that is intended to guide local officials, landowners, developers, and builders when decisions are being made regarding land use (Allegany County Maryland Planning Department 2002a).

Comprehensive Planning

Comprehensive planning efforts have occurred in all four counties within the watershed. Allegany and Washington counties in Maryland completed updates to their county comprehensive plans in 2002. In Pennsylvania, Fulton County completed its plan in 2000, and Bedford County is currently updating the 1993 version of its plan.

Mann, Monroe, and Southampton townships in Bedford County completed a joint municipal comprehensive plan in 2004. The only municipality in the watershed that does not have a municipal comprehensive plan is Union Township in Fulton County, Pa.

Comprehensive plans are created to serve as a guide to public and private actions and decisions to ensure the appropriate development of public and private property (Allegany County Planning Department 2002a). Municipalities and counties recognize that, without formal plans, they may be vulnerable to undesirable land uses through uncontrolled industrial, commercial, or residential development. Comprehensive plans are not legislative documents and have no regulatory authority. According to the Municipalities Planning Code, counties in Pennsylvania are required to review and update their comprehensive plans every 10 years. In Maryland, comprehensive plans are reviewed and, if needed, updated every six years.

Smart Growth

Municipalities and counties should consider implementing cooperative land-use strategies to improve their quality of life. They should also consider initiating Smart Growth practices when development issues are being addressed. Some strategies they may want to consider are:

- Mixing land use;
- Taking advantage of compact building designs;
- Creating a range of housing opportunities and choices;
- Creating walkable neighborhoods;
- Fostering distinctive, attractive communities with a strong sense of place;
- Preserving open space, farmland, natural beauty, and critical environmental areas;
- Strengthening and directing development toward existing communities;
- Making development decisions predictable, fair, and cost-effective; and
- Encouraging community and stakeholder collaboration in development decisions.

Conservation by Design

Conservation by design is an approach to conserve open spaces, greenways, and natural resources, while also addressing development issues. It implements conservation through local zoning and subdivision ordinances. When utilizing conservation by design strategies, the development is rearranged to decrease the amount of buildable space on each individual parcel by at least half, setting aside

community open space. Following conservation by design is a four-step process. For more information, contact the Natural Lands Trust at www.natlands.org.

Step 1 – Identify land that should be permanently protected. These lands become the community open space and can include natural features, such as floodplains and steep slopes, historical sites, farmland, etc.

Step 2 – Locate sites of homes so that their views of the open space are maximized.

Step 3 – Identify the locations where roads and trails should go. This is the reverse of the conventional development process where roads are the first things to be identified.

Step 4 – Determine the boundaries of the lots.

Zoning notice that appeared at the Terrapin Run development site

Zoning

In the Pennsylvania portion of the watershed, zoning is currently not being used. Zoning is a legal mechanism by which government bodies, for the sake of protecting public health, safety, morals, and general welfare, can limit a landowner's right to use privately owned land. This is done through the development of zoning ordinances. Zoning ordinances divide all land within a governing body's area into districts, and create regulations that apply generally to the governing body as a whole, as well as specifically to individual districts.

In Maryland, zoning is currently being used in the watershed to control land uses, and to protect citizens' health and well-being. In Pennsylvania, subdivision and land-use ordinances are being utilized in Mann and Monroe townships. Southampton and Union townships should consider implementing zoning to protect the rural characteristics citizens want and enjoy.

Utilities and Infrastructure

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

Septic and Sewage

Public sewage treatment plants are limited. Small treatment plants, located in Oldtown, Md. and Flintstone, Md. provide the only public treatment systems within the watershed. While some local campgrounds have private treatment systems, the majority of the watershed utilizes individual septic systems. More information about septic and sewage systems is identified in the Water Resources chapter.

Stormwater Management

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

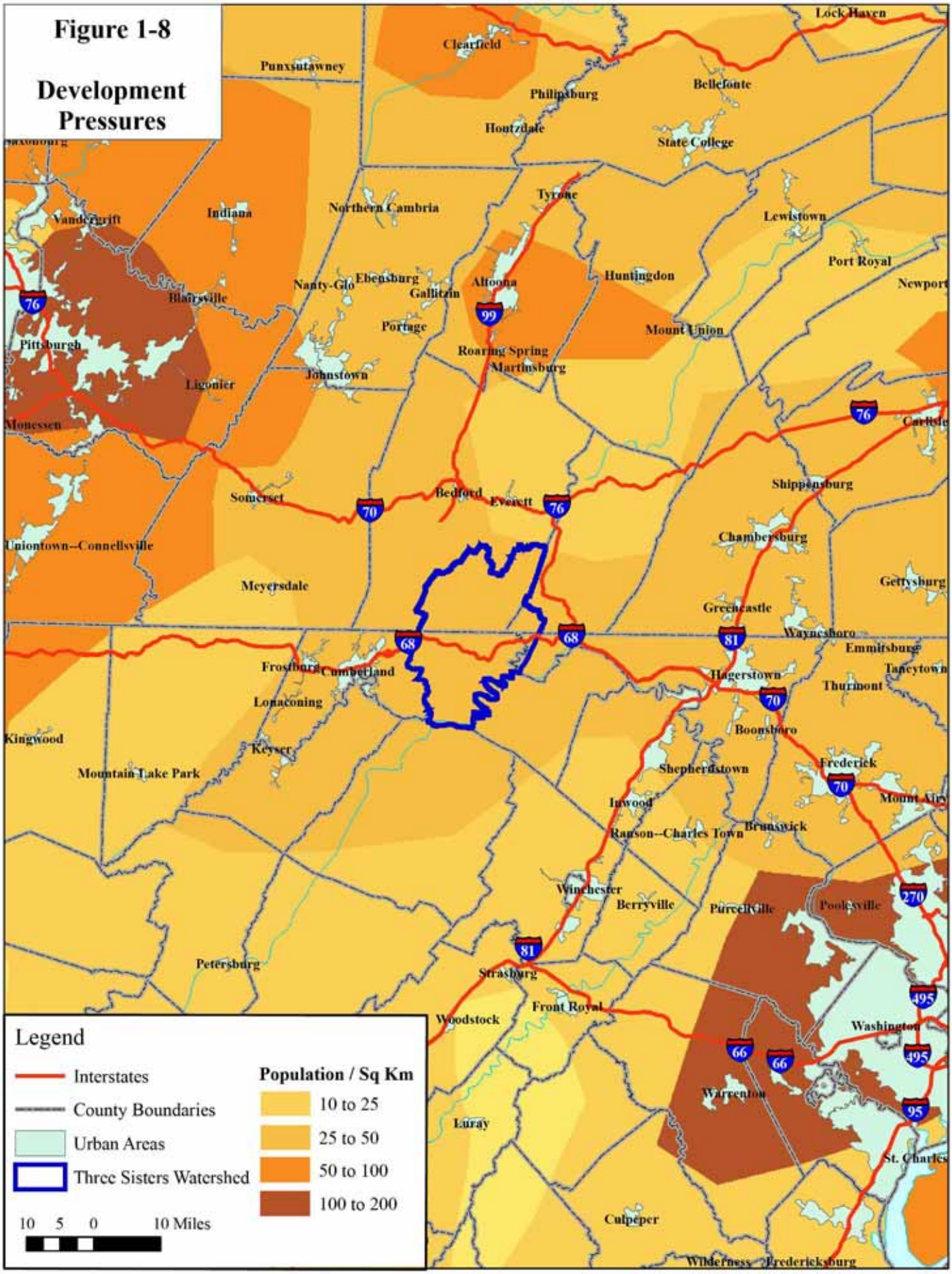


Figure 1-8
Development Pressures
Lock Haven
Clearfield
Punxsutawney
Philipsburg
Bellefonte
Houtzdale
State College
Tyrone
Indiana
Northern Cambria
Lewistown
Vandergrift
Port Royal
Nanty-Glo
Ebensburg
Gallitzin
Altoona
Huntingdon
Newport
Blairsville
Portage
Mount Union
Pittsburgh
Roaring Spring
Martinsburg
Johnstown
Ligonier
Monessen
Carlisle
Shippensburg
Somerset
Bedford
Everett
Chambersburg
Uniontown--Connellsville
Meyersdale
Gettysburg
Greencastle
Waynesboro
Emmitsburg
Frostburg
Cumberland
Hagerstown
Taneytown
Thurmont
Lonaconing
Boonsboro
Kingwood
Keyser
Frederick
Mountain Lake Park
Shepherdstown
Mount Airy
Inwood
Brunswick
Ranson--Charles Town
Winchester
Berryville
Purcellville
Poolesville
Petersburg
Strasburg
Front Royal
Woodstock
Washington
Warrenton
Luray
St. Charles
Culpeper
Wilderness
Fredericksburg
Legend
Interstates
County Boundaries
Urban Areas
Three Sisters Watershed
Population / Sq Km
10 to 25
25 to 50
50 to 100
100 to 200
10 5 0 10 Miles

Act 167 requires Pennsylvania counties to prepare and adopt stormwater management plans for each watershed in their county, as designated by the PA DEP. In Maryland, each county is responsible for adopting ordinances necessary to implement its stormwater management program. More information about stormwater management is identified in the Water Resources chapter.

Public Water Supply

Access to clean water is very important. Currently, there are no public water systems providing water to residents within the watershed. A small-scale water system is proposed for Oldtown and Flintstone that should be able to adequately accommodate most new growth in the eastern portion of Allegany County, Md. Watershed residents rely on springs or well water for their daily needs. More information about source water is identified in the Water Resources chapter.

Transportation

While there are numerous secondary roads, state roads, and an interstate highway traversing the watershed, access to other forms of transportation within the watershed is limited. There are no airports or active railroads within the boundaries of the watershed. In addition to major roadways, the majority of the roadways in the watershed are unpaved dirt and gravel roads. More information about the impact of dirt and gravel roads is located in the Water Resources chapter. Figure 1-9 displays available transportation options.

Major Roads

There are six major roads within the watershed: Interstate 68, U.S. Route 40, Route 26, Route 326, Route 484, and Route 51. Interstate 68 is the only interstate in the watershed. It travels through northern Maryland from east to west and coincides with U.S. Route 40. U.S. Route 40 is designated as a national pike with historical significance. Route 26 travels north to south through the Town Creek and Sideling Hill Creek watersheds until it terminates at U.S. Route 40. Route 326 travels through the Town Creek watershed in a north to south direction. Route 484 travels east to west through the Fulton County portion of the Sideling Hill Creek watershed. Route 51 also travels in an east to west direction and crosses the southern portion of the Town Creek watershed.

A dirt and gravel road traveling through the Billmeyer Wildlife Management Area is typical of most of the roads within the watershed

Dirt and Gravel Roads

The Dirt and Gravel Road Pollution Prevention Program identifies unpaved roads that are sources for dust and sediment pollution. This program funds environmentally sound maintenance of these unpaved roadways.

The Nature Conservancy and Western Pennsylvania Conservancy received funding through the Federal Transportation Bill for the Better Roads Clean Streams program. The Better Roads Clean Streams program is an inventory and assessment of dirt and gravel roads within the Three Sisters watershed. It also funds implementation projects identified in the assessment in Mann, Monroe, Southampton, and Union townships.

Within the Three Sisters watershed, there are approximately 300 miles of unpaved roadways. Figure 1-10 shows the dirt and gravel roads and priority work sites within the watershed. At least 12 sites will be selected for resurfacing and drainage enhancements. Work crews will also be trained throughout the project area.

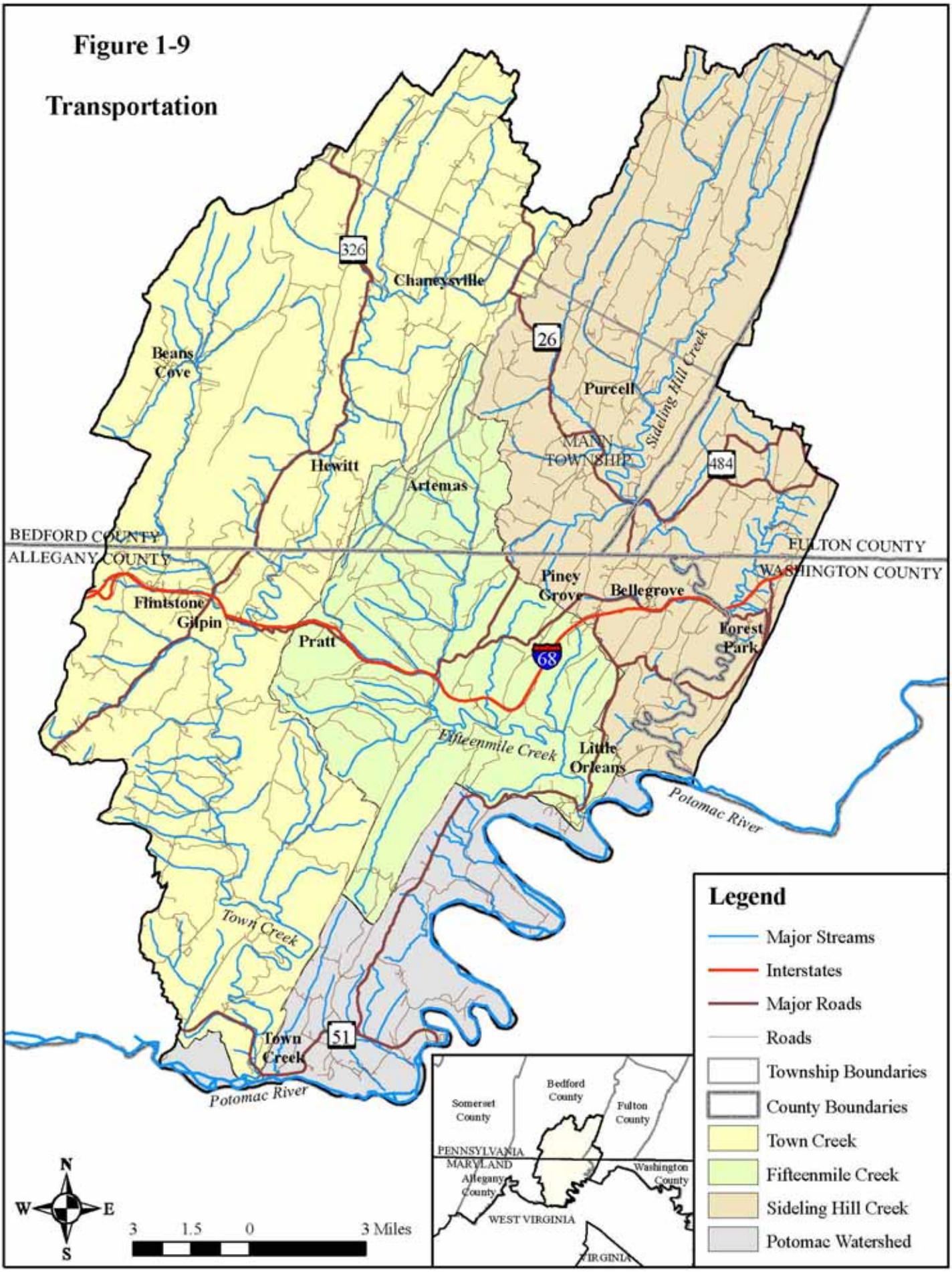
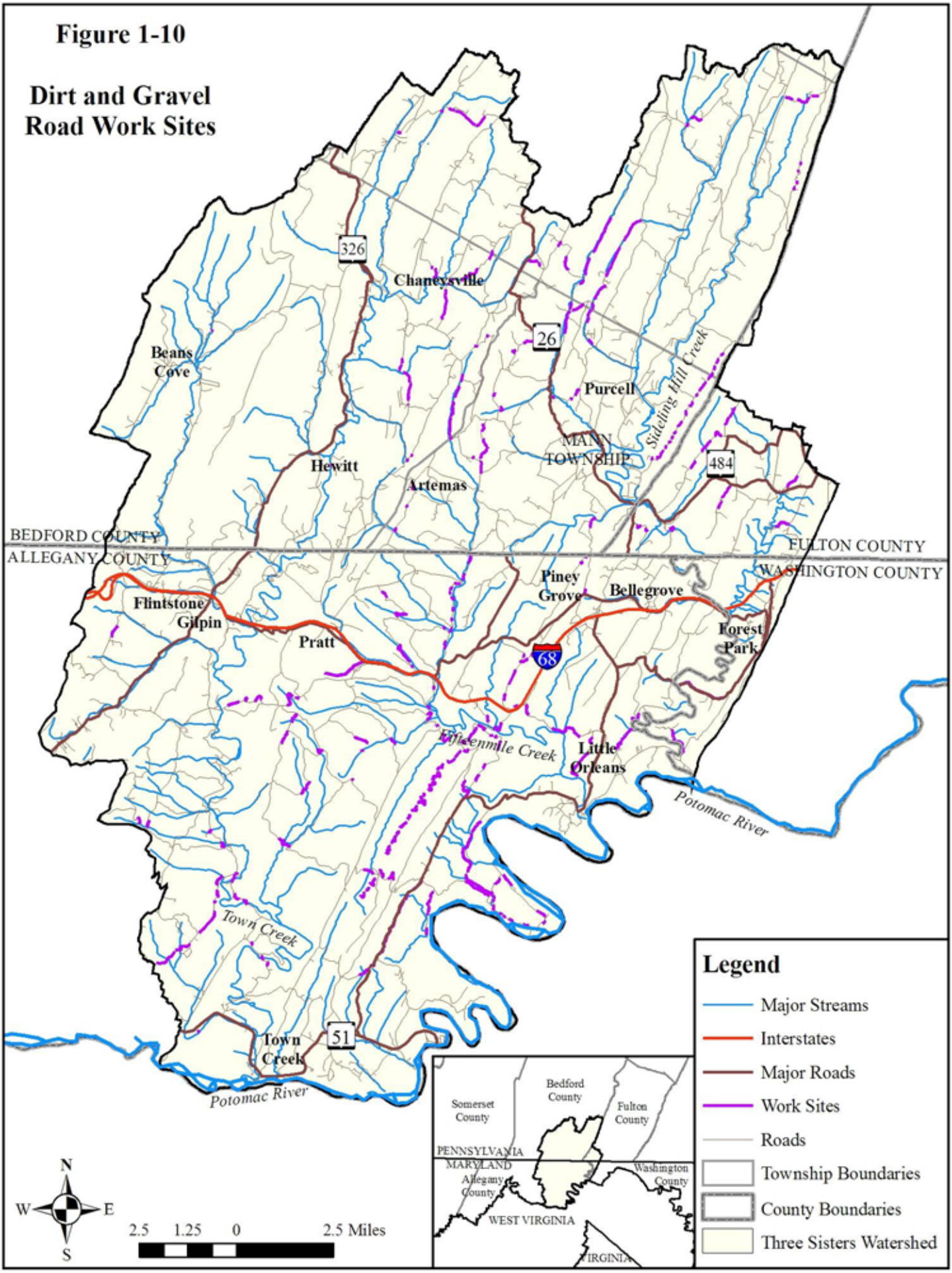


Figure 1-9
Transportation
326
Chaneysville
26
Beans Cove
Purcell
Sideling Hill Creek
MANN TOWNSHIP
484
Hewitt
Artemas
BEDFORD COUNTY
ALLEGANY COUNTY
FULTON COUNTY
WASHINGTON COUNTY
Piney Grove
Bellegrove
Flintstone
Gilpin
Pratt
68
Forest Park
Fifteenmile Creek
Little Orleans
Potomac River
Town Creek
Town Creek
51
Potomac River
Somerset County
Bedford County
Fulton County
PENNSYLVANIA
MARYLAND
Allegany County
Washington County
WEST VIRGINIA
VIRGINIA
N
W
E
S
3 1.5 0 3 Miles
Legend
Major Streams
Interstates
Major Roads
Roads
Township Boundaries
County Boundaries
Town Creek
Fifteenmile Creek
Sideling Hill Creek
Potomac Watershed

Figure 1-10

Dirt and Gravel Road Work Sites



Airports

The Greater Cumberland Regional Airport, Washington County Regional Airport, and the Bedford County Airport are local airports located not far outside of the watershed. The nearest international airports are located in Baltimore, Md., and Harrisburg, Pa.

Economy

In July 2004, the unemployment rate of the United States was 5.5 percent. The unemployment rate was 5.3 percent in Pennsylvania and 4.1 percent in Maryland, both under the national rate. The four counties making up the watershed saw decreases in the unemployment rate from January to July in 2004.

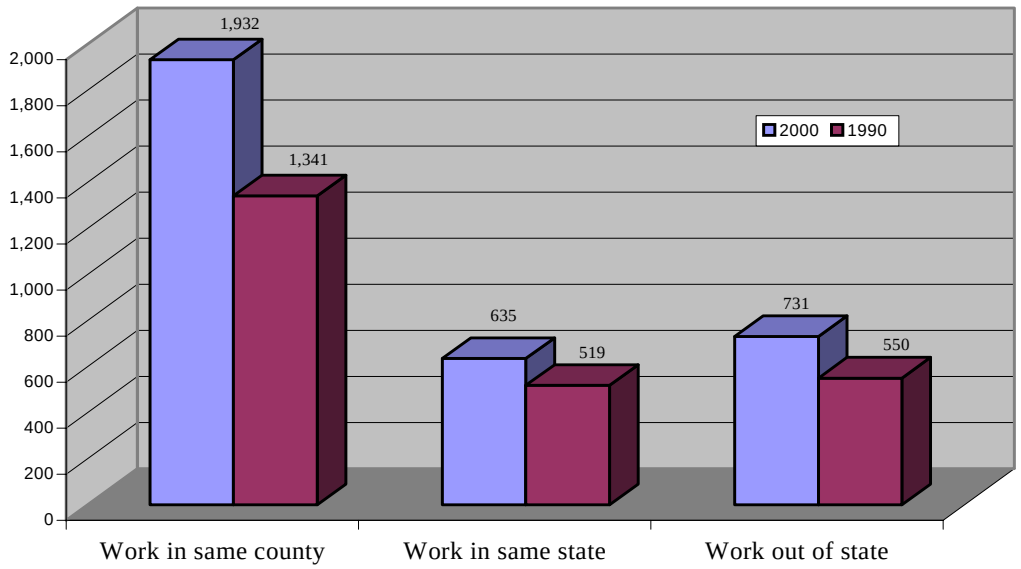
In Pennsylvania, Fulton County had an unemployment rate of 4.7 percent in July 2004 and Bedford County had a rate of 7.4 percent, the highest in the watershed. In Maryland, Allegany County's unemployment rate was 6.8 percent, while Washington County's was the lowest at 3.8 percent (U.S. Department of Labor Bureau of Labor Statistics 2004).

The national median household income was $41,994 in 1999. The 1999 median household incomes for the watershed were $32,731 in Bedford County, $34,882 in Fulton County, $30,821 in Allegany County, and $41,994 in Washington County (U.S. Census Bureau 2000).

Major Sources of Employment

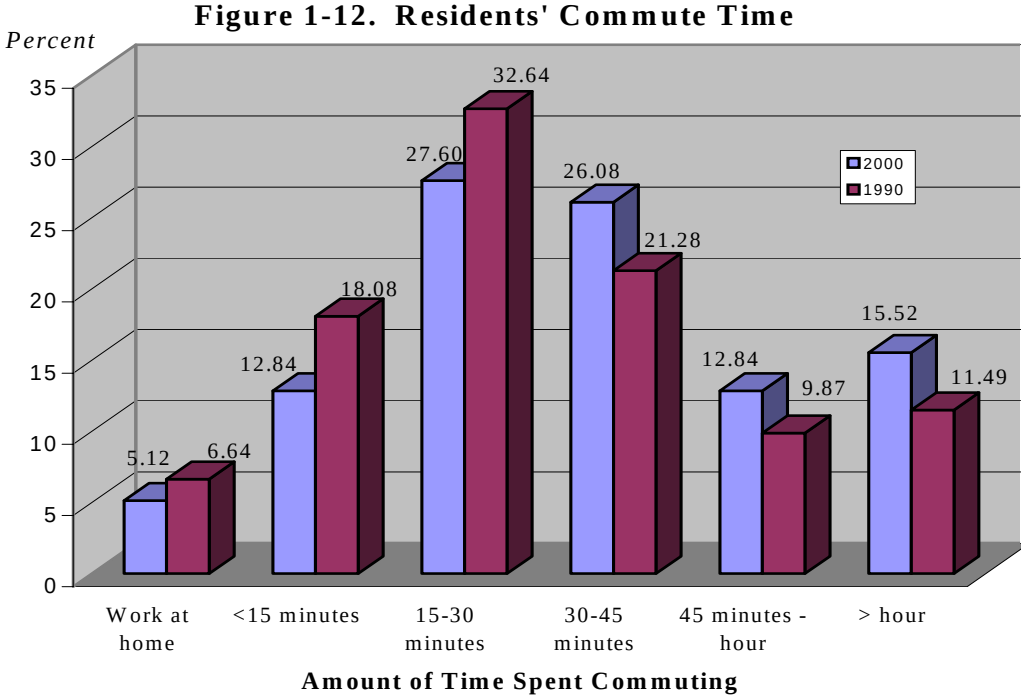
Major employers are designated as companies having a minimum of 200 employees. Due to its rural nature, there are no major employers located within the watershed. A list of employers is located in Appendix C. Since employment opportunities are limited in the region, many residents commute to different counties or states for work. Figure 1-11 shows where people work in relation to where they live, and Figure 1-12 shows the amount of time many residents spend traveling to work.

Figure 1-11. Employment Locations



The breakdown of employment by industry from the 2000 U.S. Census is illustrated in Table 1-3. In Maryland, the largest employment sector was education, health, and social services at 20.1 percent. Manufacturing was second with 14 percent, and retail trade was third with 13.2 percent. In Pennsylvania, manufacturing was the largest employment sector with 23.5 percent. Education, health, and social services were second with 15.8 percent, and retail trade was third with 12.2 percent.

Figure 1-12. Residents' Commute Time



Education

Portions of four school districts are located within the Three Sisters watershed—two school districts in each state. The departments of education in Pennsylvania and Maryland operate differently. In Maryland, school districts are organized and run by counties. In Pennsylvania, local governments organize school districts and elected school boards oversee the school districts. Table 1-4 identifies school and school district enrollments.

In Pennsylvania, Everett School District and Southern Fulton School District are located within the watershed. Students residing in the Bedford County portion of the watershed are enrolled in the Everett School District. Bedford County students attend two elementary schools, Mann-Monroe Elementary School and Chaneysville-Cove Elementary. Once students reach the sixth grade, they begin attending classes at Everett Junior-Senior High School. In Fulton County, students residing within the watershed attend Southern Fulton Elementary and Southern Fulton Junior-Senior High School.

In Allegany County, Maryland, students residing within the watershed attend Flintstone Elementary, Washington Middle School, Fort Hill High School, or Hancock Middle/High School. In Washington County, students residing within the watershed attend Hancock Elementary and Hancock Middle/High School.

Table 1-3. Breakdown of Employment in Bedford, Fulton, Allegany, and Washington Counties by Industry (Source: U.S. Census Bureau, 2000)

Industry	Bedford County		Fulton County		Allegany County		Washington County	
	Absolute Employment	%	Absolute Employment	%	Absolute Employment	%	Absolute Employment	%
Agriculture, forestry, fishing and hunting, and mining	1,111	4.9	352	5.2	281	0.9	957	1.6
Construction	2,016	9	731	10.9	1,872	6.2	5,572	9.1
Manufacturing	5,032	22.4	1,808	26.9	3,815	12.7	9,006	14.7
Wholesale trade	708	3.2	147	2.2	717	2.4	1,949	3.2
Retail trade	2,867	12.8	695	10.4	3,812	12.7	8,237	13.4
Transportation, warehousing, and utilities	1,473	6.6	307	4.6	1,937	6.5	3,451	5.6
Information	300	1.3	96	1.4	752	2.5	1,738	2.8
Finance, insurance, real estate, rental, and leasing	645	2.9	263	3.9	1,337	4.5	4,275	7.0
Professional, scientific, management, administrative, and waste management services	925	4.1	232	3.5	1,361	4.5	4,060	6.6
Educational, health, and social services	3,552	15.8	1,051	15.7	7,854	26.2	10,553	17.2
Arts, entertainment, recreation, accommodations, and food services	1,810	8.1	413	6.2	2,587	8.6	3,691	6.0
Other services	1,165	5.2	279	4.2	1,523	5.1	3,348	5.4
Public administration	854	3.8	335	5.0	2,183	7.3	4,605	7.5
Totals	**22,458**	**100.1**	**6,709**	**100.1**	**30,031**	**100.0**	**61,442**	**100.1**

Table 1-4. Schools and School Enrollment

Schools and School District	Enrollment
Everett School District	1,558
Chaneysville-Cove Elementary	64
Mann-Monroe Elementary	90
Everett Junior-Senior High	771
Southern Fulton School District	904
Southern Fulton Elementary	482
Southern Fulton Junior-Senior High	422

Schools and School District	Enrollment
Allegany County	1,958
Flintstone Elementary	216
Washington Middle School	784
Fort Hill High School	958
Washington County	607
Hancock Elementary	245
Hancock Middle/High School	362

Management Recommendations:

Goal 1-1. Protect the watershed from unwanted and undesirable land uses.

Establish and enforce land-use ordinances supportive of county and municipal comprehensive plans.	High
Establish land-use ordinances protecting the communities from undesirable land uses.	High
Strengthen the regulation of land-use ordinances so they are not changed easily.	High
Monitor the amount of commercial zoning along major highway interchanges, to support county and municipal comprehensive plans.	Medium

Goal 1-2. Utilize smart growth practices and comprehensive land-use plans when addressing development pressures.

Encourage the use of smart growth practices in local planning to support good planning and conservation policies.	High
Consult and implement county and municipal land-use plans.	High
Encourage the use of conservation by design strategies when community development activities arise.	High
Encourage participation by natural resource managers to actively participate in municipal and county planning meetings, commissioner or municipal official meetings, and become involved in the development of comprehensive plans.	Medium
Complete a comprehensive plan for Union Township, Fulton County.	Low
Maintain skilled professionals in positions to guide county planning efforts.	Low

Goal 1-3. Protect the rural character and pace of life and create a stronger sense of community.

Limit the amount of residential development based upon limitations of the physical characteristics of the region, including the consideration of water-use limitation in permitting decisions.	High
Establish a joint or shared management of non-road issues among townships.	High
Establish interstate communication and cooperation between townships, counties, and states.	High
Avoid urban sprawl by restricting large housing developments.	Medium
Maintain local schools within the watershed to protect the sense of community around them.	Medium

Goal 1-4. Enhance area roadways through the installation of best management practices.

Implement practices identified in the Better Roads Clean Streams assessment of dirt and gravel roads.	High
Provide required workshops and/or training sessions to train road masters on sustainable maintenance practices.	High
Increase funding available to provide sustainable maintenance practices on area roadways.	High

Goal 1-5. Establish economic stability needed to maintain a balanced workforce.

Increase economic stability that promotes sustainable natural resource use, such as establishing local resource-oriented sustainable industries like value-added and farmers' markets. Value added industries increases the value of a product through addition stages of production, such as wood staining, or building furniture from local timber.	High
Create non-polluting jobs to keep young adults in the region and improve economic viability.	Medium
Encourage residents to support local businesses through the development of a local business directory.	Medium
Create an employment registry listing all filled and vacant jobs.	Medium
Encourage local business owners to establish a cooperation or network of industries to spread the word about each other's businesses.	Medium
Establish a website promoting the local businesses.	Low
Investigate the possibilities of combining local schools to determine if any economic gain could be made through school consolidations.	Low

Goal 1-6. Minimize threats to air quality.

Educate residents about the impacts that acid rain and mercury have on the environment.	High
Identify impacts of acid rain and mercury and work to minimize or remediate these impacts.	High
Educate residents about local issues affecting air quality.	Medium
Work with neighboring states to reduce emissions from industries emitting critical pollutants impacting the air quality.	Low

CHAPTER 2. LAND RESOURCES

Geology

Today's landscapes reflect millions of years of natural events. Because forces acting on the land had different effects, a vast array of landscapes exists. In order to categorize landscapes and land forms with similar features and help distinguish among them, geologists have divided the earth into various physiographic provinces. Pennsylvania and Maryland are divided into 12 physiographic provinces, each with a particular type of landscape and geology. The Three Sisters watershed is located in the Ridge and Valley Physiographic Province.

Shale barren along Sideling Hill Creek

Tightly folded strata characterize the Ridge and Valley Physiographic Province (Brezinski 1994). Erosion of these folds has produced a series of ridges and valleys, in which erosion-resistant sandstones cap the ridges, and the intervening valleys are underlain by soluble limestone and easily eroded shale (Brezinski 1994).

In Pennsylvania, the Ridge and Valley Physiographic Province is divided into seven sections, of which the Appalachian Mountain Section is the only one located within the Three Sisters watershed. Long, narrow ridges and broad to narrow valleys characterize this section (Sevon 2000). It is underlain by sandstone, siltstone, and shale with some conglomerate.

In Maryland, the Folded Appalachian Mountain Section and the Great Valley Section make up the Ridge and Valley Physiographic Province. The Three Sisters watershed is located in the Folded Appalachian Mountain Section. It is characterized by strongly folded and faulted sedimentary rocks, with rugged terrain (Edwards 2002). The bedrock is composed of sandstone and shale and ranges in age from Silurian to Mississippian. Some valleys in this region are underlain by limestone from the Silurian and Devonian ages providing local sources of agricultural lime and building stone (Edwards 2002). Sedimentary rocks in this province yield small to moderate amounts of groundwater (Edwards 2002).

A unique geological formation found within the Three Sisters watershed is the shale barrens. Shale barrens are steep, south-facing, eroding slopes of thinly bedded, weathered shale, having sparse tree cover and little soil [The Nature Conservancy (TNC) 2005]. With their southern exposure, steep slopes, and rocky substrate, the habitats they support are very dry (TNC 2005). Found in the Ridge and Valley Province, from southern Pennsylvania to southern Virginia, shale barrens support a unique plant community. Approximately 12 rare species of plants grow exclusively in, or are mostly restricted to, shale barrens within the Three Sisters watershed (Watershed Natural History). Many rare and endangered plant species grow in these environmentally sensitive ecosystems.

The bedrock geology of the region is from the Devonian and Silurian periods of the Paleozoic Era. It is estimated that the Devonian period occurred 365–405 million years ago (Sevon 2000). Rocks formed during this period include red sandstone, gray shale, black shale, limestone, and chert (Sevon 2000). The oldest rocks in the watershed are from the Silurian period, occurring 405–430 million years ago (Sevon 2000). Red sandstone, gray sandstone, conglomerate, shale, and limestone are typical rocks formed during this period (Sevon 2000).

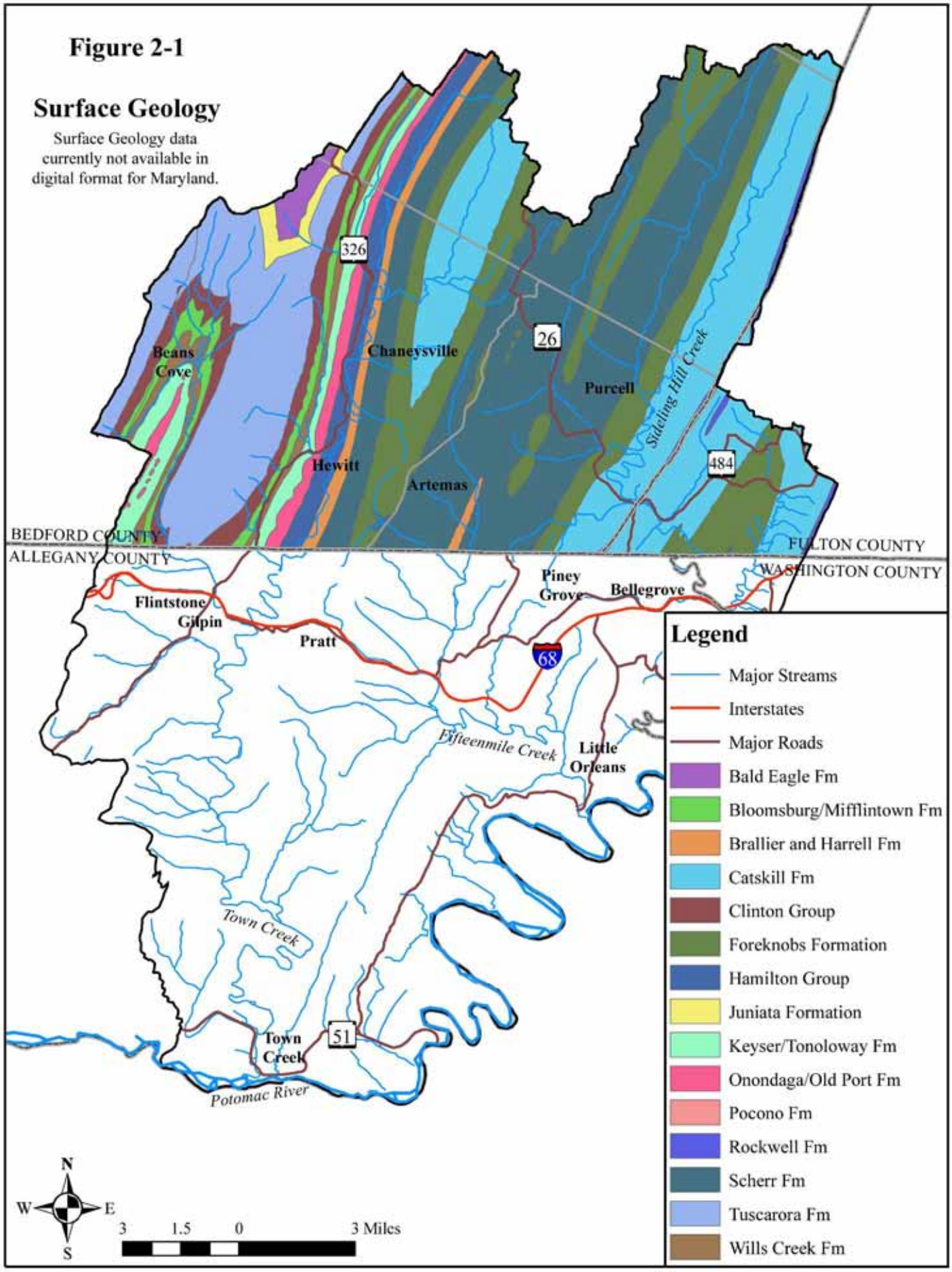


Figure 2-1
Surface Geology
Surface Geology data currently not available in digital format for Maryland.
326
26
484
68
51
Beans Cove
Chaneysville
Purcell
Sideling Hill Creek
Hewitt
Artemas
BEDFORD COUNTY
ALLEGANY COUNTY
FULTON COUNTY
WASHINGTON COUNTY
Piney Grove
Bellegrove
Flintstone
Gilpin
Pratt
Fifteenmile Creek
Little Orleans
Town Creek
Town Creek
Potomac River
N
W
E
S
3 1.5 0 3 Miles
Legend
Major Streams
Interstates
Major Roads
Bald Eagle Fm
Bloomsburg/Mifflintown Fm
Brallier and Harrell Fm
Catskill Fm
Clinton Group
Foreknobs Formation
Hamilton Group
Juniata Formation
Keyser/Tonoloway Fm
Onondaga/Old Port Fm
Pocono Fm
Rockwell Fm
Scherr Fm
Tuscarora Fm
Wills Creek Fm

Soil Characteristics

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

Soil Associations

Soil associations are comprised of two or three major soil types and a few minor soil types. There are 15 associations in the project area. Descriptions of each of the associations are located below.

1. **Berks-Weikert-Blairton** soil association landscape consists of rolling hills and long, narrow ridges. Streams that have narrow floodplains dissect them. The valleys are narrow and the foot slopes are narrow and moderately wide. Most of the lesser-sloping areas in this association are cleared and used for hay, pasture, and cultivated crops. In some areas, available water capacity and natural fertility are low. Shallow and moderate depth to bedrock and slope are limitations for community development.

2. **Buchanan-Dystrochrepts-Meckesville** soil association is located on mountain ridges throughout Bedford County, Pa. The landscape consists of very steep mountain ridges, sloping to steep colluvial benches, and foot slopes. Streams and water gaps dissect areas. Most areas in this association are wooded, with a few smaller areas being farmed or in non-farm uses. The soils are not suited to farming because of the slope and large stone and boulder substrate. These same reasons, plus the seasonal high water table and slow permeability, limit use in community development. They are suited to woodlands and have potential for development into wildlife habitat and as recreational areas. Large areas of state game lands and forestlands are contained in this association.

3. **Calvin-Klinesville-Leck Kill** soil association landscape consists of deeply dissected hills and low ridges. Streams that have narrow and moderately wide floodplains and bottomlands dissect areas. The lesser-sloping areas of this association are commonly used for farming. The steeper areas are wooded, pasture, or idle. Some areas are droughty because of low or moderate available water capacity. Soils are limited for most community development uses because of shallow or moderate depth to bedrock, slope, and moderately rapid permeability.

4. **Dekalb-Lehew-Cookport** soil association is located on high mountaintops and upper slopes. The mountain slopes are steep or very steep where there are some small ledges and depressions where seep spots exist. Most of this soil association is wooded and not suited to farming, even where the slope permits, without a high level of management. The potential for recreation is good where a supply of water can be obtained.

5. **Dekalb-Sideling-Hazelton** soil association is located on ridges from Fairview Mountain to Sideling Hill. The slope in this association ranges from three to 65 percent, but is commonly around 25 percent. The soils have stones on the surface and are moderately steep. They are best suited for use as forestland and habitat for

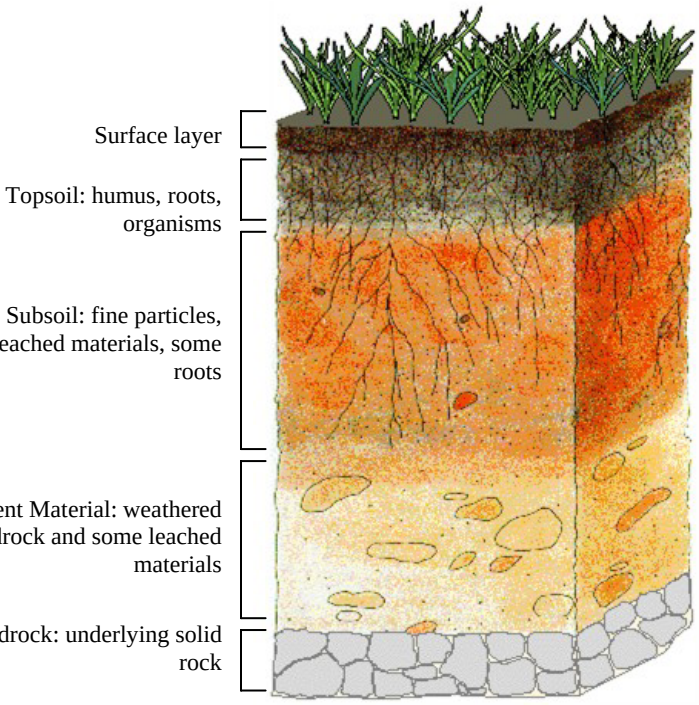
woodland wildlife. They are poorly suited to agricultural and urban uses on the steep slopes.

6. **Downsville-Monongahela-Walkersville** soil association is located on old stream terraces along Sideling Hill Creek. The slope ranges from zero to 25 percent, but is commonly between zero and 15 percent. The soils in this association are well suited to corn, soybean, small grain, hay, and pasture. Large cobbles on these soils can interfere with some agricultural practices. The Downsville and Walkersville soils are well suited to most non-agricultural uses and tree production. A seasonal high water table limits Monongahela soils for many non-agricultural uses.

7. **Elibert-Opequon-Mertz** soil association is located on minor ridges. The landscape consists of relatively broad, undulating to smooth ridgetops and steep, smooth side slopes. The ridges are elongated and are occasionally dissected by major streams. Many of the lesser-sloping areas of this association are cleared and cultivated. Many favorable areas are used as orchards. Most steep areas are wooded. Some small areas are being mined for road fill material. Soils are generally suited for farming with the main limitations being the hazard of erosion, small stones on the surface, and shallowness to bedrock. Soils are also suited for woodland. The hazard of groundwater contamination, shallowness to bedrock, and steep slopes are limitations for community development.

8. **Elibert-Dekalb-Opequon** soil association is located in the central portion of Allegany County, Maryland. Soils in this association are used for orchards, pastures, general farming, and woodlands. Limestone is exploited for local commercial use. Moderate to severe limitations are placed on buildings with basements and septic tanks because of the limited depth to bedrock. Slope is the only limitation for septic tanks and building sites on Elibert soils. In all areas of limestone, groundwater pollution is a hazard. Community systems of water supply and sewage disposal are needed for the development of residential areas.

Figure 2-2. Primary Layers of a Soil Profile



9. **Hazelton-Clymer-Dystrochrepts** soil association is located on broad mountaintops and ridges throughout Bedford County. The landscape consists of smooth side slopes of ridges, convex ridgetops, and undulating plateaus. Small or medium streams irregularly dissect

areas. Most areas in this association are wooded with a few areas being used as farms and for non-farm uses. State game lands and forestland are comprised of this association. Soils are not well suited for farming because of slope and large stones and boulders on the surface. They have potential for woodlands, wildlife habitat, and some recreational uses. Most soils in this association have limitations for community development because of the slope, large stones and boulders, slow permeability, and the seasonal high water table.

10. **Klinesville-Calvin** soil association extends west of Fairview Mountain to Sideling Hill Creek. Prominent features of the landscape include rolling shale hills, steep, wooded hollows, and narrow floodplains. The slope ranges from zero to 65 percent, but is commonly between three and 25 percent. The soils are shallow and moderately deep with a shaly and medium texture. The majority of the soils in this association are used in tree production, but in isolated areas they are also used for agricultural purposes. These soils are also limited to some urban uses because of depth of bedrock and slope in some areas. If septic systems are not properly located, the effluent can seep into cracks in the bedrock and contaminate wells.

11. **Lindside-Deposit-Combs-Melvin** soil association is located on landscapes near perennial streams. These soils have severe limitations for urban uses because of flooding and the seasonal high water table. Well-drained and moderately well-drained soils in this association are excellent for corn, soybean, small grain, hay, and pasture. Poorly drained soils are well suited as habitat for wetland wildlife, but have severe limitations for urban uses because of flooding and the seasonal high water table.

12. **Weikert-Berks** soil association is located in intermountain valleys. The landscape contains rolling shale hills, steep, wooded hollows, and narrow floodplains. The soils have a shaly or channery, medium-textured surface layer with a low to moderate available moisture capacity. The majority of the association is used for agricultural purposes; the remainder is wooded.

13. **Weikert-Calvin-Lehew** soil association is located east of Green Ridge extending northeast from the North Branch of the Potomac River to the state line. Most areas in this association are used for general farming; however, some areas are used for residential development with limitations. Some limitations are from the depth of bedrock, drainage capabilities, and stoniness of the substrate. Areas considered for development of residential areas would require community systems for water supply and sewage discharge.

14. **Weikert-Gilpin** soil association extends west from the top of Green Ridge to the eastern slopes of Warrior Mountain. Gently sloping and rolling hills of this association are used for general farming and pasture. Soils are generally less productive than those in other parts of the county because of the dominance of the shallow, droughty Weikert soils in the association. Some areas are used for grazing land and steep areas with stony soils are mostly wooded, but since tree growth tends to be slow, wood crops are not produced in large quantities. Soils have moderate to severe limitations for building sites because of shallowness to relatively soft bedrock that is, however, not too difficult to excavate. Soils are also severely limited for septic tanks because of this limited depth to bedrock. Community

systems for water supply and sewage disposal are needed if areas are going to be developed for residential use.

15. **Westmoreland-Edom-Opequon** soil association's landscape is undulating to rolling and irregularly dissected by streams that have moderate or wide floodplains and bottomland. Lesser-sloping areas of this association are cleared and are cultivated. The steeper areas are used for pasture and woodland. Soils in this association are generally suited to farming. The major limitations are a moderate or severe hazard of erosion and shallowness to bedrock. Soils are suited to woodland. Sinkholes and the hazard of groundwater contamination are limitations for community development.

Agricultural Soils

Soils that meet certain physical, chemical, and slope characteristics are identified as prime agricultural soils (Farmland Protection Policy Act Annual Report FY 2000, 2001). Based upon a pre-determined set of criteria, they are designated by the United States Department of Agriculture (USDA) Natural Resources Conservation Service in each county. The criteria typically include level to nearly level slopes, a well-drained structure, deep horizons, an acceptable level of alkaline or acid components, and the capacity for producing food and crops. There are 82 prime agricultural soils within the watershed. A listing of these by county is located in Appendix D.

Farmland of statewide importance does not meet the criteria for prime agricultural soils, but nearly meets the criteria and produces high yields of crops when managed accordingly (Farmland Protection Policy Act Annual Report FY 2000, 2001). Some of these areas may even produce yields as high as areas in prime farmland when conditions are favorable (Farmland Protection Policy Act Annual Report FY 2000, 2001). Farmland of statewide importance is designated by the appropriate state agency and may include tracts of land that have been designated for agriculture by state law. Designations are made by the State Rural Development Committee in Pennsylvania and by the Natural Resources Conservation Service in Maryland. Within the watershed, 95 soils have been designated as farmland of statewide importance. They are listed by county in Appendix D.

Agricultural Preservation Areas

Agricultural preservation areas are lands enrolled in statewide programs to promote and conserve agricultural lands and the agricultural community. Since they are statewide programs, each state manages its program differently. In Pennsylvania, agricultural security areas (ASAs) are designated, while in Maryland, agricultural preservation districts are established.

Agricultural Security Areas

ASAs serve as a tool to protect farmland from urbanization. They are designated by local governments in cooperation with landowners to secure agricultural land use and the right to farm. In Pennsylvania, areas of at least 250 collective acres are eligible to enroll in the program. The acreages need not be continuous, but each parcel must be no less than 10 acres. Property established as an ASA must be viable agricultural land, including pasture, hayland, woodland, or cropland. The local governing body reviews ASAs every seven years.

Cattle farm located within the watershed

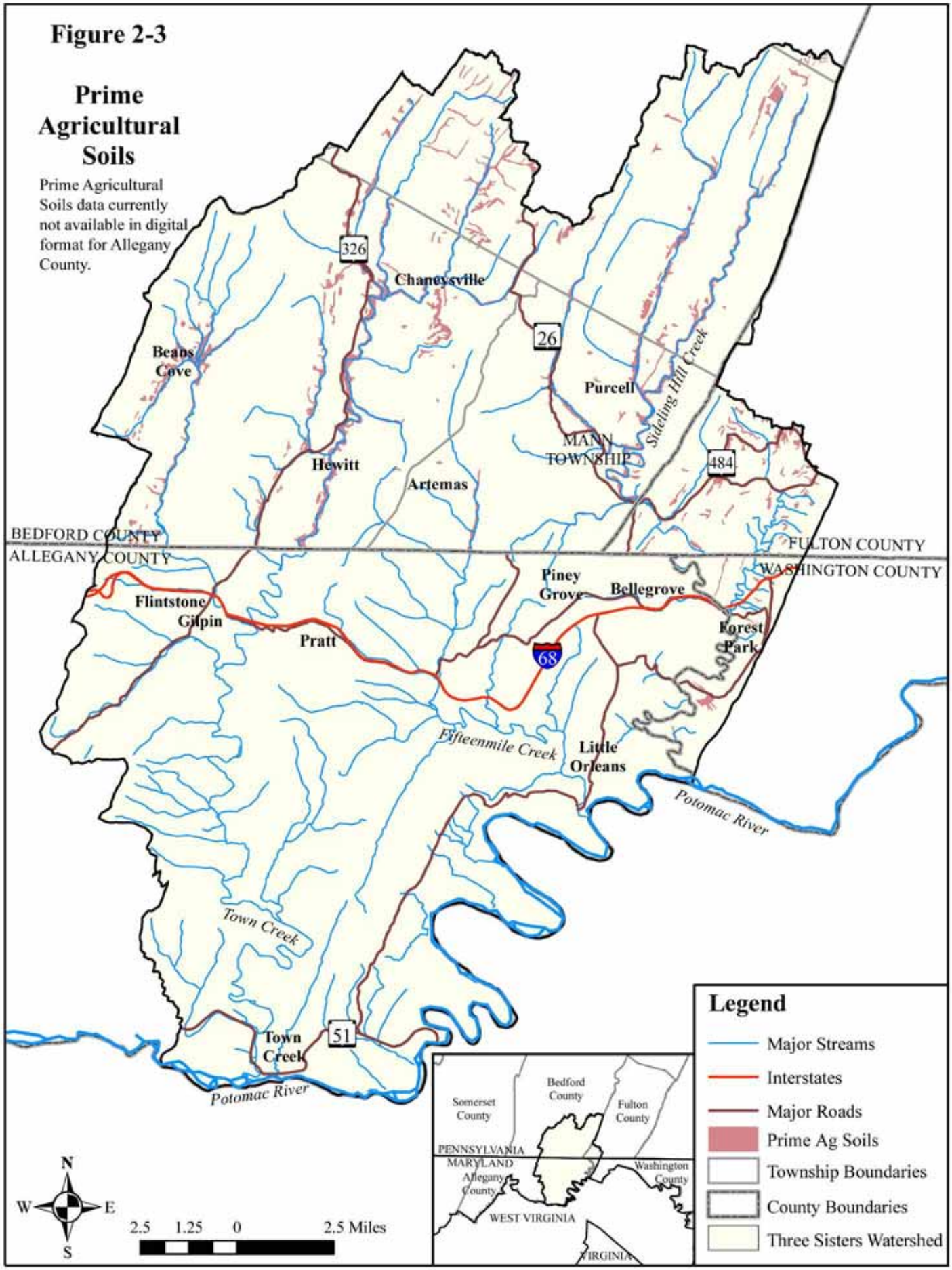


Figure 2-3
Prime Agricultural Soils
Prime Agricultural Soils data currently not available in digital format for Allegany County.
326
Chaneysville
26
Beans Cove
Purcell
Sideling Hill Creek
MANN TOWNSHIP
484
Hewitt
Artemas
BEDFORD COUNTY
ALLEGANY COUNTY
FULTON COUNTY
WASHINGTON COUNTY
Piney Grove
Bellegrove
Flintstone
Gilpin
Pratt
68
Forest Park
Fifteenmile Creek
Little Orleans
Potomac River
Town Creek
Town Creek
51
Potomac River
Somerset County
Bedford County
Fulton County
PENNSYLVANIA
MARYLAND
Allegany County
Washington County
WEST VIRGINIA
VIRGINIA
N
W
E
S
2.5 1.25 0 2.5 Miles
Legend
Major Streams
Interstates
Major Roads
Prime Ag Soils
Township Boundaries
County Boundaries
Three Sisters Watershed

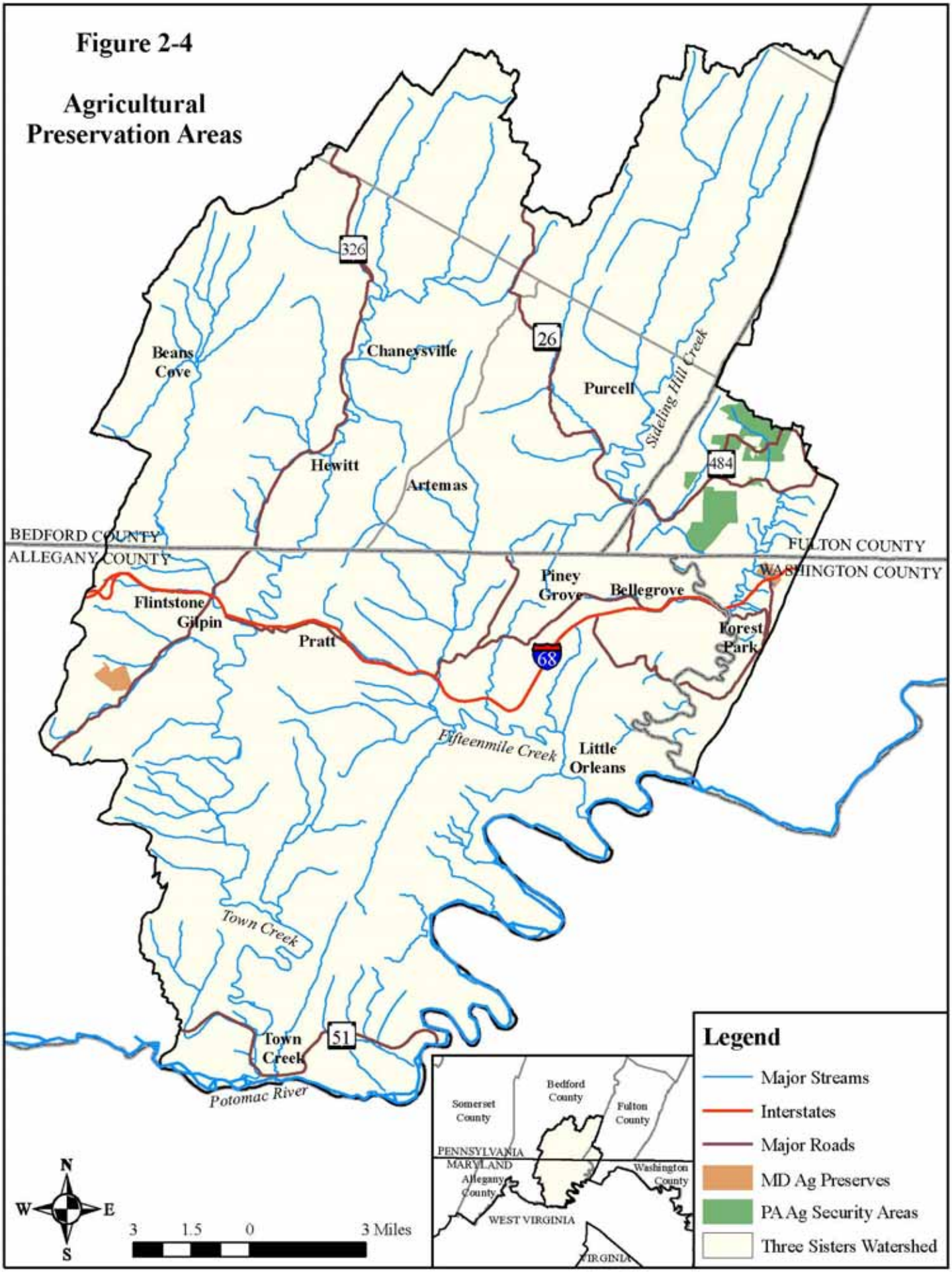


Figure 2-4
Agricultural Preservation Areas
326
26
484
68
51
Beans Cove
Chaneysville
Purcell
Sideling Hill Creek
Hewitt
Artemas
BEDFORD COUNTY
ALLEGANY COUNTY
FULTON COUNTY
WASHINGTON COUNTY
Piney Grove
Bellegrove
Flintstone
Gilpin
Pratt
Forest Park
Fifteenmile Creek
Little Orleans
Town Creek
Town Creek
Potomac River
N
W
E
S
3 1.5 0 3 Miles
Somerset County
Bedford County
Fulton County
PENNSYLVANIA
MARYLAND
Allegany County
Washington County
WEST VIRGINIA
VIRGINIA
Legend
Major Streams
Interstates
Major Roads
MD Ag Preserves
PA Ag Security Areas
Three Sisters Watershed

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

An easement is a deed restriction that landowners may voluntarily place on their property with another entity, that establishes a material interest in the property, to protect its natural resources (American Farmland Trust 1998). With an easement agreement, the owner authorizes the easement holder to monitor and enforce restrictions set forth in the agreement, and ensures that the property will be protected indefinitely.

Agricultural Preservation Districts

In Maryland, the purpose of the agricultural preservation program is primarily to preserve sufficient agricultural land to maintain a viable local base of food and fiber production for the present and future citizens of Maryland (Maryland Agricultural Land Preservation Foundation 2003). This is accomplished by establishing agricultural preservation districts and purchasing agricultural conservation easements.

Agricultural preservation districts must contain at least 50 contiguous acres. Neighboring landowners can join together to make up the minimum 50 acres. Land must be utilized, or have the potential to be utilized, for food or fiber production. Qualifying land must meet specified criteria. Agricultural preservation districts must be maintained for at least five years, but land can stay in district status indefinitely without needing to renew the agreement.

Benefits of enrolling land into an agricultural preservation district include protecting agricultural lands from development and official acknowledgement that farming is the preferred use of the land. An additional benefit is the retention of eligibility to have up to three one-acre lots for landowners and their children, or a single unrestricted lot, that can be released from the district agreement (Maryland Agricultural Land Preservation Foundation 2003).

In order to purchase an agricultural conservation easement through the agricultural preservation program in Maryland, the property must be enrolled into an agricultural preservation district and have a completed soil conservation plan. If 50 percent or more of the property is wooded, then a forest management plan must also be completed (Maryland Agricultural Land Preservation Foundation 2003). More information about the agricultural preservation program is available on the Maryland Agricultural Preservation Foundation website at http://www.malpf.info/.

Land Use

The Three Sisters watershed remains a rural area with very little growth from development. Table 2-1 and Figure 2-5 display the current land-use information for the Three Sisters watershed. Forestland overwhelmingly dominates the land use. While the watershed is not currently experiencing rapid development and growth, it is a possibility. More information about development threats is located in the Project Area Characteristics chapter.

Agriculture is the second-leading land use within the Three Sisters watershed

Within the Sideling Hill Creek subwatershed, forestland covers 75 percent of the land, and another 23 percent is used for agriculture. The remaining two percent of land is in other uses, such as barren, development, and water.

Forestland, which covers 92 percent of the land, dominates the Fifteenmile Creek subwatershed. That leaves only eight percent for other uses, and half of that is used for agriculture.

Within the Town Creek subwatershed, forestland covers 84 percent, and agriculture accounts for another 15.5 percent of land usage. Only .5 percent of the land is dedicated to other uses.

Table 2-1. Land Use

Land-Use Type	Square Miles	% of Land Area
Agriculture		
Pasture/Hay	43.66	12.27
Row Crops	2.63	0.74
Woody Wetlands	0.31	0.09
Emergent Herbaceous Wetlands	0.14	0.04
Barren		
Transitional	4.33	1.22
Development		
Low-Intensity Residential	0.09	0.02
Commercial/Industrial/ Transportation	1.70	0.48
Forest		
Deciduous Forest	256.48	72.11
Evergreen Forest	17.57	4.94
Mixed Forest	26.71	7.51
Water		
Open Water	2.08	0.59

Forestry

Forests provide a variety of resources, including timber, wildlife habitat, water filtration, aesthetics, recreation, and jobs. Over 90 percent of the nation's threatened and endangered species have some or part of their habitat on private forestlands (Koehn 2005).

Nationally, Pennsylvania ranks number one in hardwood production (Bureau of Forestry). Seventeen million of Pennsylvania's 28 million acres are covered by forest (Bureau of Forestry). Private landowners own the majority of the forest in Pennsylvania, with 12.5 million acres or 71 percent. State forest and state game lands make up 22 percent of Pennsylvania's forests, and three percent is national forestland.

Within the boundaries of Maryland, there are 2.6 million acres of forestlands accounting for 41 percent of Maryland's land cover (Koehn 2005). Of the 2.6 million acres, only 24 percent is publicly owned. It is estimated that there are 130,600 forest landowners in Maryland (Koehn 2005).

Within the Three Sisters watershed, there are 300 square miles of forestland, with approximately 85 percent of the forest being deciduous. Two state forests exist within the watershed—Buchanan State Forest in Pennsylvania and Green Ridge State Forest in Maryland. More information about the watershed's forests is available in the Biological Resources chapter.

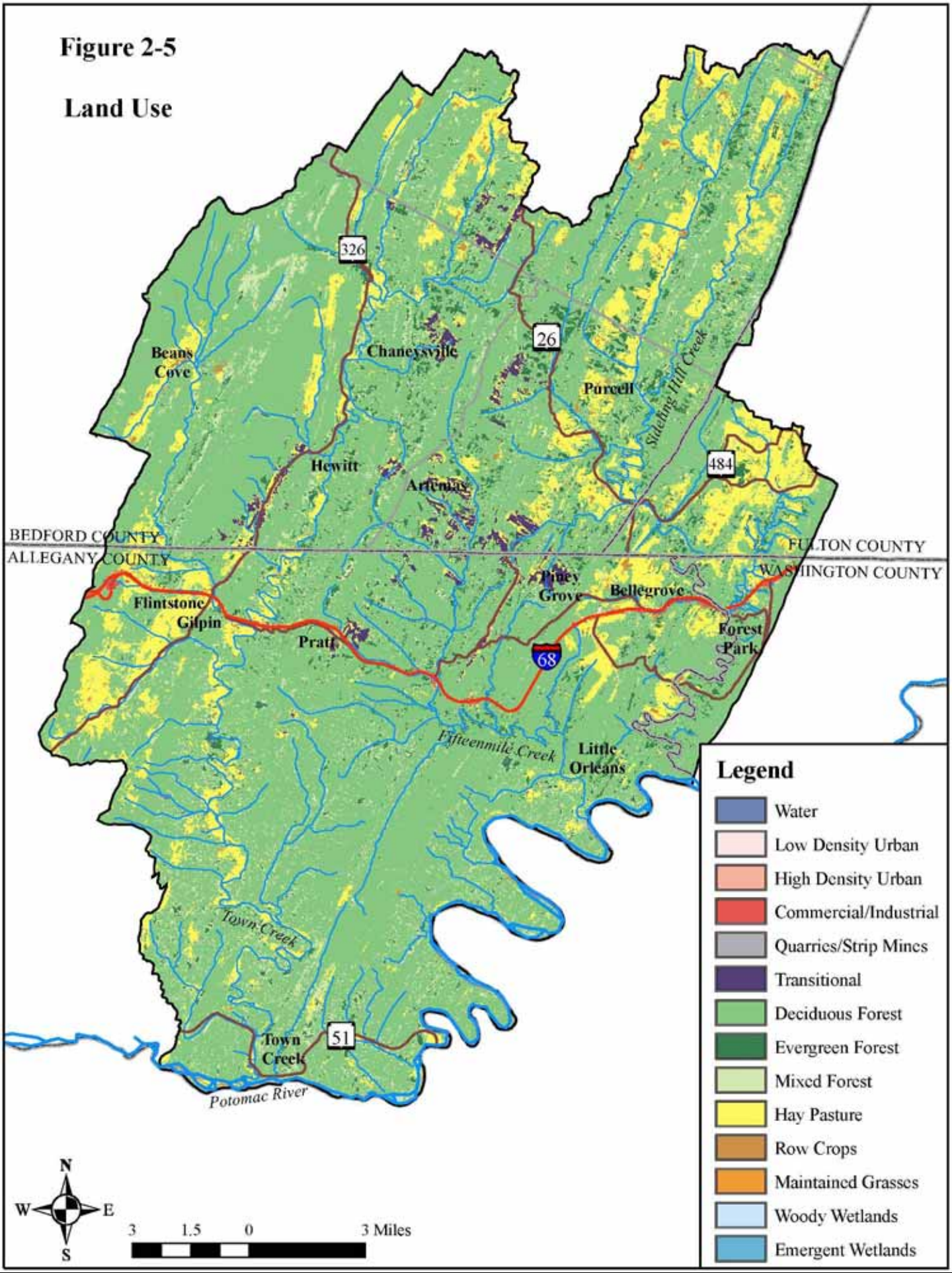
Many livelihoods are based upon the forestry industry. The final steps associated with turning raw timber or unfinished lumber into finished products increases the value of the wood. Each step in the process increases the value of the raw material, providing more revenue than it cost to produce.

Forest Management

Forest management is the art and science of treating a forest to promote a desired outcome. Skilled foresters use silviculture (the art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands) to meet the diverse needs and values of landowners and society on a sustainable basis (Helms 1998). The treatment type used may differ depending on the goals.

Figure 2-5

Land Use



Common treatment types used in Pennsylvania and Maryland often fall under the categories of "even-aged" versus "uneven-aged" management.

Even-aged management methods harvest all trees in a stand at one time or in several cuttings over a short time to produce stands of all or nearly the same age. This management method is commonly applied to achieve a forest comprised of shade-intolerant trees, such as black walnut, cherry, poplar, oak, Virginia pine, and table mountain pine.

Management Practices:

1. Clear-Cutting: The removal of all trees and most, if not all, woody vegetation from an area, leaving maximum growing space and resources available for the next generation. If done in an appropriate area, it can allow for rapid seedling growth and recolonization.

2. Seed Tree: A heavy removal of a forest where trees are left for regeneration purposes.

3. Shelterwood: A heavy removal in which some trees are left uncut to provide a seed source for regeneration. Once regeneration is established, multiple cuttings may occur to remove remaining trees.

Uneven-aged management is used to maintain a stand with trees of varying ages, from seedlings to mature. Trees are harvested selectively to maintain shaded conditions. It is most often used to promote stands comprised largely of shade-tolerant species, such as sugar maple and beech (Penn State 2005).

Management Practices:

1. Individual Selection Cutting: Cutting of scattered individual trees, including both large, economically valuable trees and weak trees, in order to maintain the health of the forest and multi-dimensional forest structure.

2. Group Selection Cutting: Similar to individual selection cutting, but involves cutting small groups of trees.

3. High-Grading: Involves cutting of only the biggest, most profitable trees in a stand; this is not a good forestry management practice because only smaller, weaker trees remain. Some foresters also view this as an even-aged management technique, but rarely recommended it as a sustainable management technique. High-grading is also referred to as selective cutting or diameter limit cutting.

Though even-aged management practices are most often utilized in Pennsylvania and Maryland, these practices may not be appropriate for all types of stands. Forest management needs to be specific for each individual forest. No one practice can be recommended as the best or worst practice because of the varying characteristics and factors that exist for each forest. However, it is recommended that forest landowners work with a professional forester to manage their land to its greatest potential.

One method commonly used within the watershed is high-grading, or the removal of the biggest and most profitable trees. In general, professional foresters agree that this practice is not good for the long-term livelihood of the forest and will also result in less economic return in the long run. This is because the trees remaining are weak, with stunted growth and are more susceptible to disease.

Forest Management Assistance

The Pennsylvania Bureau of Forestry, administered by Pennsylvania's Department of Conservation and Natural Resources, offers a cost-free Forest Stewardship Program. Landowners can receive forestry management advice and develop a forest management plan for their properties. The Maryland Forest Service, administered by Maryland Department of Natural Resources, offers a Forest Stewardship Program. Similar to Pennsylvania, landowners can receive management advice, develop a forestry management plan, and receive financial assistance to implement their forestry management plan.

Agriculture

While forestry is the major land use within the watershed, agriculture is second with 13 percent. The agricultural industry in Pennsylvania's Bedford and Fulton counties has a greater annual economic contribution than the forestry industry (Jacobson 2004). Like the forestry industry, many watershed residents' livelihoods are based on the agricultural industry. There are two management types of farms within the watershed—family farms and factory farms.

Family farms are typically smaller farms that have been in operation for several generations. For the most part, owners of family farms manage and work on their farms following sustainable agricultural practices. The majority of the farms within the Three Sisters watershed are locally owned family farms.

Factory farms are larger, corporate-based industries. Many of these farms control production, from animal breeding and processing, to the market shelf. Factory farms emphasize high volume and profit. Several different types of farming operations are considered factory farms; they include Concentrated Animal Feeding Operation, Confined Animal Feeding Operation, Conventional Farming, Industrial Agricultural Operation, and Industrial Livestock Operation. Currently, there is one factory farm operating within the watershed.

This picture shows a cover crop experiment at a farm field within the Three Sisters watershed

(Notice the left side of the photo where a cover crop is being utilized, and the right side where no cover crop is being used. Plants on the left side are larger than those on the right.)

Agricultural Management Practices

1. **High Residue Management** leaves at least 30 percent of the ground covered with crop residue, such as leaves and stalks, after crops are planted. This limits erosion by protecting and binding the soil.

2. A **Cropland Protection Cover**, or cover crop, is usually grown for a year or less. A crop of close-growing grasses, legumes, or small grains is not grown for harvest, but for many different functions in crop rotations, such as preventing erosion and improving soil fertility.

3. **Nutrient Management** is the management and crediting of nutrients from all sources, including legumes, manure, and soil reserves for the application of manure and commercial fertilizers. Management includes the rate, method, and timing for the application of all sources of nutrients to minimize the amount of nutrients entering surface water or groundwater. This practice includes manure nutrient testing, routine soil testing, and residual nitrogen soil testing.

4. **Pesticide Management** is the management, handling, disposal, and application of pesticides, including the rate, method, and timing of application to minimize pesticides entering surface water and groundwater. This practice includes integrated pest management scouting and planning.

5. **Rotational Grazing** is an intensive grazing management practice that divides pastures into multiple cells that receive a short but intensive grazing period followed by a period of recovery of the vegetative cover. This practice can correct existing pasturing practices that result in degradation and should replace the practice of summer dry-lots when this practice results in water quality degradation.

6. **Livestock Fencing** encloses or divides an area of land with a suitable permanent structure that acts as a barrier to livestock or big game. The fencing excludes livestock from areas that should not be grazed, subdivides land to permit use of grazing systems, and protects new seeding and plantings from grazing.

7. **Channel Crossings** are stable surfaces installed on the bottom of streams to provide a crossing for equipment or livestock. They are typically used to coincide with streambank fencing.

An example of a channel crossing, which allows animals to cross streams while minimizing the impacts of sedimentation on area waterways

8. A **Manure Storage Facility** is a structure used to store manure until it can be applied to the land. The facility is needed to properly store manure, so that it does not become a non-point source of pollution.

9. **Field Diversion** is a shallow channel constructed across the slope of the land to divert water from areas where it may cause flooding or erosion. The water is diverted to where it can be stored or safely transported.

10. **Terraces** are a system of ridges and channels with appropriate spacing, constructed on the contour with a suitable grade to prevent erosion in the channel.

11. **Grassed Waterways** are a natural or constructed channel shaped, graded, and established with suitable cover as needed to prevent erosion by runoff waters.

12. An **Agricultural Sediment Basin** is a structure designed to reduce the transport of sediment, agricultural waste, and other pollutants transported from agricultural fields and barnyards to surface waters, closed depressions, and wetlands.

13. **Shoreline and Streambank Protection** is the stabilization of streambanks and lake banks to protect them from erosion, and the protection of fish habitat and water quality from impacts caused by livestock. Methods include fencing, shaping, and seeding of vegetation, rock, riprap, bioengineering, or structures to stabilize shorelines and/or provide fish habitat.

14. **Shaping and Seeding** is the planting of vegetation, such as trees, shrubs, vines, grasses, or legumes, on highly erodible or critically eroding areas. This vegetation stabilizes the soil, reduces damage from sediment and runoff, and improves wildlife habitat and visual resources.

15. **Streambank Fencing** excludes livestock from the near shore area to prevent trampling and grazing, protecting the riparian habitat.

16. A **Remote Watering System** is a system of portable tanks, pumps, and pipes designed to bring water to livestock in all grazing cells, rather than allow the animals to have direct access streams where erosion can occur.

17. **Shoreline Buffers** are permanent vegetated areas immediately adjacent to lakes, streams, channels, and wetlands designed and constructed to manage critical non-point sources or to filter pollutants from non-point sources.

18. **Wetland Restoration** is the construction of berms or destruction of the function of tile lines or drainage ditches to create conditions suitable for wetland vegetation.

19. **Barnyard Runoff Management** includes the structural measures to redirect surface runoff around the barnyard and collect, convey, or temporarily store runoff from the barnyard. Management includes measures such as sediment basins, roof gutters, and clean water diversions.

20. **Animal Lot Relocation** involves moving an animal lot from a critical site, such as a floodway, to a suitable site to minimize the amount of pollution from the lot to surface water or groundwater.

Landfills

According to the United States Environmental Protection Agency (U.S. EPA), there are currently no active landfills operating within the Three Sisters watershed (U.S. EPA 2004c).

Ownership

As identified in Figure 2-6, approximately 40 percent of the area is under public ownership. Green Ridge State Forest is the largest parcel, accounting for 44,000 acres. It is owned and managed by the Maryland Department of Natural Resources, which manages an additional 8,565 acres of wildlife management units in the region. The Pennsylvania Department of Conservation and Natural Resources manages the Buchanan State Forest (a portion of the 75,000-acre forest is located within the project area). The Pennsylvania Game Commission manages 13,622 acres as state game lands. Additional public lands include portions of the Chesapeake and Ohio National Heritage Park and conservation lands owned by Western Pennsylvania Conservancy and The Nature Conservancy.

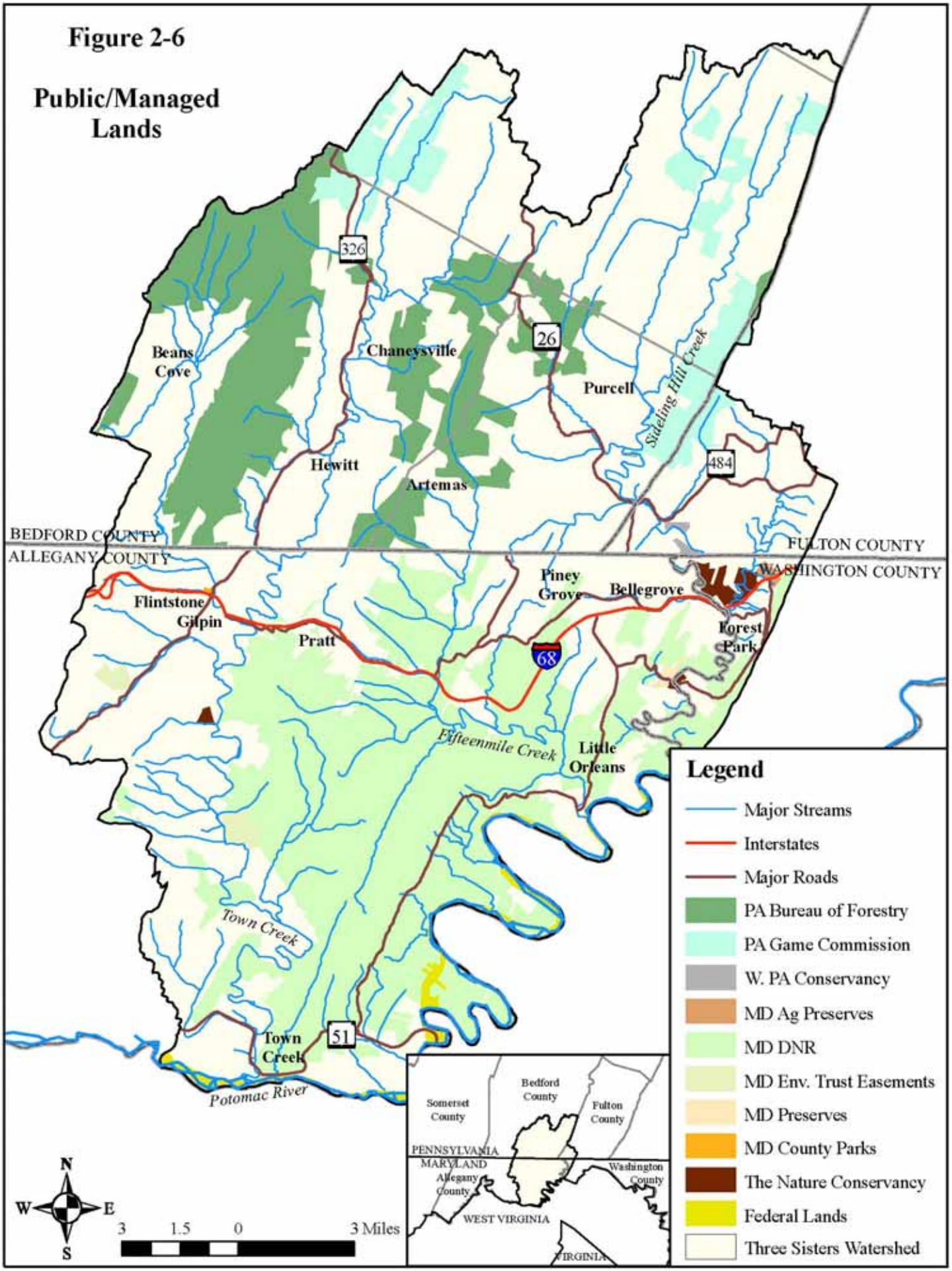
Approximately 60 percent of the area is privately owned. These private holdings include residential areas, farmland, and forested areas.

Critical Areas

Critical areas are areas that have constraints that limit development and various other activities. Critical natural areas contain rare, threatened, or endangered species, natural communities of special concern, or significant ecological and geological landscapes worthy of protection. Steep slopes, ridgetops,

Figure 2-6

Public/Managed Lands



floodplains, streambanks, and wetlands are examples of critical natural areas. Figure 2-7 displays environmentally sensitive areas within the Three Sisters watershed.

Erosion and Sedimentation

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

Fish and Wildlife Habitat

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

A lack of native vegetation along the riparian corridor can increase the amount of sediment and nutrients entering the stream

Riparian Corridors

Riparian areas are lands located next to a body of water. When densely vegetated, they serve as a buffer against polluted runoff and provide habitat corridors for many species of wildlife.

Floodplains

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

Wetlands

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

Hazardous Areas

Illegal Dumpsites

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

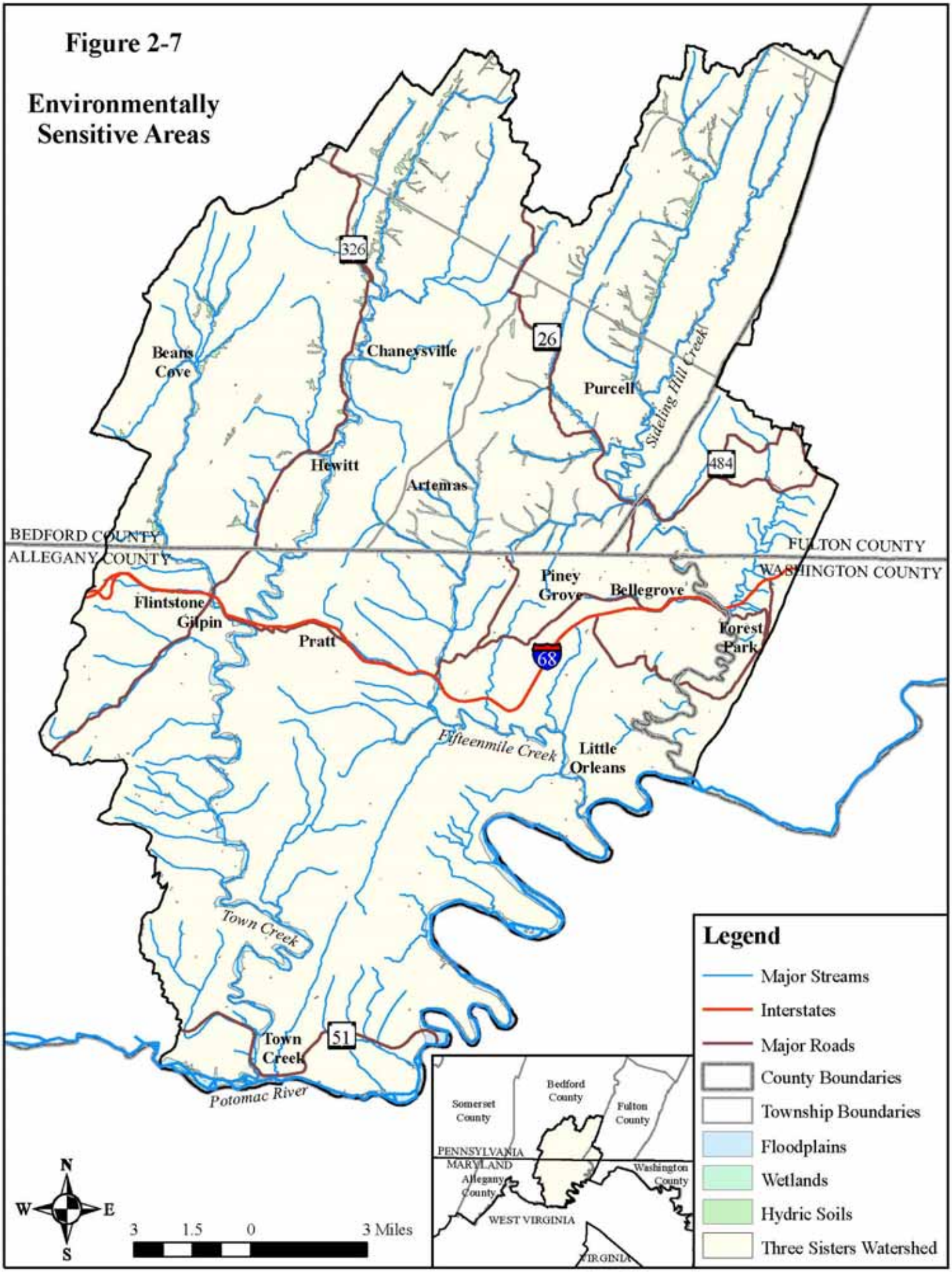


Figure 2-7
Environmentally Sensitive Areas
326
26
484
68
51
Beans Cove
Chaneysville
Purcell
Sideling Hill Creek
Hewitt
Artemas
BEDFORD COUNTY
ALLEGANY COUNTY
FULTON COUNTY
WASHINGTON COUNTY
Piney Grove
Bellegrove
Flintstone
Gilpin
Pratt
Forest Park
Fifteenmile Creek
Little Orleans
Town Creek
Town Creek
Potomac River
Legend
Major Streams
Interstates
Major Roads
County Boundaries
Township Boundaries
Floodplains
Wetlands
Hydric Soils
Three Sisters Watershed
N
W
E
S
3 1.5 0 3 Miles
Somerset County
Bedford County
Fulton County
PENNSYLVANIA
MARYLAND
Allegany County
Washington County
WEST VIRGINIA
VIRGINIA

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

Steep hillsides and streambanks are primary locations for illegal dumps, such as this one along Cliff Road in Little Orleans, Md.

Waste Sites

The **Comprehensive Environmental Response Compensation and Liability Act** (CERCLA), commonly known as Superfund, was enacted in 1980 to provide broad federal authority to respond directly to releases of hazardous substances that may endanger public health or the environment (U.S. EPA 2004a). By creating a tax on the chemical and petroleum industries, a trust fund was established to provide for cleanup where no responsible party could be identified. In 1986, the Superfund Amendments and Reauthorization Act (SARA) amended CERCLA.

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

The **Resource Conservation and Recovery Act** (RCRA), a federal statute, regulates the transportation, handling, storage, and disposal of solid and hazardous materials. Regulatory responsibilities, including obtaining permits, identifying and listing hazardous waste, adhering to proper procedures when transporting or disposing of waste, developing risk management plans, and maintaining records, may be controlled by federal facilities (U.S. EPA 2002). Requirements for underground storage tanks, including cover tank design, operation, cleanup, and closure, are also contained in RCRA. There are nine RCRA sites within the Three Sisters watershed; they are listed in Table 2-2.

Table 2-2. Resource Conservation and Recovery Act Sites

Site	Handler ID	Type	Location
Barkman Auto Body Works	PA0000382051	CESQG	Clearville, Pa.
Columbia Gas Transmission Artemas	PAD987279049	LQG	Artemas, Pa.
Elite Auto Restoration	PAR000029884	CESQG	Clearville, Pa.
Rick's Auto Body	PA0000382028	CESQG	Clearville, Pa.
TETCO MLV Ln2 MP 1240.24	PAD987351137	CESQG	Clearville, Pa.
Chesapeake & Potomac Tele Co	MD980553739	N/A	Flintstone, Md.
Chesapeake & Potomac Tele Co	MD980721922	N/A	Flintstone, Md.
Maryland State Highway Administration	MDD981038003	CESQG	Little Orleans, Md.
Quarry Ridge Asphalt	MD0000147082	CESQG	Flintstone, Md.

Descriptions of Waste Site Types
Conditionally Exempt Small Quantity Generator ~ CESQG
Large Quantity Generator ~ LQG
Information Not Available ~ N/A

Landslides

Landslides occur throughout the state, and are heavily concentrated in southwestern Pennsylvania. Most landslides occur in areas with steep slopes where loose colluvial soils exist. Gravity eventually forces this rock and debris down the slope in a gradual or sudden, flashy manner (Delano and Wilshusen 2001). Landslides can also occur as a slump, where a block of weathered rock or soil slides outward because of the force from the weight rotation of weathered rock or soil above it (Delano and Wilshusen 2001). Typically, landslides occur along road cuts having unstable bank conditions. Other factors, such as stream erosion, earth-moving activities, soil characteristics, weakened or fractured rock, mining debris, and weather can determine the occurrence of a landslide.

Subsidence Areas

Subsidence is the downward movement of surface material involving little or no horizontal movement. Occurring naturally due to physical and chemical weathering of certain types of bedrock, subsidence usually occurs locally as a result of underground mining, excessive pumping of groundwater, or subsurface erosion due to the failure of existing utility lines (Kochanov 1999). Subsidence usually occurs slowly over a long period, but can happen rapidly. The development of a sinkhole, for example, occurs when the support of the land is gradually removed, causing the land surface to sag and finally collapse, leaving a hole or cavity (Kochanov 1999). Although subsidence is not common within the watershed, the potential for it exists.

Management Recommendations

Goal 2-1. Encourage the use of sustainable farming practices.

Educate agricultural landowners about programs available to increase sustainability and assist them financially, such as best management practices and new techniques that would be beneficial to the landowner and the environment.	High
Increase financial assistance to small-scale agriculture, helping it become economically viable and environmentally responsible.	High
Encourage agricultural landowners to create and implement nutrient management plans for their properties.	Medium
Work with Pennsylvania and Maryland legislatures to enforce regulations placed on industrial agriculture, protecting the health of the watershed.	Medium
Encourage agricultural landowners to enroll in incentive programs like Conservation Reserve Enhancement Program and Conservation Reserve Program.	Medium
Conduct an agricultural liming demonstration project to determine if farmers are under-liming for optimal productivity and whether they can be encouraged to increase the use of lime on their fields.	Low
Conduct feasibility studies and demonstration projects designed to integrate biological by-products of agriculture and forestry with energy production in ways that make these industries more self-sufficient, more economically sustainable, and less of an environmental impact.	Low
Limit the amount of industrial agriculture through the establishment and implementation of land-use ordinances.	Low
Encourage agricultural producers to utilize organic sources of nutrients for crop production, including bioenergy crop production, as a component of nutrient management planning.	Low

Goal 2-2. Protect forest resources by utilizing best management practices.

Decrease forest fragmentation by maintaining contiguous forest tracts and/or by maintaining travel corridors between non-contiguous forest tracts.	High
Educate forestland owners by providing them with accurate information regarding sound silviculture practices, forest management plan development, and insect and disease problems that can affect forest health.	High
Encourage public land managers to adopt and utilize management plans that protect forest landscapes.	High
Encourage the development and use of forest stewardship plans or forest management plans and participation in forest stewardship and tree farm programs.	High
Continue hosting workshops and conferences to encourage and compare forestry best management practice and investigate sustainable forestry certification opportunities.	Medium
Discourage the use of high-grading practices, such as diameter-limit harvest and selective cutting, and encourage timber harvesters to use sustainable best management practices under the direction of a professional forester.	Medium
Support laws and regulations to maintain whitetail deer populations at levels that will ensure healthy forests, productive agricultural lands, and healthy deer populations.	Low
Encourage the Pennsylvania legislature to expand Clean and Green to protect forest and open space along with other lands and encourage the Maryland legislature to establish a program similar to Clean and Green.	Low
Encourage farmland/forestland tax matching programs to provide incentives to keep land in agriculture/forest and not convert it to residential use.	Low

Goal 2-3. Protect farmland from developmental pressures.

Increase funding to establish easements and to protect them as a conservation tool.	High
Encourage landowners to establish conservation easements protecting their land for agricultural and conservation uses indefinitely.	High
Encourage participation of agricultural landowners in farmland preservation programs.	Medium
Establish an incentive program to encourage agricultural landowners to maintain their land for agricultural uses.	Medium

Goal 2-4. Maintain the ecological, recreational, and visual significance of natural and open space areas.

Protect large forest tracts and key riparian areas by working with landowners to keep these tracts intact through enrollment in forestland stewardship programs, purchase of conservation easements, or acquisition of land.	High
Protect ecologically significant areas through land acquisition and/or purchasing conservation easements.	High
Develop a strategic plan to prioritize areas for protection through acquisition and conservation easement purchases.	High
Limit sprawl by restricting the number and types of developments that can be established through the creation and implementation of land-use ordinances.	High

Goal 2-5. Decrease the amount of illegal dumping.

Consider establishing a program similar to PA CleanWays in Maryland.	High
Continue programs, such as bulky waste days and waste drop-off locations that provide alternative methods for waste disposal.	High
Host special cleanup days to remove illegal dumps.	Medium
Identify and inventory dumpsites and establish an ongoing monitoring program to determine recent dumping activity at illegal dumpsites.	Medium
Establish and increase funding for programs that educate residents about illegal dumping and alternative methods for trash removal.	Medium
Establish a hotline or other means to report illegal dumping activity.	Low

Goal 2-6. Protect ecological resources by reducing impacts from industry.

Continue to educate loggers and landowners about management practices and their advantages for the landowner and sustainability of the forest.	High
Increase funding to assist loggers who utilize best management practices.	High
Monitor the number of gas and water wells being drilled to protect the resources and the rural character.	High
Remove leaky underground gas and fuel storage tanks.	Medium

CHAPTER 3. WATER RESOURCES

The Sideling Hill Creek, Fifteenmile Creek, and Town Creek watersheds have many aquatic resources in common. A combination of geological, climate-related, and accompanying hydrological characteristics support unique aquatic communities within the project area. Unlike many other watersheds in the region, water quantity, rather than quality, tends to be the most important factor in determining stream health and viability. Both human and aquatic communities are influenced by extreme variations in water flow.

Overall, streams in the project area are of high water quality. Based upon data collected within the Pennsylvania portion of the Sideling Hill Creek watershed by Pennsylvania Department of Environmental Protection (PA DEP), the Sideling Hill Creek watershed was given an Exceptional Value designation in 1994. Within Maryland, tributaries of Town Creek have been designated Natural Trout Waters. Low pH, resulting from the effects of acid rain and the absence of alkalinity-producing rocks, is one of the biggest threats to aquatic life. Other major threats to water resources include single- and multi-home developments and dirt and gravel road impacts.

Results from surveys show that although stream health may not be a high priority for the majority of residents, protecting the rural nature of the area is. However, protecting waterways is compatible with, and perhaps even necessary to, ensuring the way of life that residents have come to love. There are many opportunities for residents, conservation organizations, and other entities to work together in ways that will benefit both aquatic life and quality of life within local communities.

Location

Potomac/Chesapeake Bay Drainage

Potomac River at Town Creek confluence

The Sideling Hill Creek, Fifteenmile Creek, and Town Creek watersheds all drain directly into the Potomac River, which eventually empties into the Chesapeake Bay. The Chesapeake Bay is the largest estuary in the United States, located between the states of Maryland and Virginia and the Delmarva Peninsula. The project area is considered one of the most pristine portions of the approximately 15,000-square mile Potomac River watershed. In 2000, three of the states making up the Chesapeake Bay watershed (Maryland, Pennsylvania, and Virginia), as well as the District of Columbia and the federal government signed the Chesapeake 2000 Agreement, detailing goals for restoring the Chesapeake Bay based on scientific principles. This focused additional efforts and funding towards watersheds that drain into the Chesapeake Bay (MD DNR 2003).

Hydrologic Unit Code

The United States Geological Service has developed a system for organizing watersheds of the United States. This system divides and subdivides the country into successively smaller hydrologic units based on watersheds, which are broken down into four levels: regions, sub-regions, accounting units, and cataloguing units. Each unit is identified by a unique hydrologic unit code (HUC) consisting of two to eight digits based on four levels of classification.

The project area is included in the Cacapon-Town HUC, which also includes the Cacapon watershed and many streams flowing directly into the Potomac River in this general area.

The eight-digit HUC including Sideling Hill Creek, Fifteenmile Creek, and Town Creek, which is extremely useful in locating data pertaining to the watershed is 02070003.

Region 02: Mid-Atlantic
Sub-region 07: The Potomac
Accounting Unit 00: The Potomac
Cataloging Unit 03: Cacapon-Town

Shale streambed of Fifteenmile Creek

Hydrology

The folded and faulted shale rock layers that comprise the Ridge and Valley Province largely dictate the movement of water in the project area. Whereas many portions of the province contain dolomite or limestone deposits, which transmit and hold water, few of these deposits exist within the Three Sisters watershed. The result is that most of the groundwater is stored between layers of shale and transmitted through fractures, or breaks. Water travels vertically along these fractures until it meets an area of resistance, often creating a spring or stream. Many springs are near anticlines, extreme upward folds in rock (Trapp and Horn 1997).

Groundwater stored in confined aquifers tends to deplete quickly and hold less water than unconfined aquifers. Confined aquifers are those separated from the atmosphere by a layer of impermeable soil or rock, which reduces groundwater yields. In unconfined aquifers, water is found in small pores and is exposed to the atmosphere, and groundwater yields are relative to the amount of spaces found between the pores. In the project area, the most common aquifers are confined or intermediate, between confined and unconfined. Groundwater yields are low. Streambeds serve as an interchange between groundwater and surface water. Streams that cross fault zones may serve to recharge groundwater aquifers during droughts. Under drought conditions, groundwater comprises nearly 100 percent of surface flow (Trapp and Horn 1997).

The aquatic life of the project area is affected by these geologic conditions. Many of the streams have almost no flow during the summer, and extremely high flood events during the spring. Low stream flow can result in low dissolved oxygen and increased nutrient concentrations, which can affect aquatic life. Though these are, in many cases, natural characteristics of the project area, they may reach unhealthy conditions if impairments are introduced. These natural characteristics should be kept in mind when evaluating streams. The extreme flow regime is beneficial to the establishment and disbursement of unique species, such as harperella, an endangered plant, and several relatively uncommon mussel species (Figure 3-1 illustrates discharge fluctuations in a monitoring station on Fifteenmile Creek).

Because of naturally low flows during certain times of year, it may be difficult to separate changes in hydrology that are a result of natural conditions from those caused by human alterations. As more development occurs within the project area, this may draw down the amount of groundwater available. It would be beneficial to study the natural hydrology of the project area to develop an understanding of reference (normal, natural) conditions related to stream flow. The United States Geological Survey has developed a modeling tool called "Indicators of Hydrological Alteration" to determine whether stream flows are being affected by unnatural causes. This could be parameterized for the watershed and used to study changes in streams within the project area over time.

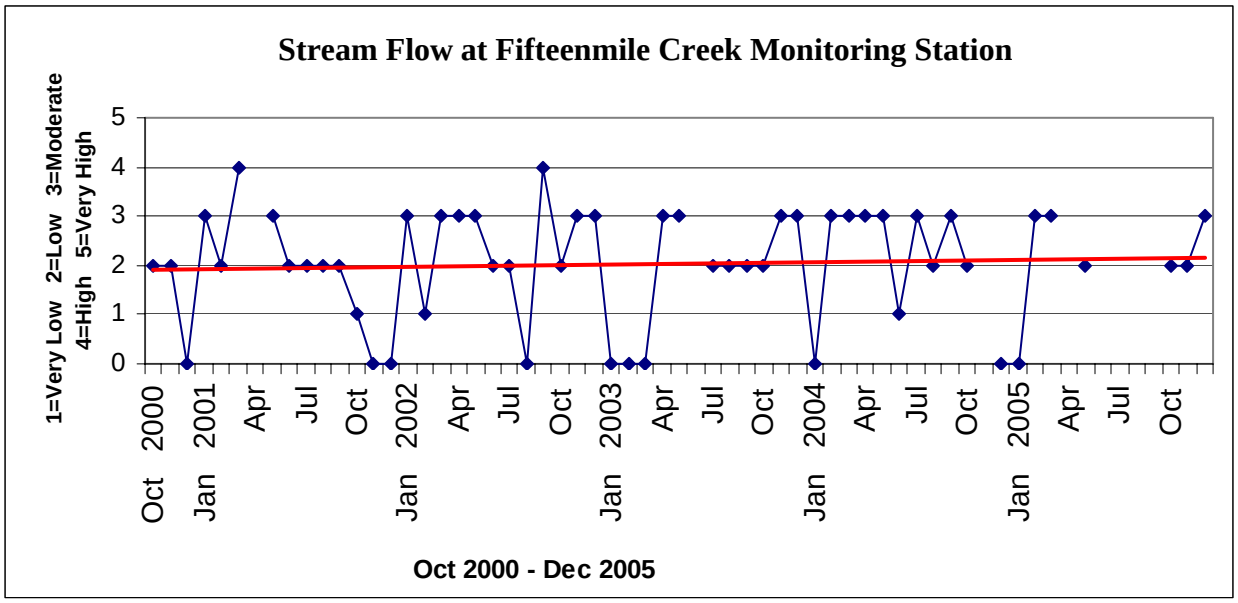


Figure 3-1. Flow data showing fluctuations in stream flow over time in Fifteenmile Creek

A drainage pattern is the arrangement of streams in a landscape in response to local topography and subsurface geology. Runoff tends to follow the path of least resistance. In an area where the geology is fairly homogeneous, streams form dendritic drainages, resembling the apparent random branching of a tree. In the project area, downturned folds in rock, called synclines, form valleys, to which water naturally flows. Much of the water runs off ridges and meets the valleys at right angles, forming a trellis drainage pattern. This is characteristic of watersheds in the Ridge and Valley Province. Because of the steep gradients of these small tributaries, water flows can increase rapidly in short amounts of time.

In some cases, streams deviate from this normal pattern, forming a water gap. This occurs when a section of a ridge has a weaker geological structure and a stream essentially cuts through a ridge to end up on the other side, or "superimposes" itself. Water gaps often provide important corridors for land animals, enabling them to get from one side of a ridge to another. Numerous water gaps exist within the project area, including Barnes Gap (Sideling Hill Creek), Blues Gap (Town Creek), and Black Valley Gap (Town Creek). A large gap also separates Town Hill Ridge near the mouth of Fifteenmile Creek. Route 68 passes through this gap in Town Hill Ridge.

Major Tributaries

Major tributaries follow the valleys between mountain ridges. The two main branches of Sideling Hill Creek are separated by Addison Ridge. Fifteenmile Creek resides largely in the valley between Town Hill Ridge and Ragged Mountain. Tussey Ridge, Warrior Ridge, and Polish Mountain are prominent geologic features in the Town Creek watershed. Table 3-1 shows square miles and percent area of major tributaries in the watersheds.

Table 3-1. Major Tributaries

Tributary	% Area	Area (Square Miles)
Fifteenmile Creek		
Fifteenmile Creek North	29.36	18.20
Biclic Run, Big Divide Run		
Pine Lick Hollow	5.24	3.25
Fifteenmile Creek South	30.65	19.00
Terrapin Run, Flat Run		
Sulphur Run	9.14	5.67
White Sulphur Run, Black Sulphur Run		
Deep Run	10.19	6.32
Bear Camp Branch	5.52	3.42
Pratt Hollow	9.91	6.14
Total Area	**100.00**	**61.99**
Sideling Hill Creek		
East Branch Sideling Hill Creek	16.56	17.27
West Branch Sideling Hill Creek	20.79	21.68
Piney Creek	15.46	16.12
Blackberry Lick Run, Johnson Branch		
Sideling Hill Creek	30.09	31.38
Trough Run Mainstem		
Crooked Run	7.40	7.71
Bear Creek	9.70	10.12
Stahle Run		
Total Area	**100.00**	**104.28**
Town Creek		
Elk Lick Creek	15.63	24.53
Bushy Fork, Wilson Run		
Sweet Root Creek	6.87	10.78
Sweet Root Run		
Black Valley Branch	8.24	12.93
Flintstone Creek	19.78	31.05
Wildcat Run, Bear Gap Run, Pigeonroost Run, Laurel Branch		
Murley Branch	7.88	12.36
Lower Town Creek	15.28	23.98
Lick Run	3.42	5.36

Table 3-1. Major Tributaries (continued)

Tributary	% Area	Area (Square Miles
Maple Run	6.46	10.14
Sawpit Run	3.67	5.76
Upper Town Creek	12.79	20.07
Georgetown Branch, Blue Gap Run, Amorine Branch		
Total Area	**100.00**	**156.97**
Potomac Bends		
Purslane Run	18.15	5.92
Potomac Bends	81.85	26.69
Total Area	**100.00**	**32.61**

Wetlands

In order for an area to be considered a wetland, it must have three components: anaerobic or hydric soils, wetland vegetation, and indications that it has been covered with water at least part of the year (Mitsch and Gosselink 2000). Anaerobic or hydric soils include those that form under conditions of flooding long enough in the growing season to not contain oxygen in the upper part. It is important to note that an area does not have to be covered with water during the entire year to be considered a wetland. Wetland areas may be permanently flooded by shallow water, permanently saturated by groundwater, or periodically saturated for varying periods during the growing season.

People are often confused about why wetlands are so important. Of particular importance to the project area is that they are sites of groundwater recharge, essentially helping to replenish the water supply during times of drought. Wetlands near streams also perform important filtering and flood-protection functions, absorbing water during flood times to reduce flooding pressures and taking up nutrients, bacteria, and sediment that would otherwise end up in the water. They are also important sites of biodiversity. Only special types of plants are able to survive in wetland soils, which have reduced soil oxygen, and wildlife (such as birds and amphibians) is attracted to these habitats.

It is estimated that over 70 percent of wetlands in Maryland and 50 percent of wetlands in Pennsylvania have been lost to development and agriculture (Mitsch and Gosselink 2000). A recent Maryland study suggests that the project area contains only one percent of Maryland's wetlands. This is attributed primarily to the characteristics of the project area, but also to the fact that over 92 percent of Allegany County's wetlands have been lost to development (Tiner and Burke 1995).

The National Wetland Inventory (NWI) is a database of wetlands in the United States developed from black and white, infrared, and natural-color aerial photographs. Unfortunately, the database does not include all wetland areas, because photographs cannot easily identify transition zones between wetlands and other land types, and they may not identify wetlands with standing water during only a part of the year. Although NWI wetlands can be a good starting point for identifying the extent of wetlands in an area, its limitations should be considered. Another way to identify wetlands is through the examination of hydric soils. Hydric soils are those that have been formed under unoxygenated conditions, which is one of the indications that wetlands are present. Fortunately, paper maps of soils for the project area have been converted for use in Geographic Information Systems (maps can be made of these areas and taken in to the field). These areas can easily be observed to determine if they meet the criteria to be called a wetland. Figure 3-2 shows NWI wetlands and hydric soils for the project area.

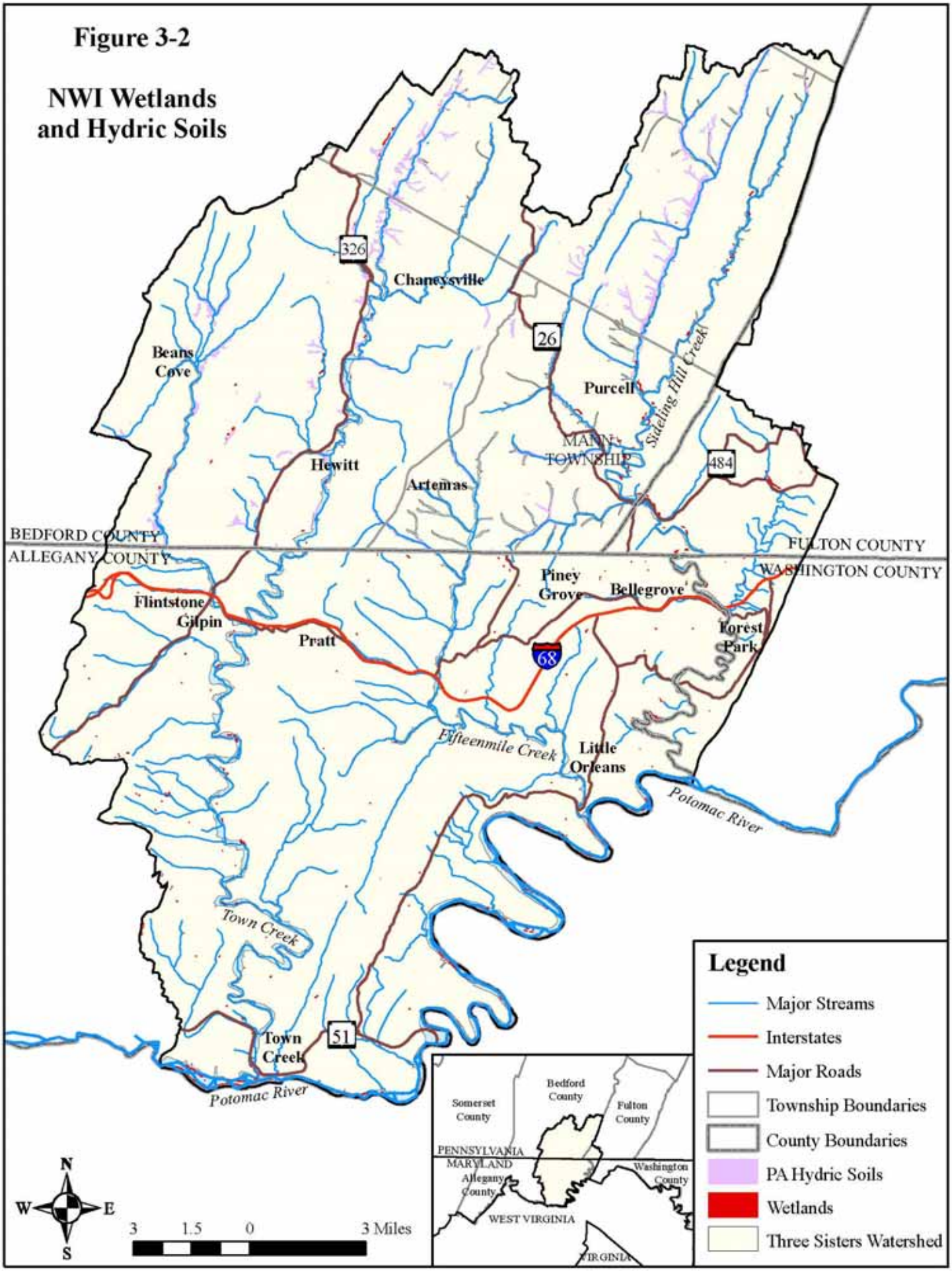


Figure 3-2
NWI Wetlands and Hydric Soils
326
Chaneysville
26
Beans Cove
Purcell
Sideling Hill Creek
MANN TOWNSHIP
484
Hewitt
Artemas
BEDFORD COUNTY
ALLEGANY COUNTY
FULTON COUNTY
WASHINGTON COUNTY
Piney Grove
Bellegrove
Flintstone
Gilpin
Pratt
68
Forest Park
Fifteenmile Creek
Little Orleans
Potomac River
Town Creek
Town Creek
51
Potomac River
Somerset County
Bedford County
Fulton County
PENNSYLVANIA
MARYLAND
Allegany County
Washington County
WEST VIRGINIA
VIRGINIA
N
W
E
S
3 1.5 0 3 Miles
Legend
Major Streams
Interstates
Major Roads
Township Boundaries
County Boundaries
PA Hydric Soils
Wetlands
Three Sisters Watershed

Wetland areas are not particularly large or abundant within the project area, due to the underlying shale geology. However, there is a scattering of mainly small wetlands formed by depressions in the landscape and hillside seeps, with vegetation potentially dominated by trees, shrubs, moss, or lichens. Wetlands in the area also include those associated with river floodplains and may be forested, shrubby, or marshlike (Tiner and Burke 1995). State and federal agencies offer mitigation programs to cover up to 100 percent of the costs associated with restoring wetlands. Local Natural Resources Conservation Service (NRCS) offices or state environmental agencies can be contacted about these opportunities.

Watershed Protection Laws

Clean Water Act

General Provisions

The 1977 amendments to the federal Water Pollution Control Act became known as the Clean Water Act (CWA). This act establishes the basic structure for regulating discharges of pollution into waterbodies of the United States. The CWA gives the United States Environmental Protection Agency (U.S. EPA) the authority to regulate pollution discharges and set water quality standards. It also makes it unlawful for any person to discharge pollution from a point source into navigable waters without a permit, funds construction of sewage treatment plants, and recognizes the need for planning to address non-point source pollution problems (Elder et al. 1999).

Existing and Designated Uses

The CWA works to enforce these requirements by making sure streams and lakes are suitable for specific uses. Designated uses include the types of activities that the waterbody currently supports, regardless of whether they have been attained since 1975. An existing use is defined as any use that has been attained or has occurred in a waterbody since November 1975. In Pennsylvania, uses include aquatic life, fish consumption, shellfish harvesting, drinking water supply, primary contact recreation, secondary contact recreation, and agriculture (Table 3-2). Also included are special protection uses (Exceptional Value and High Quality) and Warm Water and Cold Water Fishery designations. High Quality and Exceptional Value waters are considered to satisfy all designated uses. In Pennsylvania, the state agency that works to enforce the requirements of the CWA is the PA DEP. The State of Maryland must also meet the requirements of the CWA, though the designated use categories differ slightly from those of Pennsylvania (Table 3-3). The agency responsible for enforcing the act in Maryland is the Department of the Environment (MDE[3]). Table 3-4 lists stream designations for the project area.

Town Creek

Table 3-2. Pennsylvania Waterbody Designated Uses (PA DEP)

PA DEP Designated Uses	Description
Aquatic Life	The waterbody provides suitable habitat for survival and reproduction of desirable fish, shellfish, and other aquatic organisms.
Fish Consumption	The waterbody supports a population of fish free from contamination that could pose a human health risk to consumers.

Table 3-2. Pennsylvania Waterbody Designated Uses (PA DEP) (continued)

PA DEP Designated Uses	Description
Shellfish Harvesting	The waterbody supports a population of shellfish free from toxicants and pathogens that could pose a human health risk to consumers.
Drinking Water Supply	The waterbody can supply safe drinking water with conventional treatment.
Primary Contact Recreation (swimming)	People can swim in the waterbody without risk of adverse human health effects (such as catching waterborne diseases from raw sewage contamination).
Secondary Contact Recreation	People can perform activities on the water (such as canoeing) without risk of adverse human health effects from occasional contact with the water.
Agriculture	The water quality is suitable for irrigating fields or watering livestock.

Table 3-3. Maryland Designated Uses (MD DNR)

Category	Description
I	Water Contact Recreation and Protection of Non-Tidal Warmwater Aquatic Life
I-P	Water Contact Recreation and Protection of Non-Tidal Warmwater Aquatic Life and Public Water Supply
II	Support of Estuarine and Marine Aquatic Life and Shellfish Harvesting
III	Natural Trout Waters
IV	Recreational Trout Waters
IV-P	Recreational Trout Waters and Public Water Supply
V	Limited Use Waters (which do not freely support aquatic life or recreational uses due to natural or manmade conditions)

Discharges are generally not permitted to streams or lakes if they violate existing uses. They may violate designated uses, but only if the uses cannot be obtained through reasonable enforcement or without causing widespread social and economic costs. For instance, a stream may have "drinking water supply" as an existing use but not a designated use (it is not currently safe to drink but has been safe since 1975). In this case, the state must take steps to restore the stream so that it can be used as a water supply (Elder et al. 1999).

If a point source will violate a designated use, a public hearing must be held to inform the public before a permit can be issued. Citizens and non-profit organizations can gather information about their watershed's existing uses, including historical photographs, newspaper articles, and personal letters, so that a stream can be protected for those uses. The exception is Exceptional Value waterways, for which no exception is granted for activities that would cause the stream or watershed to no longer meet the Exceptional Value requirements (Elder et al. 1999).

Table 3-4. Three Sisters Project Area Protected Designated Uses

Watershed	Use
Pennsylvania	
Fifteenmile Creek	Warm Water Fishery
Sideling Hill Creek	Exceptional Value Cold Water Fishery
Town Creek	High Quality Cold Water Fishery
Maryland	
Town Creek tributaries	III-P: Natural Trout Waters/Public Water Supply
Sideling Hill Creek and tributaries	IV-P: Recreational Trout Waters/Public Water Supply
Potomac Bends tributaries	IV-P: Recreational Trout Waters/Public Water Supply
Fifteenmile Creek and tributaries	IV-P: Recreational Trout Waters/Public Water Supply
Town Creek mainstem	IV-P: Recreational Trout Waters/Public Water Supply

Warm Water and Cold Water Fishery Classifications

Streams can be scientifically classified as Warm Water and Cold Water Fisheries. As the name suggests, Warm Water Fisheries are those containing fish and other aquatic species characteristic of streams with comparatively higher temperatures, while Cold Water Fisheries contain species tolerant of lower temperature conditions. In Pennsylvania, Cold Water and Warm Water Fisheries are official classifications and are considered to be uses under the CWA. A PA DEP Warm Water Fishery satisfies certain temperature requirements, including a maximum healthy water temperature of 87° F in August, versus 66° F for a Cold Water Fishery.

Typically, Warm Water Fisheries have more exposed surface and, therefore, receive more sunlight than Cold Water Fisheries. Within the project area, most streams were historically cold-water streams because the project area was forested. Most warm-water streams are in areas that have been changed due to development or agriculture. However, some Warm Water Fisheries also support species commonly considered to be cold-water fish and some streams classified as Cold Water Fisheries do not always meet the temperature requirements. In fact, many streams fall somewhere in between the two classifications and are loosely referred to as "Coolwater Fisheries," although this is not an official designation in either state (Pennsylvania Code 1997b; COMAR 2004).

Special Protection Designations

Within Pennsylvania, a stream designated as High Quality or Exceptional Value meets a number of criteria, including specific water quality and biological standards (Tables 3-5 and 3-6). As with other designated uses, any proposed discharge that will degrade a High Quality stream below these criteria can only occur if a special exception is granted and the public is informed. No special exceptions are granted for Exceptional Value watersheds. Maryland does not have specific designations of "high quality" or "exceptional value," but similar rules apply for designated uses (COMAR 2004).

Table 3-5. High Quality Watershed or Watershed Stream Qualifications (PA DEP)

Parameter	Description
Chemistry (meeting at least one condition)	The water has long-term water quality, based on a year of data, including being better than the water quality criteria in PA Code Chapter 93.7 at least 99 percent of the time.
	Additional chemical and toxicity information, which characterizes or indicates good water quality.
Biology (meeting at least one condition)	The surface water supports a high-quality macroinvertebrate community, as determined by biological and physical habitat procedures outlined in U.S. EPA's "Protocols for Use in Streams and Rivers" and has a score of at least 83 percent when compared to a reference stream or watershed of high quality.
	The surface water supports a high-quality aquatic community based on information gathered using approved biological assessment procedures.
	The surface water has been designated a Class A Wild Trout Stream.

Table 3-6. Exceptional Value Watershed or Stream Qualifications (PA DEP)

(in addition to High Quality requirements)

The waterbody meets one or more of the following:

- The water is located in a national wildlife refuge or a state game propagation and protection area.
- The water is located in a designated state park natural area or state forest natural area, national natural landmark, federal or state wild river, federal wilderness area, or national recreational area.
- The water is an outstanding national, state, regional, or local resource water.
- The water is a surface water of exceptional recreational significance.
- The water achieves a score of at least 92 percent using approved biological assessment methods.
- The water is designated as a Wilderness Trout Stream by the Pennsylvania Fish and Boat Commission following public notice or comment.
- The water is a surface water of exceptional ecological significance.

Impaired Waterbody or 303(d) List

In order to satisfy the requirements of the CWA, states must report to the U.S. EPA every two years on the status of its waterways, and provide a list of waterways not meeting water quality standards. A water quality standard is a combination of a designated use for a particular waterbody and the water quality criteria to protect that use. Typically, states now report on the status of all assessed waterbodies and this list is referred to as the Integrated Waterbody List (Pennsylvania) or Integrated 303(d) List (Maryland). Streams are assigned to one of five categories based on their status on this list and are required to develop a Total Maximum Daily Load (TMDL) for streams in Category 5. These streams

include those that are not meeting their designated uses and exclude those where point source pollution can alleviate the problem (PA DEP[1]; MDE[1]).

In Pennsylvania, the Integrated Waterbody List is developed based on the Surface Water Assessment Program. In Maryland, much of the information to develop the Integrated 303(d) List comes from the Maryland Biological Stream Survey. Impaired streams in the project area are shown in Figure 3-3 and described further in the "Water Quality" section of this chapter.

TMDLs

A TMDL is an analysis of the maximum level of pollutants that can enter a waterbody while still meeting water quality standards and existing uses under the CWA. The U.S. EPA mandates that these must be developed for impaired streams where the source of impairment is not known or where the source is non-point source pollution (Category 5). Currently, there are seven stream segments in Pennsylvania for the Town Creek watershed, and two for the Sideling Hill Creek watershed that are listed as impaired. Maryland does not currently designate segments, but instead designates specific points along streams as being impaired. A number of such impaired points are listed for the Maryland portion of the Sideling Hill, Town, and Fifteenmile Creek watersheds. The majority of these are in the Town Creek watershed. Lists of impaired sections and points can be found later in this chapter.

The sources of these impairments include nutrients, sediment, acid deposition (rain), and unknown causes contributing to poor biological diversity. Information regarding special protections for water quality can be found in the Pennsylvania Code, the state's official listing of its laws and regulations, and in Maryland's similar rulebook, the Code of Maryland Regulations (Pennsylvania Code 1997b; COMAR 2004).

Table 3-7. Sections of the Pennsylvania Integrated Waterbody List (PA DEP)

Category	Classification Description
1	Streams in which all uses are attained
2	Streams in which at least one use is attained
3	Unassessed streams
4	Streams impaired for one or more designated use, not requiring a TMDL assessment
5	Impaired streams requiring a TMDL

Pennsylvania Surface Water Assessment Program

PA DEP initiated the Surface Water Assessment Program in 1997 as part of the CWA requirements. The goal of the program is, "to conduct stream assessments quickly and effectively, complete a statewide assessment in 10 years, to document point and non-point sources of pollution, and to identify causes of stream impairments." The first part of the assessment included macroinvertebrate sampling similar to the U.S. EPA's Rapid Bio Assessment Protocol. The percentage of organisms in families tolerant or intolerant to pollution was used to help determine if a stream was impaired. Another important component was a visual assessment, which rated a stream according to streambank erosion, siltation, health of the riparian zone, and other factors.

Results of this assessment are included in PA DEP's Unassessed Waters Report. The list of assessed streams included on this list is the Integrated Waterbody List (Table 3-7). Streams found to be impaired are included on the 303(d) List, or Impaired Waters, portion of the list (Section 5). The Sideling Hill,

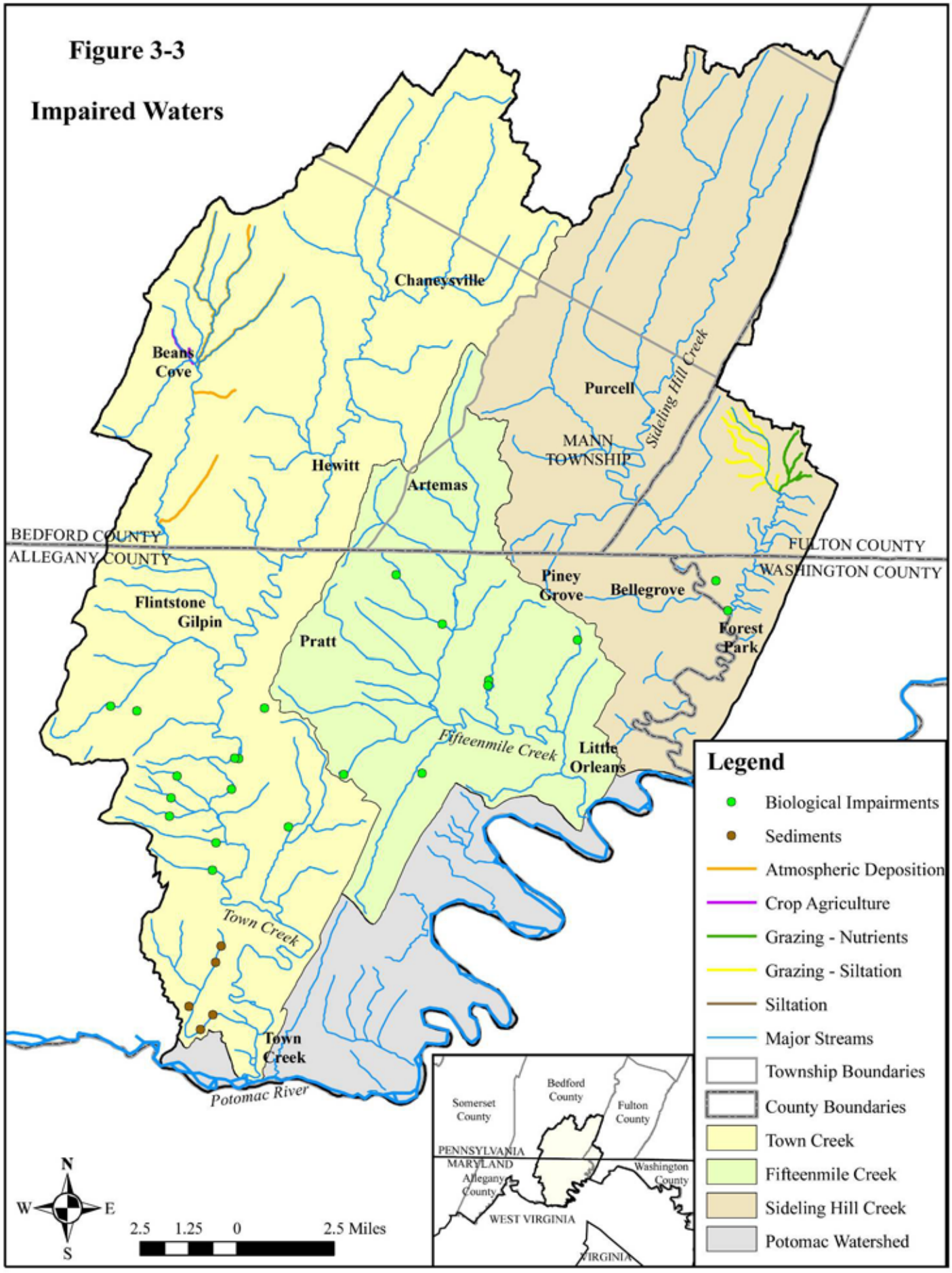


Figure 3-3
Impaired Waters
Chaneysville
Beans Cove
Purcell
Sideling Hill Creek
MANN TOWNSHIP
Hewitt
Artemas
BEDFORD COUNTY
ALLEGANY COUNTY
FULTON COUNTY
WASHINGTON COUNTY
Piney Grove
Bellegrove
Forest Park
Flintstone
Gilpin
Pratt
Fifteenmile Creek
Little Orleans
Town Creek
Town Creek
Potomac River
Legend
Biological Impairments
Sediments
Atmospheric Deposition
Crop Agriculture
Grazing - Nutrients
Grazing - Siltation
Siltation
Major Streams
Township Boundaries
County Boundaries
Town Creek
Fifteenmile Creek
Sideling Hill Creek
Potomac Watershed
Somerset County
Bedford County
Fulton County
PENNSYLVANIA
MARYLAND
Allegany County
Washington County
WEST VIRGINIA
VIRGINIA
N
W
E
S
2.5 1.25 0 2.5 Miles

Town, and Fifteenmile Creek watersheds were assessed in 2001. Results of this assessment will be discussed later in this chapter (PA DEP[1]).

Maryland Biological Stream Survey

The Maryland Biological Stream Survey (MBSS) is the Maryland equivalent of the Pennsylvania Surface Water Assessment Program. Initiated in 1994, the goal of this program is to identify the best and worst areas of stream, find sources of impairment, and locate target streams for protection and restoration within Maryland. Impaired sections are included on the state's Integrated 303(d) List of impaired waters. Parameters measured as part of the project include water chemistry, fish diversity, the macroinvertebrate assemblage, and physical habitat characteristics. Portions of the Sideling Hill Creek, Fifteenmile Creek, and Town Creek watersheds were assessed in 1996, 2000, and 2004 (MDE[1]). The results of these surveys can be found in the "Water Quality" section of this chapter.

NPDES Permits

One of the ways that the CWA is executed is through the National Pollutant Discharge Elimination System, or NPDES, whereby PA DEP and MDE issue permits for point source discharges. Point sources refer to discharges that enter a stream or lake directly via a pipe, culvert, container, or other means, whereas non-point sources do not have a defined source and mainly include runoff from residential areas, agriculture, and commercial operations. In Pennsylvania, PA DEP and local conservation districts are responsible for issuing point source permits to industrial operations, municipal wastewater treatment plants, concentrated animal feeding operations, and households. In Maryland, these permits are issued through the Department of Environmental Quality. A list of current permits can be found in Appendix E.

In Pennsylvania, an earth disturbance activity from one to five acres requires an NPDES permit if a point source exists at the site. Any disturbance over five acres requires a permit regardless of whether there is a direct point source to a waterway. Farmers do not need to obtain an NPDES permit unless the farm meets the criteria to be considered a concentrated animal feeding operation (CAFO). However, they must complete a conservation plan. Timber operations under 25 acres are also exempt from NPDES permits, but must complete soil and erosion control plans. Active NPDES permits may be found at the U.S. EPA Envirofacts website (http://www.epa.gov/enviro/index.html).

Concentrated Animal Feeding Operations

A CAFO is a farm where large quantities of livestock or poultry are housed inside buildings or in confined situations where traditional pastures and feeding practices are not used. Feed is brought to the animals, and all units of production, including feed, wastes, and dead animals, are concentrated in one area.

In general, any animal feeding operation with 1,000 animal units or more is considered a large CAFO. Smaller animal feeding operations can be considered CAFOs for regulatory purposes if they discharge to surface waters or allow animal contact with surface water. An animal unit is considered to be more than 1,000 pounds of animal weight. However, in 2002, the U.S. EPA developed specific standards for the number of animals based on animal type and has required states to adopt a similar approach. For instance, a large cattle CAFO is an operation exceeding 1,000 animals, whereas a large chicken CAFO is an operation exceeding 125,000 animals [Cooperative State Research, Education and Extension Service (CREES) 2004].

The 1972 CWA contains provisions for the regulation of CAFOs and permitting through the NPDES permit program that regulates point source pollution. This permitting is done through state agencies, such as PA DEP and MDE. Though most agricultural activities fall under the category of non-point sources, the concentrated nature of CAFOs makes them, for all intents and purposes, point sources. As such, the federal water quality rules require that all CAFOs obtain an NPDES permit. They must also develop and

implement nutrient management plans that include adequate manure storage, proper operation and maintenance of storage facilities, animal mortality management, no direct animal contact with surface waters, proper chemical disposal, and use of conservation practices. This is enforced through state agencies and specific activities are often administered with the help of local conservation districts. Under the new 2002 regulations, poultry operations and operations raising immature animals must be considered in state CAFO programs (CREES 2004).

CAFOs can fall under a state general permit, which is a blanket permit on which a number of CAFOs are included. These permits do not require public notification but still must meet the regulatory requirements. Individual permits are required for CAFOs in environmentally sensitive areas and, specifically, in special protection waters within Pennsylvania (Exceptional Value and High Quality). In this case, municipalities are notified of the CAFO permit application and the notification is published in a newspaper for public comment. A public meeting is required for CAFOs in Exceptional Value watersheds within Pennsylvania and is also required if the public requests it. Currently, there is one CAFO within the project area, and it is located within the Sideling Hill Creek watershed (CREES 2004).

Pennsylvania State Protections

Pennsylvania Clean Streams Law

First established in 1937, the Pennsylvania Clean Streams Law prohibits the discharge of any substance, regardless of quantity, into Pennsylvania waters (surface and groundwater) without a permit or other permission from the PA DEP.

The law was designed to protect streams from pollution and the effects of coal mining. It also provides authority for erosion and sediment control regulations. State laws are enforced along with federal laws and statutes and may, in some cases, be more strict and extensive.

Soil and Erosion Control

Pennsylvania's Clean Streams Act and regulations under the Pennsylvania Code create a role for local governments in protecting streams by developing erosion and sediment control plans, which include sediment control best management practices (BMPs). BMPs are practices that help protect the quality of land and the environment by preventing erosion and pollution. They include agricultural practices, such as utilizing contour farming and filter strips, sustainable forestry practices like limited harvesting in riparian zones and steep slopes, and wise development practices, such as maintaining vegetated zones around parking lots and buildings.

In Pennsylvania, any disturbance over 5,000 square feet must have a soil and erosion control plan on site. Earth disturbance permits must be obtained for activities disturbing an area over 25 acres, including timbering and development activities. Most agricultural operations do not need to have an earth disturbance permit, but must have a conservation plan if the farmer wishes to take part in incentive programs. Both earth disturbance permits and conservation plans require provisions for sediment control. A separate permit is required for stormwater from construction activities. The Bedford County and Fulton County conservation districts assist in the development of erosion and sediment control plans and conservation plans (PA Code 1997c). They also help fill out paperwork for earth disturbance permits. However, all permits in High Quality and Exceptional Value watersheds must be approved by PA DEP. It is not clear whether soil and erosion control regulations in the project area are being adequately implemented. Any efforts to improve the effectiveness of soil and erosion control measures should involve the local conservation districts and state agencies responsible.

Municipal Sewage Plans

Act 537, the Pennsylvania Sewage Facilities Act, requires that all municipalities develop and implement an official sewage plan addressing present and future sewage disposal needs. PA DEP reviews official plans and revisions and issues necessary construction permits. PA DEP also provides grants and reimbursements for up to 50 percent of costs associated with Act 537 planning and permitting.

Act 537 plans vary by municipality and may include plans for municipal sewage treatment facilities and upgrades to on-lot systems. Sewage Enforcement Officers within each municipality are responsible for issuing permits for new systems and repairs to old systems. All homes not serviced by a sewage treatment facility are required to have a functioning on-lot system that does not create an obvious discharge. Malfunctioning systems can be reported to PA DEP, as well as failure of municipalities to follow Act 537 plans. PENNVEST, the Pennsylvania Infrastructure Investment Authority, offers loans, and some grants, to municipalities developing sewage treatment facilities. Loans are also available to individuals for development or improvements to on-lot systems.

Nutrient Management Program

The Pennsylvania State Conservation Commission, formed through the Pennsylvania Nutrient and Odor Management Act (NOMA), administers the Pennsylvania Nutrient Management Program (PNMP). The commission and county conservation districts with approved delegated authority control the program. Concentrated Animal Operations are required to participate in the program, as well as any operation that wishes to gain liability protection under the act, or has received financial assistance through NOMA for BMP installation. In addition, any agricultural operation in violation of the Pennsylvania Clean Streams Law may be required to submit a nutrient management plan that meets NOMA requirements (PNMP).

Farmers participating in NOMA must develop and implement approved nutrient management plans. Nutrient management planning is a series of BMPs designed to reduce nutrient pollution by balancing nutrient inputs with nutrient requirements. A certified Pennsylvania Department of Agriculture nutrient management specialist must develop the plans. The intent of NOMA is to address water quality issues from activities such as animal number and density, nutrient losses from manure storage and handling areas, nutrient runoff from animal concentrated areas, and manure fertilization. Questions about the program should be directed to the appropriate county conservation district. Financial and technical assistance is available (PNMP).

Maryland State Protections

Water Quality Protection Legislation

Though Maryland does not have a specific law like the Clean Streams Law, its environmental legislation generally provides similar protections. The legislation gives it the authority to regulate the quality of surface and groundwater through the MDE and to develop comprehensive programs and plans for the abatement, prevention, and control of water pollution (National Association of State Departments of Agriculture).

Soil and Erosion Control

Maryland also has a Soil and Erosion Control Program similar to that of Pennsylvania, which is administered by Maryland's local conservation districts. As in Pennsylvania, soil and erosion control plans are needed for disturbances over 5,000 square feet. The 1994 Standards and Specifications for Soil and Sediment Control are incorporated into the state regulations and serve as the official guide for the principles, methods, and practices of soil and erosion control in Maryland.

Sewage Enforcement

Maryland does not have a law comparable to Pennsylvania's Act 537. However, in May 2004, the state legislature signed a bill creating a Bay Restoration fund to provide updates to the state's outdated treatment plants and septic systems. The money from this fund is provided through an extra fee charged to both homeowners with on-lot systems ($30.00 a year) and those tapping in to public systems (varies with bill). Money from this fund pays for either upgrades to on-lot systems to the newest technology, which greatly reduces the amount of nitrogen generated, or to fund treatment plant upgrades. Up to 40 percent of the fund is set aside for a cover crop program, to reduce the amount of nitrogen and phosphorous entering streams from cropland. Though the fund was tailored for use by residents in critical areas along the coast, money is available to residents of the entire state. Special consideration may be given to residents in areas like those included within the Three Sisters watershed because it is a relatively high-quality area and is vulnerable to pollution because of the underlying geology (Boris, personal communication 2006).

Nutrient Management

In 1998, the Maryland legislature passed the Water Quality Improvement Act, requiring farmers to develop nutrient management plans. However, prior to this legislation, a program already existed to help farmers with nutrient planning. The Maryland Department of Agriculture and Maryland Cooperative Extension developed the Maryland Nutrient Management Program in 1989. This program has placed 31 advisors in county offices throughout the state to assist local farmers with nutrient management planning efforts.

Important Components of Watershed Health

Streams are not static, isolated systems. Much of the energy needed to support stream function comes in the form of organic matter (twigs, leaves, etc.) from the area immediately adjacent to the stream, called the riparian zone. Additionally, the streambed is an interface between the stream and the groundwater underneath. The health of a stream can affect groundwater and vice versa. Protecting the components of stream health is not only important for wildlife, they also provide valuable functions to humans by helping to prevent flood events, transport stormwater, and provide recreational opportunities.

Mowing along a riparian zone can decrease its filtering capacity and increase the temperature of the water, affecting aquatic organisms

Floodplains

Importance

Floodplains refer to areas of land adjacent to a stream onto which water spills when the water level in the stream rises. Floodplains increase the capacity of a stream to handle flood events by dissipating energy from high flows. The vegetation along a stream essentially acts as a giant sponge, absorbing and filtering floodwaters. As a result, building on floodplains, or other alterations, can increase flooding downstream, cause bank failures, and be dangerous for residents. Several opportunities exist to enhance the function of floodplains within the project area. A number of these are associated with the National Flood Insurance Program. Additionally, Maryland DNR has been involved with projects to restore floodplains on Murley Branch in the Town Creek watershed by removing flood berms and stabilizing streambanks. Other similar opportunities may exist.

National Flood Insurance Program

The National Flood Insurance Program (NFIP) was established in 1968 with the National Flood Insurance Act (FEMA 2006). The Federal Emergency Management Agency (FEMA) administers it. This act enables property owners to purchase insurance as a protection against flood loss in exchange for communities agreeing to adopt ordinances that reduce flood damage, including limited building in floodplain areas. In communities that adopt such ordinances, building in Special Flood Hazard Areas may only occur if the owner agrees to purchase flood insurance. These hazard areas are areas within the 100-year flood zone, meaning that there is a one percent chance of a flood reaching this zone each year. Special subsidies are available for existing structures. Future structures built in 100-year floodplains must meet certain requirements. During declared national disasters, FEMA may also make grants and loans available to those not participating in the program (FEMA 2006). Floodplains can be considered "sensitive," areas inappropriate for most building and other activities because of safety or wildlife concerns. All townships in Pennsylvania and counties in Maryland within the watershed have floodplain ordinances, and residents are able to enroll in the NFIP. These ordinances were adopted in the following years: Mann Township–1978; Monroe Township–1985; Southampton Township–1987; Union Township–1983; Allegany County–1981; and Washington County–1978 (Federal Insurance Administration 2005).

Riparian Buffers

Riparian buffers, or zones, are vegetated areas along streams, rivers, and lakes that filter runoff and provide a transition zone between water and land. A functioning riparian zone can reduce flooding by retaining water in its vegetation and soil. This also promotes retention of groundwater during dry periods. Vegetated riparian zones prevent soil loss and bank failures by holding soil in plant roots. They also provide important corridors for wildlife, enhance recreational activities, and provide fish habitat. Woody debris and leaves entering the stream from the riparian zone break down into the nutrients and organic matter utilized by aquatic organisms, such as macroinvertebrates and fish.

This debris provides much of the initial energy for the stream system, and ultimately supports fish and insects downstream. Because the project area is in the headwaters of the Potomac River drainage, the importance of woody debris is high. Removing riparian zones and altering stream courses can reduce inputs of woody debris. A potential project for volunteers would be to estimate relative abundance of woody debris in stream courses of the watershed as a sign of stream health.

Studies have shown that the wider and more substantial a riparian buffer is, the better it can perform these functions (Klapproth and Johnson 2000). Figure 3-4 shows recommended riparian zone widths for bank support, fisheries habitat, nutrient removal, sediment control, flood control, and wildlife habitat. Mowing, or otherwise removing vegetation, increases flooding potential and reduces the capacity of the riparian buffer to provide these services. Within the project area, it would be beneficial to identify priority riparian zones according to width and quality and to consider these areas in a land protection strategy. Recent studies have shown that topography, soils, and geology, also help determine the relative importance of a riparian zone. It will be important to use this data as it becomes available to help inform the prioritization of riparian zones in the project area.

Well-functioning riparian buffers generally have three management zones. The first zone, directly adjacent to a stream or lake, contains trees and shrubs to provide shade, insect habitat, bank stability, and large woody debris for habitat. No timbering, development, or farming activities are recommended in this zone. Zone two also contains trees and shrubs needed to filter runoff and provide for uptake of nutrients and pollutants. Livestock access is discouraged in this zone, but forest harvesting and management are appropriate as long as the function of the zone is not compromised. Finally, the third zone contains a strip of tall grasses or herbaceous cover acting as a barrier to spread and filter runoff, which may be transporting sediment, nutrients, pesticides, and other pollutants from cropland or urban areas.

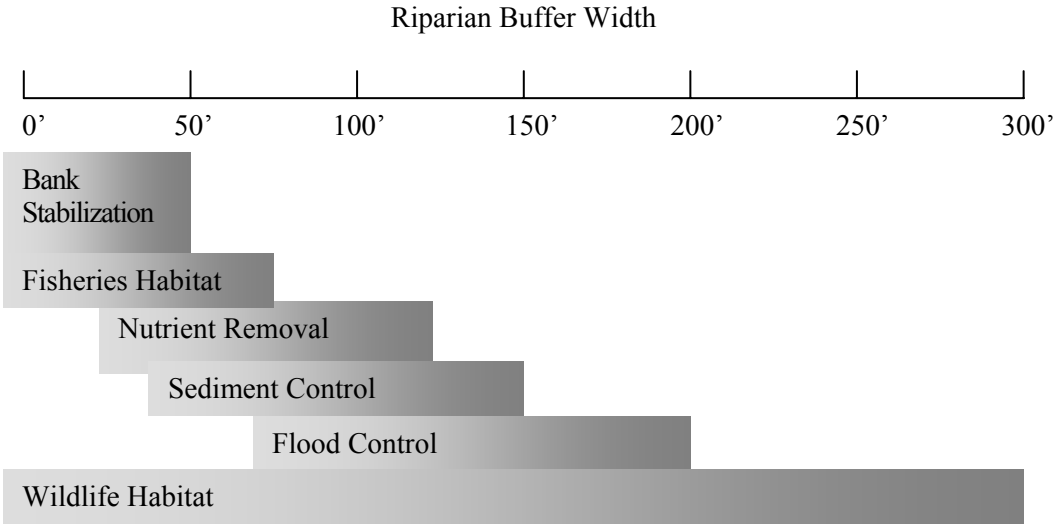


Figure 3-4. Recommended Riparian Buffer Widths (Klapproth 2000)

Groundwater

Groundwater refers to water stored beneath the land surface in the pores and openings of soil and rock formations. Within the project area, water is mostly stored in sandstone and shalestone fractures. Well yields in these kinds of aquifers are considerably smaller, averaging 10 to 30 gallons per minute, compared to those containing limestone and yielding up to 200 gallons per minute. Groundwater yields in most of the project area are sufficient for most rural residential uses, but generally inadequate for commercial uses or intensive residential uses. One of the few areas where limestone rock is found near or at the surface is Martin Mountain and the valley between Tussey Mountain and Warrior Ridge. Also, Murley Branch, one of Town Creek’s tributaries, flows from an underground limestone cave (Trapp and Horn 1997).

Because water is constantly interchanged between ground and surface waters, surface water quality is often indicative of groundwater quality, and streams can be important in recharging groundwater aquifers. Also, increases in groundwater withdrawals can lead to lower stream flows. Some common pollutants of surface waters that can lead to groundwater contamination include sewer and agricultural contamination (nutrients, bacteria), mining (metals, low pH), and abandoned oil and gas wells (chlorides).

Stormwater

Stormwater is water that rapidly rushes off the land surface during rain events. Water running off impervious surfaces, such as paved parking lots and sidewalks, cannot filtrate into groundwater and often reaches streams at the same time, creating rapid increases in stream flow. Besides causing flooding, stormwater can contribute a significant amount of pollution to waterways. Much of the unhealthy bacteria that enter streams from manure lots and faulty sewage systems enter during storm events. Many of Pennsylvania’s urban areas have ordinances that include stormwater management. This involves activities such as regulating the size of culverts and ditches through which water travels to prevent flood events, and requiring the use of pervious materials for sidewalks and parking lots to prevent ponding of water. It is estimated that less than three percent of the project area has impervious cover, which is a very small amount (Canaan Valley 2004). Recent efforts by The Nature Conservancy will provide better estimates, which can be used in the future to track changes in land use and the effect on stormwater flows.

Pennsylvania's Stormwater Management Act of 1978 requires each county in Pennsylvania to develop stormwater management plans for each of its watersheds. The development of such plans is usually considered more relevant to urban areas than to rural areas such as the Three Sisters watershed area. However, stormwater management, especially for flood-regulation purposes, may become more of an issue as development continues and the amount of impervious surface increases.

The challenge will be to maintain this low percentage in the future through maintaining natural areas and practices such as utilizing appropriately sized culverts and designing buildings and parking lots in a way that minimizes stormwater runoff. PA DEP provides model stormwater management ordinances and funding options for stormwater management plans on its website at http://www.dep.state.pa.us (Keyword: stormwater). Municipalities may choose to adopt any one of these ordinances in order to prevent flooding and maintain safety for residents. Unfortunately, additional funding is needed to provide support for the program, which is largely underfunded. None of the municipalities within the watershed currently have stormwater management provisions.

The MDE is responsible for administering Maryland's stormwater management program. Permits are required for construction activities that disturb greater than one acre, industrial sites, and municipal sewage systems. In addition, specific water quantity requirements are required for storm events. For instance, for projects draining to the eastern portion of the state, the post-development peak discharge rate may not exceed the pre-development peak from a two-year storm event (storm magnitude occurs every two years). In the western portion of Maryland, which includes the project area, the discharge rate may not exceed the pre-development discharge rate for a 10-year storm event. This information is calculated using computer modeling. BMPs must be used to achieve these goals, and these must be designed according to Maryland's Stormwater Design Manual (Stormwater Authority).

Developers who use low-impact development practices can receive credits, which allow them to reduce the size of expensive stormwater structures. Credits can be received for reducing impervious cover, permanently conserving natural areas through land trusts and conservation easements, and meeting a range of specific BMP requirements. The county or municipal authority must approve a stormwater management plan before construction can begin. The local inspector ensures that the plan is properly implemented and can impose fines if the developer fails to follow the plan. Inspections are required during the first year after construction and then once every three years to ensure that structures are maintained and performing up to standard (Chesapeake Bay Foundation 2004).

Surface water

Surface water refers to water found above the land surface during all or some parts of the year, in rivers, streams, lakes, ponds, and wetlands. Due to the lack of glacial history in the region, there are no natural lakes within the watershed. Wetlands in the project area consist mainly of riparian depressions, slopes, and headwater and mainstem stream floodplains. However, due to the geology of the area, there are comparatively fewer wetlands than in many other areas of Maryland or Pennsylvania.

Drainage patterns form from the interactions between geology and topography within a landscape. Streams typically follow the path of least resistance, forming valleys where rock is most easily eroded or along the steepest gradient. The most common drainage pattern is dendritic drainage, which forms when geology is relatively uniform and rock layers are horizontal. In this case, streams intersect to form a "V," with a resulting pattern resembling the branching of a tree. Streams in the project area primarily take on a trellis drainage pattern, in which the underlying rock causes tributaries to connect with mainstem streams at a right angle (see Project Area Characteristics chapter). This is characteristic of landscapes containing parallel valleys and ridges. Small tributaries drain rainwater from the ridges to the valleys, which contain major streams that flow parallel to the ridges. It is possible for a tributary to be superimposed on the

landscape, which means that it has incised itself into an underlying sequence of rock by eroding away the upper surface, crossing a ridge and creating a water gap.

Rain events in the project area may contribute to high amounts of water being lost to streams. For instance, it is estimated that in Sideling Hill Creek, a 25-year flood event has 1,000 times the average stream flow (Ridge and Valley Stream Keepers 2001a). The high impermeability of rock results in water running off into streams, rather than being taken up by soil. Also, the largely siltstone and shale geology is able to hold less water than areas containing carbonate rocks, and water is lost to streams through fractures in rock. These factors contribute to low flow during the summer months of August and September. Other reasons for low flow include high rates of evapotranspiration, or evaporation from trees, which comprise a large portion of the project area. Because the project area is in the rain shadow of the Appalachian Mountains, it receives up to four inches less rain each year than surrounding areas. The amount of stream flow is directly related to groundwater availability, and higher groundwater withdrawals may also result in lower stream flows.

Within the project area, the United States Geological Survey (USGS) maintains 10 gauging stations designed to monitor the flow of the creek. These station gauges can provide valuable information about flood events and the navigability of the creek at any given time. Three of these stations actively collect data; they include Station 01610155 Sideling Hill Creek, Station 01609000 Town Creek, and Station 01609500 Sawpit Run. Table 3-8 illustrates the variability of flow at these USGS gauging stations.

Table 3-8. High and Low Flow Data at Active Gauging Stations

USGS Gauging Station	High Flow (Date)	Low Flow (Date)
01609000 Town Creek, Oldtown Md.	27,000 cfs (3/17/1936)	1,160 cfs (5/18/2002)
01609500 Sawpit, Oldtown Md.	770 cfs (10/15/1954)	46 cfs (3/25/1969)
01610155 Sideling Hill Creek, Bellegrove Md.	14,200 cfs (6/22/1972)	871 cfs (3/20/2002)

Western Pennsylvania Conservancy and The Nature Conservancy recently obtained a grant to maintain Station 01610155and open additional stations on Fifteenmile Creek and Town Creek. Sediment data will also be collected at these stations in an effort to measure changes in sediment contributions to these watersheds. Real-time data can be accessed at the following USGS website: http://waterdata.usgs.gov/nwis/rt.

Best Management Practices

Best management practices are techniques utilized for the reduction of groundwater and surface water pollution, while allowing the productive use of resources for agriculture, forestry, and other activities. When used correctly, BMPs can greatly reduce pollution loading.

Agricultural BMPs on cropland can prevent runoff of sediment and nutrients

Agriculture BMPs

The main types of pollution to streams resulting from agricultural activities include sediment, nutrients, disease-causing agents, and salts. Examples of BMP options for these types of pollution include integrated pest management, the use of cover crops, strip cropping, and streambank fencing (U.S. EPA[2]). These are only some of the BMP options available. County conservation districts or other appropriate agencies may be able to provide additional information.

Sediment

Sedimentation occurs when wind or water runoff carries soil particles from an area, such as a farm field, and transports them to a waterbody, such as a stream or lake. Excessive sedimentation clouds the water, which reduces the amount of sunlight reaching aquatic plants, covers fish spawning areas and food supplies, and clogs the gills of fish. In addition, other pollutants often attach to the soil particles and deposit in the waterbodies with the sediment. Farmers and ranchers can reduce erosion and sedimentation by 20 to 90 percent by applying management measures to control the volume and flow rate of runoff water, keep the soil in place, and reduce soil transport. For example, farmers can:

- Use strip-cropping techniques, which involve planting crops along the natural contours of the land, helping to prevent wind and water erosion.
- Plant cover crops after harvesting row crops, such as corn or soybeans, to ensure the soil is not bare during the non-growing season, to prevent erosion, and add nutrients to the soil.
- Control barnyard runoff to limit erosion and pathogen and nutrient transport into surface waters.
- Establish riparian buffers to limit access of farm animals to streamside areas where they trample streambanks.

Nutrients from Crops

Nutrients, such as phosphorus, nitrogen, and potassium in the form of fertilizers, manure, sludge, irrigation water, legumes, and crop residues, are applied to enhance production. When they are applied in excess of plant needs, nutrients can wash into aquatic ecosystems where they can cause excessive plant growth, reduce swimming and boating opportunities, create a foul taste and odor in drinking water, and kill fish. Studies have shown that adding appropriate nutrients at precise times of the growing season can increase farm yields while decreasing nutrient runoff. Farmers can:

- Determine optimal nutrient rates to use and apply no more than necessary.
- Use appropriate sources of nutrients for plants.
- Apply at optimal times with respect to weather and the growing season.

Feed and Manure Lots

By confining animals to areas or lots, farmers and ranchers can efficiently feed and maintain livestock. But these confined areas become major sources of animal waste. Runoff from poorly managed facilities can carry pathogens (bacteria and viruses), nutrients, and oxygen-demanding substances that contaminate shellfish areas and cause other major water quality problems. Groundwater can also be contaminated by seepage. Discharges can be limited by:

- Storing and managing facility wastewater and runoff with an appropriate waste management system.
- Developing a nutrient management plan, which helps limit nutrient runoff by identifying sources of nutrient loading and BMPs to decrease these amounts.

Pesticides

Pesticides, herbicides, and fungicides are used to kill pests and control the growth of weeds and fungi. These chemicals can enter and contaminate water through direct application, runoff, wind transport, and atmospheric deposition. They can kill fish and wildlife, poison food sources, and destroy the habitat that animals use for protective cover. To reduce non-point source contamination from pesticides, people can:

- Apply integrated pest management (IPM) techniques, such as utilizing only the minimum amount of pesticide necessary and applying it under the right conditions.

- Use natural methods of pest control, such as crop rotation.

Livestock Grazing

Overgrazing exposes soils, increases erosion, encourages invasion by undesirable plants, destroys fish habitat, and reduces the filtration of sediment necessary for building streambanks, wet meadows, and floodplains. To reduce the impacts of grazing on water quality, farmers and ranchers can:

- Adjust grazing intensity through rotational grazing.
- Keep livestock out of sensitive areas such as steep slopes and riparian zones through streambank fencing and other techniques.
- Provide alternative sources of water and shade.
- Revegetate eroding rangeland and pastureland.

Forestry BMPs

Forestry BMPs seek to implement the best ways to harvest trees for timber, while enhancing wildlife, protecting water quality, preserving aesthetics, and ensuring future forest regeneration (Chunko and Wolf 2001). Examples of forestry BMPs include:

- Obtaining required non-point source and soil and erosion control plans and implementing soil and erosion control practices.
- Choosing management methods for forest harvesting that ensure the long-term health of the forest and its importance for protecting water quality and wildlife, as well as providing economic value.
- Developing a forestry management plan that takes into account long-term goals for the forest in order to ensure both economic gains and forest health.
- Implementing practices such as deer exclosures, improvement thinning, and removal of invasive plant species, to improve forest health.

Poor forestry practices can cause erosion, which may result in increased sediment entering streams

For more information about forestry management techniques, see the Land Resources chapter.

Development BMPs

Development refers to human changes to the land that usually occur for financial reasons, including building, engineering, and mining. BMPs are needed to carry out these activities in ways that protect water quality and aquatic resources.

BMPs for developing areas include (Pennsylvania Association of Conservation Districts 2003):

- Maintaining a riparian zone, or area of natural vegetation, along waterways for the purposes of stabilizing the streambank, filtering pollutants from storms and floods, and providing habitat for birds, amphibians, and other wildlife.
- Developing setbacks in areas of intense development (buildings, parking lots, roads) to minimize the amount of sediment entering streams, and to increase flood control and water quality.
- Discouraging development in areas of high- and medium-quality wetlands and mitigation (creating new wetlands in place of those that have been impacted) in areas of lower-quality wetlands.

- Developing site plans that fit into existing topography, rather than those that require excessive earthmoving and grading.
- Develop special provisions for limiting development in sensitive areas, such as wetlands and steep slopes.

Water Quality

Low alkalinity, acid rain, and low flow regimes, which amplify the effects of nutrient and sediment additions, make the project area particularly vulnerable to stream degradation. However, because it is largely forested, relatively undeveloped, and does not have the negative environmental effects of coal mining, the area has one of the highest levels of water quality found in either Pennsylvania or Maryland.

Determining if a Stream is Polluted

Water quality criteria are specific concentrations or conditions of surface water that need to be attained to protect existing or designated uses. Unless otherwise specified in the designated use, all streams should meet statewide water quality criteria, as well as specific water quality criteria for temperature and dissolved oxygen. Water quality criteria for Pennsylvania are provided in Table 3-9 (PA Code 1997a). In addition to those listed, dissolved oxygen and temperature criteria must be met according to the applicable stream designation (CWF or WWF; EV or HQ – see page 3-8). Criteria for Maryland are more complicated, and vary based on stream designation and other environmental factors. For more information, search the COMAR database at http://www.dsd.state.md.us/comar.

Investigators, including state agencies, compare water quality criteria with field measurements to determine if stream sections are polluted. They also use biological data, such as macroinvertebrate sampling. Whereas chemical sampling can only provide information about what is occurring at any given moment, macroinvertebrate data can provide a better picture of whether the stream is impaired in the long term. This involves rating a stream based on how many macroinvertebrates in the sample are tolerant or intolerant of pollution.

Table 3.9. Pennsylvania Water Quality Criteria

Parameter	Units (mg/L)	Source
Alkalinity	x>20	PA Code 25, Chapter 93.7
Iron	1.5	PA Code 25, Chapter 93.7
Nitrates	10	PA Code 25, Chapter 93.7
pH	6.0<x<8.5	PA Code 25, Chapter 93.7
Phosphate	0.1	EPA Water Quality Standards
Sulfates	250	PA Code 25, Chapter 93.7
Chloride	250	PA Code 25, Chapter 93.7
TSS	500 avg; 750 max	PA Code 25, Chapter 93.7
Fecal Coliform	200 during swimming season, based on 5 samples over 30 days	PA Code 25, Chapter 93.7
Fecal Coliform	2,000 during non-swimming season, based on 5 samples over 30 days	PA Code 25, Chapter 93.7

Pennsylvania Aquatic Community Classification Project

Natural Heritage Program biologists are conducting an Aquatic Community Classification of biological communities occurring in Pennsylvania's streams and rivers in partnership with The Nature Conservancy, Western Pennsylvania Conservancy, and the PA Department of Conservation and Natural Resources. This project was initiated in order to define the diversity of aquatic organisms found in Pennsylvania so that the state's aquatic resources can be effectively managed and conserved.

Communities are groups of plants and animals that interact with each other and their physical surroundings. Terrestrial (land) communities are most often classified into distinct community types such as "dry oak-mixed hardwood forest" or "tussock sedge marsh." However, scientists are now recognizing the usefulness of grouping aquatic species together into distinct community types. Because the type of communities found correlates with specific abiotic (physical) factors, such as land use and alkalinity, these abiotic factors can also be predicted in areas with specific communities. The distribution and abundance of communities can indicate which stream systems are unique and may be in need of protection. A shift in community composition may provide a good indicator of the extent of environmental degradation or success of restoration efforts.

Stream order (or size) also has an influence because of the effects of the River Continuum Concept, which basically describes how a stream is affected by the breaking up of leaves, dead aquatic organisms, and organic matter as it meets other streams and grows in size. A higher order, smaller stream is full of more particles that have not yet been broken down and therefore contains aquatic species that are able to shred this material (shredders) into smaller particles. As the stream system gets bigger, materials from outside the stream become less important than production of algae within the stream, increasing the amount of aquatic animals that rely on attached algae on the surfaces of leaves and rocks (scrapers). At the largest stream sizes, fewer surfaces are available for scrapers and the system is dominated by small particles that have been broken down. These are consumed by small species that filter sediment (collectors). Therefore, the types of species found will be naturally affected by the location of a stream segment in the river continuum.

However, even considering the effects of the River Continuum, the Aquatic Community Classification Project found that streams showing higher levels of impairment have a higher proportion of species tolerant to pollution. The Three Sisters project area was one of the pilot areas studied for the project, and so great insight exists into the types of communities found there. In the future, those involved hope the results can be better refined to be used by managers, watershed groups, and agencies involved in watershed projects. Information from this aquatic classification may be useful in deciding what types of macroinvertebrate protocols to use in stream investigations in the project area.

Three different groups of aquatic life were studied for the project: macroinvertebrates, fish, and mussels. Macroinvertebrates are insects that live primarily in waterways. Mussels are essentially the freshwater version of clams, with hinged shells.

It was found that the mussel and fish communities in the project area are similar to those found in the larger Mid-Atlantic region. The macroinvertebrate data was analyzed at the family (less detailed) and genus (more detailed) levels of identification. Three genus-level communities were identified. The project area was the only known location for one of the genus-level communities in Pennsylvania, which may be considered rare. Specific categories of ephemeroptera (mayflies), plecoptera (stoneflies), and trichoptera (caddisflies) were primary indicators of this community. Stream sections containing an assemblage of organisms in this list (Table 3-10) are unique and may be important to the aquatic biodiversity of the area. This community type is typically found in smaller (first- to third-order streams), forested streams of low slope within the project area.

Table 3-10. Primary Indicator Taxon for Rare Macroinvertebrate Community Identified in the Project Area

Order	Family	Genus
Ephemeroptera	Baetidae	Acentrella
	Baetidae	Cloeon
	Ephemerellidae	Drunella
	Ephemerellidae	Ephemerella
	Ephemerellidae	Serratella
	Ephemerellidae	Timpanoga
	Heptageniidae	Leucrocuta
Plecoptera	Nemouridae	Amphinemura
	Perlidae	Eccoptura
	Perlidae	Perlesta
	Perlodidate	Isoperla
Trichoptera	Clossosomatidae	Agapetus
	Philopotamidae	Wormaldia

At the family level of classification, five different community types were found for the project area (Table 3-11). One of these was characteristic of healthier, headwater streams, while another was characteristic of streams impaired from abandoned mine drainage or acid deposition. Three other community types were intermediate between these two types.

Table 3-11. Family-Level Aquatic Communities Identified for the Project Area

Description	Indicator Species
small, high-gradient, forested systems (uncommon)	pteronarcydiae, dixidae
small to medium, less-forested systems	nemouridae
large, low-gradient, less-forested, warmer systems (very common)	perlidae
larger, high-gradient, higher-elevation systems with low alkalinity and conductivity and highest wetland cover; likely impaired from AMD or acid rain	dytiscidae
largest, lowest-gradient, low-elevation systems with moderate development, agriculture, chemistry, and habitat scores (common)	heptageniidae, potamanthidae, polymitarcyidae, isonychiidae, helicopsychidae, philopotamidae, hydropsychidae, gyrinidae, pleuroceridae, athericidae, psphenidae, lepidoptera

Sideling Hill Creek

Water Quality

The Sideling Hill Creek watershed was designated an Exceptional Value cold-water stream in Pennsylvania in 1994. An Exceptional Value stream meets the strictest standards of water quality and macroinvertebrate assemblage. Studies have shown that the watershed has relatively few impacts from agriculture, forestry, and development. However, a portion of the mainstem and Bear Creek are impaired by siltation caused by livestock having access to the riparian zone. As a result, Bear Creek is one of the

most heavily impacted tributaries within the watershed. Acid precipitation also has a significant impact on aquatic health and has impacted fish populations.

Sideling Hill Creek

Within Maryland, Sideling Hill Creek has a designation of IV-P, Recreational Trout Waters/Public Water Supply. This means that it is capable of supporting adult trout, but is generally not healthy enough to support natural reproduction. Though no direct evidence exists, this may be related to acid precipitation impacts.

Previous Studies

The Sideling Hill Creek Special Protection Evaluation Report was conducted in 1994 by Pennsylvania Department of Environmental Resources (PA DER, now PA DEP) to determine whether the watershed should be redesignated as an Exceptional Value Cold Water Fishery. At the time of the evaluation, the entire watershed was designated a Cold Water Fishery, with the exception of the Bear Creek subwatershed, which was designated a Warm Water Fishery. The results indicated that, with a few exceptions, the watershed meets or exceeds the standards for an Exceptional Value (EV) designation (PA DER 1994) and should be redesignated as an EV watershed.

Water quality criteria infractions include high copper levels at the mouth of the East Branch of Sideling Hill Creek and at the Pennsylvania-Maryland border of Sideling Hill Creek, and one iron and one manganese infraction in Bear Creek above Stahle Run. The copper infractions appeared to be attributable to natural conditions and may be the result of acid precipitation causing metals to leach from the soil. Water quality data indicated that streams within the watershed have low buffering capacities, ranging from 9.2 to 20.0 mg/L Ca CO_3. The report noted that atmospheric deposition (acid rain) appears to be causing increased acidity and loss of buffering capacity over time.

The report also noted that agriculture, timber harvesting, and roadways presented themselves as the primary potential sources of non-point source pollution. During a physical habitat assessment, lack of riparian zone, sediment deposition, and potential for movement of road salt and toxins into streams via bridge overpasses were concerns.

In order to determine whether Exceptional Value standards were being met, benthic macroinvertebrate samples from 16 stations were compared to reference stations in the similar drainages of Little Wills Creek (CWF) and Sherman Creek (WWF). Twelve of the stations in the Sideling Hill Creek watershed earned scores deserving of special protection status, with nine qualifying for an EV designation by earning scores greater than 92 percent of reference stations. An additional three stations qualified for HQ status by earning scores greater than 83–91 percent of reference stations. Most stations exhibited tremendous taxa richness. A tributary to the East Branch of Sideling Hill Creek had one of the most sensitive assemblages of macroinvertebrates. Overall, mayflies were especially diverse with families such as Ephemerellidae ("spiny crawlers") and Heptageniidae ("flatheaded mayflies") well represented. Fish sampling found that the deep pool and shallow cold-water riffles are supporting species such as smallmouth bass, slimy sculpin, a variety of darters, and creek chubs (PA DER 1994).

Overall, the report recommended that the Sideling Hill Creek watershed be redesignated to EV, due to the existence of endangered or threatened aquatic species (criterion IV-1). These include the endangered Tennessee pondweed (*Potamogeton tennesseensis*), present in the Pennsylvania portion, and numerous rare species in the Maryland portion, such as blunt-leaved spurge (*Euphorbia obtusata*), trailing stitchwort (*Stellaria alsine*), the federally endangered Harperella, and others. In addition to this criterion, nine stations met EV criterion IV-2, Outstanding Ecology.

The **Unassessed Waters Assessment of Sideling Hill Creek** was conducted in 2002 to determine stream sections that were not meeting their PA DEP designated uses. It was found that two stream sections within the Pennsylvania portion of the Sideling Hill Creek watershed are impaired. These include the headwaters of Bear Creek, which is impaired by grazing-related siltation (Table 3-12). A portion of the mainstem is also considered impaired due to siltation (PA DEP 2004b).

Table 3-12. Pennsylvania 303(d) Impaired Stream Segments in Sideling Hill Creek Watershed

Stream Segment	Impairment Type	Source
Headwaters of Bear Creek	Aquatic Life	Grazing-Related Siltation
Sideling Hill Creek, confluence of E. Branch and W. Branch to Crooked Run	Aquatic Life	Siltation

The **Maryland Biological Stream Survey** assessments used random sampling to determine the status of wadeable streams in Maryland. During the first round of sampling (1995–1997), MD DNR biologists sampled selected sites in each the 18 major drainage basins in the state. During the second round (2000–2004), pre-chosen subwatersheds were sampled. Each site chosen was sampled for at least a year for water chemistry (spring and summer), acid rain water quality impacts, macroinvertebrates (spring), and water chemistry, fish, and physical habitat quality (fall). The macroinvertebrate data was also used to develop a scientifically based Index of Biological Integrity for Maryland Streams. With this index, the quality of a stream was determined based on the different kinds of macroinvertebrates present (MD DNR 2005b).

Eleven sites were sampled within the Sideling Hill Creek watershed. Of these sites, only two were considered impaired (Table 3-13). One of these sites is located on Bear Run, near the mouth. The other site is located on a small tributary to Sideling Hill Creek. The impairment for both sites is listed as "biological," and may be related to acid rain or another impact that can negatively affect the macroinvertebrate assemblage. These sites can be found on Maryland's Integrated 303(d) List of Impaired Streams.

Table 3-13. Maryland 303(d) Impaired Stream Points in Sideling Hill Creek Watershed

Sampling Location	Impairment Type	Latitude	Longitude	ID
Mouth, Bear Creek	Biological	39.713531	-78.323789	WA-A-068-101-95
UNT Sideling Hill Creek	Biological	39.702381	-78.317861	WA-A-144-311-95

The **Water Quality Assessment of the Sideling Hill Creek Watershed** is a comprehensive report providing data collected by the Ridge and Valley Stream Keepers (RVS) in 2000 and 2001, as well as information collected by PA DEP and MBSS (RVS 2001a). Sixteen sites were sampled for water quality (pH, alkalinity, nitrate, dissolved oxygen, and turbidity) and 28 sites were sampled for macroinvertebrates. Of the 15 water quality sites sampled, nine were considered to be impaired for pH at least 50 percent of the time. Most of these sites were located either along a headwater creek or at the mouth of Sideling Hill Creek. All of the macroinvertebrate samples were taken in the Maryland portion as part of the Stream Waders program. Only two of these sites were either "poor" or "very poor." One of these sites is located in Pools Hollow Branch, and the other was taken along Bear Creek.

Fifteenmile Creek

Water Quality

The small portion of Fifteenmile Creek located in Pennsylvania is designated a Warm Water Fishery. Very little information exists about this watershed in Pennsylvania.

Within Maryland, this watershed is designated IV-P, Recreational Trout Waters/Public Water Supply. This means that it is either a warm-water or cold-water stream supporting stocked trout, but is generally not healthy enough to support natural reproduction. Acid rain may be seriously impacting this watershed, which has many low-order tributaries.

Previous Studies

PA DEP did not find any impaired segments of Fifteenmile Creek during its 2002 **Unassessed Waters Assessment** of the Fifteenmile Creek watershed. Very little of this watershed (only 19 percent) is located within Pennsylvania (PA DEP[1]).

Maryland Biological Stream Survey—Fifteenmile Creek

From 2000 to 2004, 27 sites within the watershed were sampled for the **Maryland Biological Stream Survey**. These were sampled according to the wadeable streams protocol used by MBSS. Of these, seven were found to be impaired due to biological impacts. A number of impairments were found (Table 3-14). Though the exact cause of impairment was not identified, it is probable that acid rain contributed to these impairments. All of these sites, which are on first-order tributaries, can be found on Maryland's Integrated 303(d) List (MD DNR[1]).

Table 3-14. Maryland 303(d) Impaired Stream Points in Fifteenmile Creek Watershed

Sampling Location	Impairment Type	Latitude	Longitude	ID
UNT Sulphur Run	Biological	39.640031	-78.464561	AL-A-061-125-95
Deep Run	Biological	39.639161	-78.502531	AL-A-069-102-95
UNT Fifteenmile Creek South	Biological	39.67525	-78.433111	AL-A-027-205-95
UNT Fifteenmile Creek South	Biological	39.673269	-78.433419	AL-A-027-209-95
UNT Fifteenmile Creek South	Biological	39.690539	-78.390381	AL-A-419-106-95
UNT Elk Lick Creek	Biological	39.695719	-78.455989	AL-A-167-230-95
Elk Lick Creek	Biological	39.713881	-78.478619	AL-A-171-206-95

Town Creek

Water Quality

Within Pennsylvania, Town Creek is designated a High Quality Cold Water Fishery, which means that it has a long-term record of good water quality and has a good macroinvertebrate score compared to other high-quality streams.

The headwaters of Town Creek

Within Maryland, Town Creek is designated III-P, or Natural Trout Waters and Public Water Supply. This designation is given to waters that are capable of supporting the growth and reproduction of trout and their associated food organisms, and is generally the highest designation

given to streams in the state. In general, evidence suggests that the Town Creek watershed may have less acid rain impacts due to higher levels of alkalinity, but may have more impacts due to sedimentation than the Sideling Hill Creek watershed. Nonetheless, acid rain continues to impact both the Pennsylvania and Maryland portions of this watershed.

Previous Studies

A number of impaired segments were identified within the Town Creek watershed during the 2002 **Unassessed Waters Assessment** conducted by PA DEP (Table 3-15). Most of these impairments are attributed to acid rain impacts. The portions within Town Creek are included in section 5 of the 2004 Integrated Waterbody List for Pennsylvania, requiring a TMDL (PA DEP[1]).

Table 3-15. Pennsylvania 303(d) Impaired Stream Segments in Town Creek Watershed

Stream Segment Location	Impairment Type	Source
Pigeonroost Run	Aquatic Life	Atmospheric Deposition
Bear Gap Run	Aquatic Life	Atmospheric Deposition
Flintstone Creek (1.5-mile segment)	Aquatic Life	Atmospheric Deposition
Wildcat Run	Aquatic Life	Atmospheric Deposition
Twigg Hollow	Aquatic Life	Atmospheric Deposition
Trib 51521 to Lost Run	Aquatic Life	Crop-Related Agriculture/Nutrients/Siltation
Laurel Run	Aquatic Life	Atmospheric Deposition

For the **Maryland Biological Stream Survey Assessment**, sites were sampled according to the wadeable streams protocol. A total of 27 sites were sampled within the Town Creek watershed. Of these sites, MD DNR determined that 19 were impaired (Table 3-16). Five were considered impaired due to sedimentation. The remaining 14 sites showed impairments in the amounts and types of macroinvertebrates present. Acid rain impacts may be contributing to impairments at many of these sites.

Table 3-16. Maryland 303(d) Impaired Stream Points in Town Creek Watershed

Sampling Location	Impairment Type	Latitude	Longitude	ID
Sawpit Run	Nutrients	Information not available		
Sawpit Run	Sediments	Information not available		
Sawpit Run	Sediments	39.54276	-78.5695629	TOWN-201-R-2002
UNT Sawpit Run	Sediments	39.548289	-78.563769	AL-A-248-234-95
UNT Sawpit Run	Sediments	39.551331	-78.575331	AL-A-248-213-95
UNT Town Creek Near Mouth	Sediments	39.567923	-78.5629029	TOWN-101-R-2000
UNT Town Creek Near Mouth	Sediments	39.574117	-78.5601909	TOWN-104-R-2000
UNT Maple Run	Biological	39.602404	-78.5651039	TOWN-104-R-2002
UNT Lick Run	Biological	39.612744	-78.5636469	TOWN-102-R-2000
UNT Lick Run	Biological	39.619161	-78.528739	AL-A-020-228-95
Town Creek near Lick Run	Biological	39.622326	-78.5863029	TOWN-116-R-2002
UNT Lick Run	Biological	39.629171	-78.5856939	TOWN-108-R-2002
UNT to Town Creek	Biological	39.632896	-78.5566369	TOWN-412-R-2000
Town Creek north of Lick Run	Biological	39.637426	-78.5830849	TOWN-110-R-2002
UNT Town Creek near Murley Branch	Biological	39.644412	-78.5534599	TOWN-110-R-2000

Table 3-16. Maryland 303(d) Impaired Stream Points in Town Creek Watershed (continued)

Sampling Location	Impairment Type	Latitude	Longitude	ID
UNT Murley Branch	Biological	39.644464	-78.5553649	TOWN-409-R-2000
UNT Murley Branch	Biological	39.661617	-78.6030859	TOWN-105-R-2000
unknown	Biological	39.663243	-78.6157269	TOWN-205-R-2002
unknown	Biological	39.663475	-78.5412619	TOWN-111-R-2002

The comprehensive **Water Quality Assessment of the Town Creek Watershed**, administered by the RVS, included previously collected water quality data, as well as water quality information collected by RVS in 2000 and 2001. This also included results of PA DEP and MBSS sampling used to develop the impaired streams lists for Pennsylvania and Maryland. RVS collected water quality data from 17 sites throughout the watershed, and benthic macroinvertebrates from 42 sites. Water quality sites were sampled for pH, alkalinity, nitrate, dissolved oxygen, and turbidity. The water quality data showed that three sites, all in Pennsylvania, had a pH below 5.0 in at least 50 percent of the samples taken at those sites. Two of these sites were located along tributaries to Flintstone Creek, and one site was located along the mainstem of Town Creek. Of the 42 sites that were sampled for macroinvertebrates, only four out of 42 sites were considered to be "poor" or "very poor," whereas the remaining sites were rated "fair" or "good" based on the types of organisms found (RVS 2001b). Two of these sites were located on unnamed tributaries near the mouth of Town Creek, one was located along an unnamed tributary to Murley Branch, and one was located on Flintstone Creek.

Pennsylvania's State Water Plan

Act 220, passed in December 2002, requires that the PA DEP update Pennsylvania's State Water Plan within five years to determine how much water there is in Pennsylvania, how much is used, and how much will be available in the future (PA DEP[5]).

The State Water Plan has not been updated in more than 25 years and, as a result, it is not known which areas have critical water needs until water supplies are dry. Pennsylvania has experienced serious droughts in the last 10 years and water use has increased dramatically.

As part of these efforts, PA DEP now requires any commercial, industrial, agricultural, or individual withdrawing 10,000 or more gallons of water per day, averaged over a 30-day period, to register and report their water use to PA DEP. Those using less than 10,000 gallons may choose to register voluntarily to help PA DEP get a more complete picture of water use (PA DEP[5]).

To carry out the planning provisions of the law, a Statewide Water Resources Committee was formed to help guide the plan. Six regional water resource committees were also created to facilitate the development of regional components of the plan. Among their responsibilities is carrying out a public participation process to ensure that people with an interest in water resource issues have adequate opportunities to provide input. A series of meetings was held in 2005 at each of the six regional planning areas to better define local water resource problems and opportunities (PA DEP[5]).

During the development of the plan, areas will be identified where demand exceeds available supplies. These Water Planning Areas will serve as planning boundaries for the creation of detailed water budgets to be used in Critical Area Resource Plans, which will then be submitted for review and comment to the official planning agency and governing body of each municipality in the identified area (PA DEP[5]).

Information about water availability can be used for actions such as determining whether the location and design of future development projects is appropriate and the amount of water necessary to preserve environmental quality in critical areas.

Act 220 also establishes a formal program to promote voluntary water conservation and water use for all water users. A Water Resources Technical Center will be created to promote the use and development of water conservation and efficiency education and programs (PA DEP[5]).

Evidence suggests that the project area faces constraints with regards to water quantity. The development of a water budget has already been suggested. It is likely that this area should be included in the State Water Plan as a critical area and efforts should be made to ensure that water quantity is adequate to support its human communities, as well as its unique terrestrial and aquatic diversity.

Water Quality Trading

Water quality trading is when facilities with higher pollution-control costs, called "buyers," purchase the right to pollute from "sellers," or other companies that have reduced their pollution output below their required limits. This can enable polluters to reduce pollution at a lower cost than it would be to make reductions at their facilities. For instance, it may be cheaper for a polluter that discharges nitrates to buy credits from a polluter that can reduce its nitrate discharges more easily. Or, it may be cheaper for a polluter to pay for the installation of BMPs on a farm than to develop technologies to reduce pollution from nitrates. If the same pollution-reduction goal can be achieved through trading, then it is a benefit to both the company and the farmer.

Generally, certain criteria must be met for a water quality trading program to work. There must be a "driver," or reason why pollution reductions are being sought. This is usually a TMDL, which requires point source polluters to reduce their level of pollution by a certain amount in order for water quality standards to be met. The water quality trading will be most effective if the sources within the watershed have different costs to control their pollution, making it more economically profitable to trade. Also, the levels of pollution must be such that not all sources within the watershed must reduce their inputs. This provides a reason to bargain. Finally, watershed stakeholders and state regulatory agencies must be willing to try an innovative approach and to engage in trading design and implementation issues. Water quality trading should be conducted within a legal, regulatory framework, such as the NPDES program, which requires point source polluters to obtain permits to discharge pollution in the waterways of the United States.

Proponents of trading think that it can help achieve improvements at the lowest cost to society. It provides incentives for companies to lower their amount of pollution. Ideally, a regulatory agency or appointed committee controls the transfer of pollution credits between polluters. If a company lowers its amount of pollution below its target limit, it will be paid for these credits by the regulatory agency. Other companies that go over this limit can purchase these credits from the regulatory agency. If non-point pollution is present, there is the potential for a company to pay for the implementation of BMPs in exchange for polluting over its target amount. The type of program used depends on the pollution issues within the watershed.

All water trading activities must comply with the requirements of the Clean Water Act as well as state and local requirements, including public notification of transfers of trading credits. One potential problem with water quality trading is localized impacts. For example, all of the credits purchased may discharge into the same small stream. Because of these possible complications, it is important that the

trading program be designed so that localized impacts do not occur. For instance, the amount of credits that can be purchased by certain polluters can be set by the regulatory agency.

Water quality trading is usually most successful in developed areas, and it is unclear whether such mechanisms would be effective within the project area.

Sources of Pollution Summary

Acid Precipitation

The term pH is used to quantify whether a solution is an acid or a base. Acidity is created by the concentration of hydrogen (H+) ions in solution, while basicity is created by the concentration of hydroxide (OH-) ions. A solution with an equal number of hydroxide and hydrogen ions is considered neutral. The lower the pH, the more acidic a solution is, while higher pHs are more basic.

Rainwater is already acidic, generally having a pH of around 5.6, from the reaction of carbon dioxide with oxygen in the atmosphere to form carbonic acid. However, acidity from non-natural sources has caused rainwater in some areas to have a pH of 4.9 or lower. Acidity in precipitation (rain, snow, fog, dew, etc.) that forms from the reaction of air pollutants with water in the air is called acid rain. These pollutants mainly include sulfur and nitrogen oxides, which turn into sulfuric and nitric acids. Other times these pollutants fall as dry deposition, or acidic gases and particles that are blown onto buildings, cars, etc. When it rains, the particles are washed from objects and increase the pH of the rain. The sources of this pollution include vehicles and industrial and power generating plants. The effects of acid rain are usually felt many miles away from the source. Most pollutants in the project area come from emissions from more populated areas in the east and Midwest and from coal-burning power plants to the west.

The best way to document the pH of rain is to collect rainwater by setting out containers or installing rain gauges. Rain that is not affected by pollutants will naturally be acidic, with a pH of 5.0 to 6.0. A pH below 5.0, however, may indicate acid rain. A volunteer has recorded pH levels within the project area as low as 3.5.

However, the real impact of these low numbers is how they show up in streams. The Ridge and Valley Streamkeepers have recorded pH levels in headwater streams as low as 5.0 (Sideling Hill Creek watershed) and 4.0 (Town Creek watershed).

Streams with high alkalinity have enough carbonate ions in solution to neutralize, or buffer, the hydrogen ions in acid rain that produce acidity. Sources of buffering capacity include carbonate found in naturally occurring limestone and dolomite deposits in rock. Such deposits do occur throughout the Ridge and Valley Province but are rare within the Three Sisters watershed (Trapp and Horn 1997). As a result, acid rain has a significant impact on water quality. Fish and other aquatic life are impaired at a pH of 5.0 and typically die if pH is less than 4.0.

The 1990 Clean Water Act Amendments include the most significant legislation that has been enacted to lessen emissions contributing to acid rain. The amendments promote the use of market-based approaches to reduce emissions, including pollution trading; encouraging innovative technologies to reduce sulfur and other emissions; and promoting the use of low-sulfur coal. Through the use of stricter standards for the emission of sulfur and the use of innovative sulfur scrubbers, sulfur emissions are now 20 percent lower than when the legislation was enacted (Driscoll 2001). This has translated to a significantly lower concentration of sulfuric acid in precipitation. Unfortunately, affordable technologies have not been developed to remove the nitrogen component. As a result, nitrogen emissions have not decreased and nitric acid precipitation is still a serious problem in the Midwest (Driscoll 2001). The

portion of the Midwest including western and central Pennsylvania has the highest levels of nitrogen-containing compounds in precipitation in the United States.

Acid rain can have additional effects on water quality, besides the impacts of low pH. Toxic metals that have been deposited in soils are leached into streams and groundwater when they react with the anions found in acid rain. In some cases, the concentrations are high enough to negatively impact aquatic life. It is possible that some of these impacts are occurring within the project area. For instance, high levels of copper, iron, and aluminum have been identified previously within streams of the Sideling Hill Creek watershed. Aluminum is another common metal that amplifies in waterways that receive acid rain. Both aluminum and acidity disrupt the water-salt balance in fish, causing red blood cells to rupture and contributing to heart attacks. Acid rain can also leach important nutrients from forest soils and decrease the growth of a forest.

Fortunately, ecosystems can recover from acid rain impacts. Research shows that macroinvertebrate life in a stream re-establishes itself within three years of decreased acidity, whereas fish populations may take up to 10 years (Driscoll 2001). A visible lowering of sulfuric acid in streams of the project area has occurred as a result of the 1990 legislation. However, 1990 reductions were not adequate to allow for the full or even partial recovery of aquatic ecosystems. As a result, further and stricter regulatory controls are needed to reduce emissions from industrial and power plants, as well as vehicles.

The acid rain issue is particularly difficult because there is little that can be done locally to solve the problem. The active addition of alkalinity-producing chemicals to streams is a tactic that can be taken, but this is a temporary solution that often causes more problems for aquatic systems. Individuals interested in reducing the impacts of acid rain can make changes to reduce their personal contribution to emissions through activities such as driving more fuel-efficient cars and using less energy. Additionally, constituents should encourage their legislators to support stricter regulations that would further reduce the pollution from smokestacks and cars that is the source of acid rain.

Although evidence points to a significant decrease in water quality of the project area due to acid rain, more research is needed to determine normal pH reference conditions for the project area and the extent of the impact of low pH.

PH Levels in a Headwater Tributary to Sideling Hill Creek

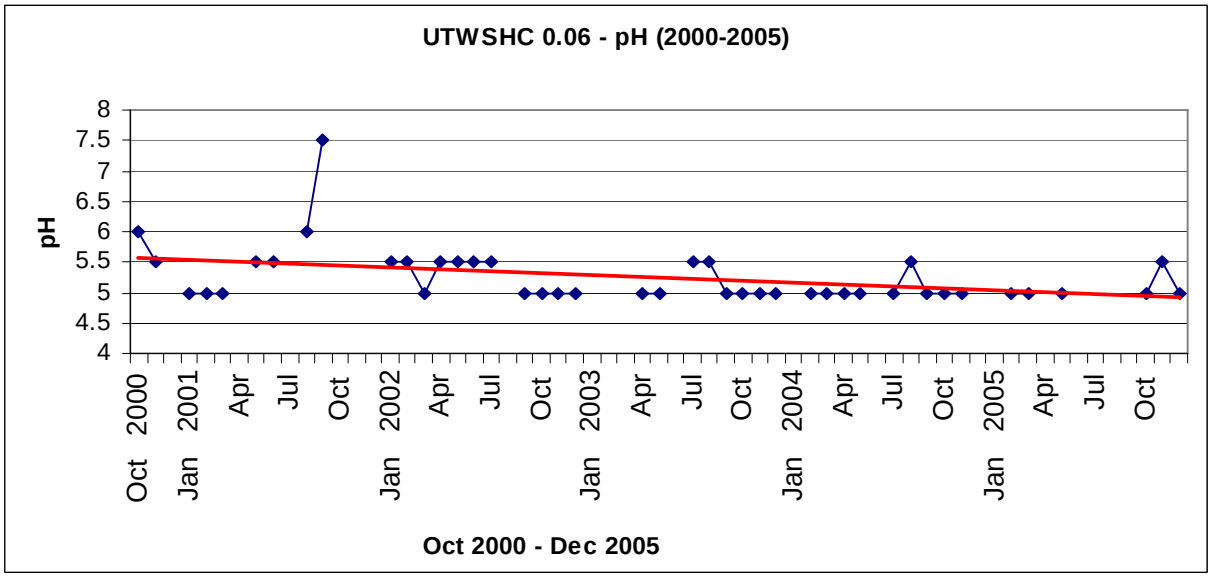


Figure 3- 5. Graph shows pH variations in a tributary to Sideling Hill Creek

Dirt and Gravel Roads

Dirt and gravel roads pose another serious threat to water quality. There are approximately 300 miles of dirt and gravel roads within the project area. The Pennsylvania State Conservation Commission Dirt and Gravel Road Pollution Prevention Program provides training and funding to local road-owning entities, mainly municipalities, to correct pollution problems on dirt and gravel roads. Sediment entering streams from roads can cause negative consequences, such as disrupting flow, suffocating organisms, and decreasing spawning areas for fish (Penn State Center for Dirt and Gravel Road Studies 2004).

The Task Force on Dirt and Gravel Roads, including public and private agencies such as Trout Unlimited, Penn State University, and PA DEP, created the commission and continues in an advisory capacity to the program. Pennsylvania's conservation districts administer the program. Municipalities may apply for funding for road improvements after completing a two-day workshop. In 1996–1997, the task force developed a list of healthy streams (High Quality and Exceptional Value) being negatively affected by dirt and gravel roads. Streams within the Town Creek (High Quality) and Sideling Hill Creek (Exceptional Value) watersheds were included on the list (Penn State 2004).

Examples of improvements made through the Dirt and Gravel Road Program include french mattresses, grade breaks, headwall and endwall construction or improvements, and use of driving surface aggregate. Grade breaks increase the road elevation on a downhill slope, causing water to flow off the road surface and preventing erosion of road material. French mattresses are structures built under a roadway through which water can fully pass, allowing a non-erosive discharge of water. Headwalls and endwalls are walls built around culvert openings that are modified to withstand higher flow capacities. Driving surface aggregate is a road surface containing fine particles that can be used in place of more common applications containing silt and clay. Unlike silt and clay, the fine particles settle out and can have fewer negative effects on aquatic life (Penn State 2004).

In 2005, a grant was awarded to a number of organizations to study the impacts of dirt and gravel roads within the project area. This funding came from a federal transportation bill to The Nature Conservancy and Western Pennsylvania Conservancy. The study involves surveying all of the dirt and gravel roads in the Pennsylvania and Maryland portions of the Town Creek, Sideling Hill Creek, and Fifteenmile Creek watersheds to determine where improvements can be made to reduce the amount of sediment entering waterways. This will include training of local road personnel on the best techniques to minimize the amount of sediment entering waterways. Funding is also included for on-the-ground improvements in the Pennsylvania portion. However, further funding opportunities are needed to conduct work in the Maryland portion and to extend these improvements beyond the five years of the grant agreement.

Faulty On-Lot Septic Systems

Most landowners within the watershed use on-lot septic systems, rather than public sewage treatment plants, to dispose of their sewage wastes. Conventional systems consist of a large tank designed to hold about two days of wastewater and allow solids to settle out, and a drainfield that distributes wastewater so that it can be slowly absorbed into the underlying soil. These systems remove much of the bacteria but are not very effective at removing nitrogen. They often fail when the drainfield becomes clogged, causing raw sewage to back up out of the tank or through the ground and end up in streams and groundwater. The systems must be pumped out every few years to prevent build-up and clogs.

Other systems are designed to remove nitrogen by moving effluent through a series of chambers containing different kinds of microbes, which uptake the nitrogen. These systems have pumps, moving parts, and other components that need to be inspected every few years. These more advanced systems can

remove twice as much nitrogen as conventional systems, but can have more serious environmental impacts if not pumped out.

Some people in rural areas do not have sewer systems at all, but storage tanks for sewage that must be emptied on a regular basis. Oftentimes, these tanks have leaks and provide direct ways for nitrogen and bacteria to get into streams and groundwater.

Septic systems allow water to slowly drain back into soil, replenishing groundwater, especially during times of drought. Sewer systems collect large amounts of water that are poured directly into a river, changing its hydrology and raising nutrient levels, especially if capacity is exceeded. Septic systems are cheaper to maintain than sewer systems. Also, sewer systems can promote sprawl by attracting more homes and businesses to an area, especially if adequate land ordinances are not in place (Blankenship 1999).

Unfortunately, it is estimated that up to 46 percent of landowners within the Chesapeake Bay watershed, do not properly maintain their septic systems. Pennsylvania does not have a state law requiring septic system pump outs (although some local governments have ordinances addressing this). Maryland just recently enacted legislation designed to address failing septic systems. This legislation charges users of both on-lot septic systems and sewage treatment systems a fee that is set aside for grants to homeowners wishing to upgrade to a more advanced, nitrogen-removing system and for sewage system upgrades. Such upgrades are now required in critical areas that provide much of the nutrients to the Chesapeake Bay, and areas with low water tables (Blankenship 1999).

So far, these activities appear to have had little impact on reducing the amount of sewage entering streams in the project area. More information is needed about the extent of these impacts, as well as additional funding to local governments in order to address this issue.

Agriculture and Forestry Activities

Though the project is less impacted by poor forestry and agricultural practices than most watersheds in Pennsylvania or Maryland, a number of streams are considered impaired due to sediment and nutrient impacts. It is important to maintain best management practices for forest and stream protection.

The forestry and agricultural industries are the second- and third-most important industries in the watershed in terms of providing local jobs, after food service/recreation (Ingerson 2002). About 80 percent of the watershed is comprised of harvestable mid-successional to late-successional forest. A majority of forest is located on steep ridges, and forestry practices may lead to sedimentation if the proper BMPs are not used. Road systems associated with forest harvesting should also meet all local, state, and federal guidelines related to BMPs. Currently, there is a lack of successfully implemented regulations for BMPs, especially on private lands.

About 13 percent of the project area is in agriculture, mostly in the form of hay and pasture. One CAFO exists within the project area in the Sideling Hill Creek watershed (Hunt, personal communication 2005). Practices, such as keeping livestock out of streams, using rotational grazing, and properly storing manure will help protect streams from sediment and nutrient impacts. The Land Resources chapter further discusses BMPs for farms and forests. Local conservation districts can also be contacted about these opportunities.

Development Activities from Inadequate Planning

Unfortunately, development often occurs in ways that are materially profitable in the short-term, whereas the long-term costs can be great. For example, mining has taken a large toll on communities throughout Pennsylvania and this has had serious long-term economic consequences, such as reducing the

potential for tourism and other industries. Within the project area, development may simply mean a higher density of residential homes, but even this can have a negative effect on waterways and pose a significant strain to local resources, particularly groundwater. Planning basically refers to the creation of local laws, regulations, and associated activities that protect the long-term economic well-being and way of life of a community, taking into account the needs of its residents and importance of resources for the future. This is beneficial not only for wildlife, but for people as well. In most cases, development is able to proceed but may be concentrated in certain areas or contain provisions for protecting sensitive areas, such as wetlands and waterways.

Family-run farms and undeveloped areas within the project area are becoming less profitable. Landowners may not want to sell their properties, but may be forced to for financial reasons. Though most of the local governments mention protecting rural and natural areas in their comprehensive plans and other planning documents, few actually have mechanisms in place for this to become a reality. In order for these plans to work, local governments must stay true to the goals and look for ways to maintain the rural character of the area in the face of development pressures. Examples include offering easements, financial incentives, and tax breaks; taking advantage of programs offered by local conservation districts and other agencies; and adjusting local ordinances to limit the density of development.

Where development activities do occur, BMPs should be used to maintain natural vegetation along waterways and keep areas of open space and forests within developed areas. By doing this, the rural nature, waterways, and other resources of the project area will be better protected.

Management Recommendations:

Goal 3-1. Minimize the amount of erosion and sedimentation that enters area waterways.

Reduce erosion and sedimentation by incorporating best management practices into all earth-moving activities, including logging, construction and development, and natural resource extraction; work with state agencies to enforce regulations in protected watersheds.	High
Implement recommendations resulting from Better Roads Clean Streams study.	High
Increase funding for maintenance of dirt and gravel roads program.	High
Promote tax incentives and cost-share programs for streambank fencing, barnyard stabilization, and other best management practices.	Medium
Support the Ridge and Valley Streamkeepers annual restoration project, like the 2006 Riparian Project.	Medium
Investigate sources and potential sources of sediment and nutrients using flow and sediment information from stream gauges and Chesapeake Bay Foundation nutrient and sediment budgets.	Low

Goal 3-2. Increase awareness of water quality issues.

Educate homeowners about the effects of the overuse of fertilizers, pesticides, and herbicides on groundwater.	High
Develop and implement education workshops and/or outreach programs to educate residents about stream designation criteria, non-point source and point source pollution, and how to research and report violations.	Medium
Encourage interested organizations and individuals to work together in determining if a petition to change Fifteenmile Creek to EV status is feasible. If feasible, petition for status change.	Medium
Promote groundwater quality awareness when conducting education and outreach programs, and provide educational information about potential threats to water supply.	Medium

Goal 3-3. Protect area water resources to maintain or improve water quality.

Determine what impact salt and ashes, utilized to remove snow and ice on roadways, have on the water quality and investigate alternative practices.	Medium
Work with local and state agencies to better enforce regulations protecting water quality, particularly for High Quality, Exceptional Value, III-P, and IV-P designated streams.	Medium
Lobby for stricter requirements for nitrous oxide emissions in order to reduce the impacts of acid rain.	Medium
Determine what the acceptable pH is for streams within the watershed and whether acid rain is negatively impacting aquatic life.	Medium
Support a regional strategy for the production of bioenergy crops utilizing excess nutrients from animal waste.	Medium
Investigate the possibility of conducting a demonstration project within the Sideling Hill Creek watershed to determine if an in-stream lime treatment could decrease acidity in the stream.	Medium
Incorporate watershed protection components into existing municipal and county ordinances; new ideas may be developed by beginning a dialogue with other municipalities or counties that have taken such an approach.	Medium
Encourage area residents to monitor groundwater levels in an effort to track ground levels that can be used as baseline data to determine loss of groundwater.	Medium
Develop and implement total maximum daily loads on impaired streams.	Low

Goal 3-4. Protect the source and quantity of water resources available.

Develop a water budget for each of the three watersheds, in order to better understand the sources and amounts of water available and the types of development activities that can be supported with the available resources.	High
Determine percent of impervious cover and use this estimate as a reference to identify future land-use changes.	High
Use Indicators of Hydrology Alteration Modeling Program to determine if streams are at healthy flow levels.	High
Establish additional monitoring stations along Sideling Hill Creek, Fifteenmile Creek, and Town Creek.	Medium
Establish guidelines that require installation of low-flow devices for all new construction.	Low

Goal 3-5. Encourage and implement agricultural best management practices.

Encourage the establishment and maintenance of riparian vegetation and implementation of best management practices as a cost-effective means of non-point source pollution reduction.	High
Encourage farmers to develop nutrient management plans to boost productivity and protect water resources.	Medium
Encourage the establishment of riparian buffers along all waterways through the education of stakeholders and/or local land-use controls.	Medium
Encourage diverse farming operations that are environmentally responsible and economically viable.	Medium
Encourage extensive use of pasture on animal-dependent farms (e.g. dairy and beef) to minimize the concentration of animals in feedlots.	Low

Goal 3-6. Monitor watershed conditions to identify threats and determine their impacts to the water quality.

Expand the Ridge and Valley Streamkeepers monitoring program, through the recruitment of volunteers, to include Fifteenmile Creek.	High
Study agricultural practices, residential developments, road maintenance practices, and forestry practices to obtain a better understanding of the impact that sediment pollution has on stream systems.	High
Develop a network of volunteers to collect rainwater and measure its pH, in order to determine the effects of acid rain.	Medium
Host workshops or trainings for adult and student volunteers about stream monitoring.	Medium
Continue efforts to collect water quality information on a seasonal basis and compare past and present monitoring results to check for changes in conditions, either positive or negative.	Medium
Utilize volunteers to measure the amount of woody debris, which supports aquatic life, that is entering streams, especially in headwater areas.	Medium
Conduct sub-basin watershed assessments.	Low

Goal 3-7. Manage stormwater to maximize groundwater recharge.

Develop a stormwater management plan and implement the recommendations.	High

Goal 3-8. Encourage and support alternative and traditional sewage treatment opportunities to reduce sewage pollution entering streams and groundwater.

Establish and/or continue cost-share programs to assist homeowners in septic repair, maintenance, and replacement.	High
Perform a watershed-wide assessment of on-lot and municipal sewage systems to identify raw sewage discharges, combined sewage overflows, and sanitary sewage overflows.	Medium
Encourage PA DEP and MDE to approve more alternative sewage treatment types in rural areas; construct demonstration types for alternative systems, and develop outreach information.	Medium
Regularly update and enforce Act 537 Sewage Plans for Pennsylvania municipalities. Deny proposed sewage upgrades that are not compatible with local goals and enforce existing regulations for current facilities.	Medium
Improve capacity of existing sewage treatment plants.	Low
Establish sewage systems in populated areas, like the village of Clearville.	Low

Goal 3-9. Reduce flooding opportunities in the area with proper and sound maintenance of floodplains.

Develop or update existing floodplain ordinances.	High
Discourage development of primary and secondary residences in floodplain areas.	High

CHAPTER 4. BIOLOGICAL RESOURCES

The streams that make up the Three Sisters watershed—Sideling Hill Creek, Town Creek, and Fifteenmile Creek—have common geologic and hydrologic characteristics. Shaley soils, low annual precipitation, and periodic flooding, along with high water quality and a large amount of forestland, contribute to unique plant and animal diversity.

Citizens' groups and organizations are concerned with preserving the forested landscape, encouraging agricultural practices that are compatible with protecting water quality and biodiversity, and upholding the quality of life by promoting compatible economic activities. During the development of a joint comprehensive planning document for Monroe, Southampton, and Mann townships, protecting natural resources was found to be highly valued by members of these communities. In addition, nearly all of those surveyed said that preserving the character of the community and agricultural land should be a high priority. Many of the landowners utilize conservation practices. For instance, at least 74 percent of the Town Creek watershed has received some type of professional land-management assistance in the form of federal, state, or local government programs (RVS 2001b). About 17 percent of the Pennsylvania portion of the Sideling Hill Creek watershed and 36 percent of the Maryland portion is protected as public land or through easements (RVS 2001a).

The goal of this chapter is to provide comprehensive information about the health and diversity of natural resources in the Sideling Hill, Town, and Fifteenmile Creek watersheds. The location and status of natural communities and species of concern is given in detail and can be used by local municipalities and citizens in planning and restoration efforts. A discussion of the many conservation efforts and biological diversity surveys that have already taken place is also included. This information was used to identify data gaps and cases where community goals and objectives are not being met. At the end of this chapter, recommendations are provided for the future protection of natural resources based on these findings.

Evidence suggests that the strategies necessary to maintain the way of life in the project area are changing. Improved highway infrastructure has increased development pressures and may continue to influence communities in the future. Family farms are becoming less common, increasing the likelihood that farm properties could be sold for other uses. Advances in communication, such as improved Internet and cell phone services, could help local businesses to be financially competitive or create additional opportunities for new businesses to develop. Incentives and planning tools are necessary to protect sensitive land from development and to maintain open space in the face of these changes.

Previous Studies

There have been many studies to document the water quality and conduct planning activities within the project area. Much of this interest has been generated as a result of the area's high biodiversity, which is recognized nationally and has been studied by conservation agencies and experts. The residents also recognize the value of natural resource protection and have provided local input and support for planning resources that consider such value. The following studies are relevant to understanding the health of natural resources:

Water Quality Assessment of the Sideling Hill Creek Watershed

Water quality has a direct impact on aquatic life, including the rare mussels and plants found in Sideling Hill Creek. The Ridge and Valley Streamkeepers, with the assistance of the Alliance for Aquatic Resource Monitoring, conducted quarterly water quality monitoring of 12 sites for the year 2001. Also,

with the help of Maryland Department of Natural Resources (MD DNR) staff, 28 macroinvertebrate sites were sampled. For more information, see the Water Resources chapter.

Water Quality Assessment of the Town Creek Watershed in Pennsylvania and Maryland, 2001

The Ridge and Valley Streamkeepers conducted quarterly water quality monitoring of 18 sites within the Town Creek watershed and macroinvertebrate surveys at 42 sites, which were analyzed by MD DNR staff. For more information about this study, see the Water Resources chapter.

Town Creek: Long-Range Planning for Ecosystem Management

Started as a pilot project in 1994 by the MD DNR Forest Service, Western Region, the Town Creek Ecosystem Management project was established to help determine how to apply ecosystem management in the mixed-ownership watershed. A steering committee of stakeholders was developed, including landowners, members of local government agencies and non-profit organizations, and business owners. Through grassroots efforts carried out at public meetings, community workshops, and discussions with individual landowners, 12 guiding issues were developed, along with accompanying objectives and recommendations. These issues (Table 4-1) provide direction to continue the implementation of ecosystem management within the Town Creek watershed.

Table 4-1. Town Creek Long-Range Planning Guiding Issues

1. Utilize consistent, regional watershed management approaches across political boundaries.
2. Understand land-use trends and natural resource limitations to ensure the future needs of the community.
3. Understand the diversity and distribution of forest types in order to meet social, economic, and biological goals.
4. Monitor air quality and disseminate this information to the public.
5. Take a regional approach to the allocation and management of water resources, both quality and quantity.
6. Encourage appropriate wildlife population management to control game species and protect species of special concern.
7. Develop and utilize strategies to minimize soil erosion.
8. Connect watershed residents to activities that provide education and encourage their participation.
9. Preserve the quality of life by promoting compatible natural resource economic activities, a well-informed public, and personal property rights.
10. Understand regulations and laws compatible with watershed management.
11. Preserve the aesthetics and historical/cultural features of the watershed.
12. Increase collaboration between public land managers in Pennsylvania and Maryland.

Mann, Monroe, and Southampton Township Comprehensive Plans

Completed in 2001, the comprehensive plan was a joint effort to evaluate existing land use, transportation, housing, facilities and services, and natural and cultural resources in Mann, Monroe, and Southampton townships. The goal was to identify the best land-use tools to accommodate growth while protecting cultural and natural resources, taking into account both local and regional assets. This resulted in a separate plan for each municipality, giving specific historical, land-use, and growth information. A large section consisting of information from joint public meetings, surveys, focus groups, and interviews conducted with residents of all three of the municipalities are also included in the plan. Goals and

objectives developed from the findings also encompass all three municipalities, and include ways to work together to meet the joint needs of the three communities.

Primary findings of the comprehensive plans included:

- A large percentage of the populations of the three municipalities are aging and are or will be reaching retirement age in the near future.
- Many goods and services are not available within the townships and people must travel outside of the townships to get them.
- Population growth in Monroe and Southampton townships is one of the highest of all townships in Bedford County, and Mann Township has also grown considerably (45 percent) in the last 30 years.
- The forestry and agricultural industries buy most of their supplies and sell most of their products outside of the area.

Findings and public input showed that residents desire a community:

- That values and protects its rural heritage;
- Where the abundance of natural resources is protected from degradation;
- That plans for sustainable growth and development; and
- That ensures the health and safety of its residents.

Agriculture and Forestry in the Sideling Hill Creek Watershed

Trends in land use can have an impact on the natural resources in an area. In 2002, the Wilderness Society completed a document for Western Pennsylvania Conservancy (WPC) entitled, "Agriculture and Forestry in the Sideling Hill Creek Watershed." This document highlights trends in land use and changes in the economic importance of the agricultural and forestry industries. Some of the findings include:

- About 36 percent of the Maryland portion and 17 percent of the Pennsylvania portion of the watershed is protected from development as public land or with private conservation easements.
- In the recent past, there has been relatively little landscape change in this remote area.
- Allegany County's land-use plan designates considerable acreage as suitable for commercial and urban mixed-use development.
- The watershed saw a 31 percent increase in developed land over the last 15 years, though the total amount of developed land is still small. At the same time that the amount of developed land has increased, the amount of forested land has also increased to replace pasture and cropland.
- The region is vulnerable to development due to its location along key transportation arteries of Baltimore, Md. and Washington, D.C.
- Clearville and Everett depend largely on the wood products industry, while Hancock depends on the food processing industry, and Artemas, Breezewood, Flintstone, and Little Orleans depend on the tourist industry for employment.
- Average farm earnings have decreased greatly over the last 10 years; however, total farms have not decreased greatly.
- Many people living here consider their farms to be "hobby farms" and do not rely on them for their primary income.

Allegany Forests Project Conservation Action Plan

The Allegany Forests Project is a plan and associated actions being undertaken by The Nature Conservancy (TNC) and WPC to protect the full range of native biodiversity in the Allegany Project area, which includes the watersheds of Town Hill Creek, Sideling Hill Creek, and Fifteenmile Creek and the adjacent important forests (matrix forest blocks) of Buchanan and Green Ridge state forests. The emphasis is on protecting important aquatic and forest resources and the overall landscape of the project

area by using good science and by partnering with both private and public landowners to achieve goals that are beneficial to the natural environment and, in many cases, in the interest of local communities.

Targets are components of biodiversity that TNC and WPC are focused on within the project area. The following targets were identified in the plan, as of June 2006:

- Stream systems, including riparian zones, and the following species and communities that depend on them: the federally endangered plant harperella (*Ptilimnium modosum*), the white mountain tiger beetle (*Cincindela ancocisconensis*), the wood turtle, the odonate (dragonfly) assemblage, and fish assemblages.
- The native mussel assemblage, including the green floater, brook floater, Atlantic spike, triangle floater, northern lance, eastern elliptio, yellow lampmussel, and creeper.
- Mixed oak forests, and the northern metalmark and southern grizzled skipper butterflies that utilize this habitat.
- Shale barrens.
- *Neotoma magister* (Allegheny woodrat).
- Important species of concern, including Canby's mountain lover (*Paxistima canbii*) and the Allegheny woodrat (*Neotoma magister*).

The goal is to protect these targets through the identification of threats and the implementation of strategies for reducing those threats. TNC and WPC have identified the following significant threats to the project area:

- Residential Development – High
- New Large Developments – High
- Road Maintenance – Medium
- Pests and Pathogens – Medium
- Invasive Species – Medium
- Poor Forestry Practices – Medium
- Water Withdrawals – Medium

Appendix H describes key components of the Conservation Action Plan (CAP) and the accompanying diagram, depicting the outcome of "Situational Analysis," which illustrates the relationship between various targets and threats to these targets. The CAP process and its potential importance to the protection of natural resources in the project area is described in more detail later in this chapter under Conservation Strategies.

Natural Setting

The project area is made up of linear, forested ridges and agricultural valleys

Ecoregion

In 1992–1993, the United States Department of Agriculture Forest Service adopted a consistent approach to ecosystem classification and mapping. Ecological types, or ecoregions, were classified, and ecological units were mapped based on associations of those biotic and environmental factors that directly affect or indirectly express energy, moisture, and nutrients regulating the structure and function of ecosystems. Ecoregions may be confused with physiographic provinces, whose boundaries are largely dictated by similarities in geological history. However, physiographic provinces are only

one component of what is used to define ecoregions. Other components include climate, physiography, water, soils, air, hydrology, and potential natural communities. Ecoregions and subregions allow managers, planners, and scientists in the Forest Service, and others, to study management problems on a multi-forest and statewide basis, organize data collected during broad-scale resource inventories, and interpret these data among regions (McNab and Avers 1994).

The Sideling Hill Creek, Town Creek, and Fifteenmile Creek watersheds are part of the Central Appalachian Broadleaf Forest-Coniferous Forest-Meadow ecoregion and the Northern Ridge and Valley subregion. This subregion is characterized by a series of parallel, southwest to northeast valleys and mountain ridges. Shale, siltstone, sandstone, and carbonates comprise the underlying rocks in this section. Soils are moist and cool. However, because the area lies in the rain shadow of the Allegheny Mountains, vegetation is often indicative of drier conditions. The subregion is largely comprised of Appalachian oak forest, oak-hickory-pine forest, and northern hardwood forest. Before the arrival of the chestnut blight, this species dominated. On drier sites, oaks are mixed with pitch and Virginia pine (McNab and Avers 1994).

Common mammal species include bear, whitetail deer, gray and fox squirrels, deer mice, meadow jumping mice, weasels, and bats. The bird assemblage is diverse, including neotropical migrants and game birds. Fish may include brook trout and sculpins at higher elevations and smallmouth bass, rock bass, and darters at lower elevations. Insect life is diverse, and some butterfly and moth species have yet to be identified (McNab and Avers 1994).

Stream patterns are often trellis-shaped, reflecting the regular folding of geology. Streams are generally active in the spring and relatively dry in the summer (McNab and Avers 1994).

Unique Habitats

Shale barrens

The project area contains some of the best representations of shale barren communities that exist anywhere. These communities are found mainly in the Ridge and Valley Province of West Virginia's eastern panhandle, in adjacent counties in Maryland and Virginia, and in Bedford and Fulton counties in Pennsylvania. The unique characteristics of these communities include exposed south-facing terraces of Devonian shale and dry, sunny conditions throughout most of the year. Only species with unique habitat requirements are able to withstand these stressful conditions, and thus shale barrens contain plant and animal communities found nowhere else.

Shale barrens provide unique habitats that are able to support plants and animal species that cannot survive anywhere else

Lichens play a significant role in shale barren communities. A lichen is a symbiosis between a fungal and algal life form, meaning a relationship exists that is beneficial to both. Within shale barrens, the remains of lichens form the soil substrate that supports shale barren plants. In addition, animals, such as larvae of the four rare species of lichen moth, depend on these unique "dual organisms" for their survival (lichen and moss working group).

Examples of plant species found in central Appalachian shale barren communities include species of special concern, such as Allegheny plum (*Prunus allegeniensis*), Allegheny stonecrop (*Sedum*

telephioides), moss pink (*Phlox subulata*), Kate's mountain clover (*Trifolium virginicum*), shale barren pussytoes (*Atennaria virginica*), and mountain pimpernel (*Taenidia Montana*). Other species commonly include bear oak (*Quercus ilicifolia*), Virginia pine (*Pinus virginiana*), sweet pignut hickory (*Carya ovalis*), chestnut oak (*Quercus prinus*), bottlebush grass (*Hystrix patula*), reindeer lichen (*Clodonia sp*.), ebony spleenwort (*Asplenium platyneruon*), and mountain mint (*Pycnanthemum incanum*). The butterflies and moths (Lepidoptera) that depend on the plants within the shale barren community may travel from one shale barren community to another, sharing genetic information (NHI).

The shale barren communities are considered to be in good ecological health, though there are some potential threats to these communities. The lichens that are so essential to these communities are sensitive to air pollution, particularly acid rain. Invasive species threats to shale barrens include spotted knapweed (*Centaurea maculosa*), brome grass (*Bromus sterilis*), and others. Additional threats include overbrowsing by deer, damage from roads, and extraction of shale (Maryland "Target" document).

Stream Communities

Stream patterns in the project area are largely dictated by ridge and valley geology, with most streams located in valleys underlain by shale. Streambeds of larger stream courses are composed of gravel material with lesser amounts of boulders, gravel, and sand, and irregularly spaced "scour" pools created by the transport of stream materials during storm events. Others are underlain by bedrock. As a result of the low precipitation and large fractures in the shale making up the valleys, the streams may be low in water during parts of the year.

Found within the project area are three federally endangered species, including the green floater (*Lasmigona subviridis*) and brook floater (*Alasmidonta varicosa*) mussels. Stream substrates support high-quality macroinvertebrate assemblages. The project area is also a location for harperella (*Ptilimnium nodosum*), a federally endangered plant. Harperella is found in both Sideling Hill and Fifteenmile creeks (but currently only in Maryland), where it is uniquely suited to the hydrological conditions. Unlike many plants, harperella tolerates, and ultimately requires, periodic flooding. During high flows, seeds are dispersed downstream and vegetative rooting of new plants occurs. When the water level lowers in late summer, seeds are able to germinate in rocky substrate. In winter and spring, water rises and submerges the plants, protecting them from cold and ice. The ever-changing stream substrate causes harperella to be re-established constantly at different points as its habitat shifts, and, therefore, the protection of entire stream system where it occurs is necessary for its preservation.

Town Creek, Chaneysville

Another threat to native harperella populations is the invasive Japanese stiltgrass (*Microstegium vimineum*), which may crowd out harperella, by adapting to the exposed cobble or sand bars on creek channels where harperella is found.

Microstegium poses a threat to another global species of conservation found in Sideling Hill Creek and Fifteenmile Creek watersheds and listed as endangered in Maryland—the tiger beetle, *Cicindela ancocisconensis.* The predatory species lives in shaded gravel and sandbars on the outside of creek bends. It depends on relatively stable, plant-free habitats where it is able to create burrows for ambushing prey and laying eggs. Alteration of streamside habitats through development and ATV use may also have an impact on this species.

Other immediate threats to stream communities include hydrologic alterations and sediment inputs, most of which are a consequence of impacts from roads and lack of appropriate best management practices in agricultural, logging, and other land-use activities. Future development could cause additional

habitat disturbance along riparian zones of streams, increasing the impact of these threats. It would also increase water withdrawals, which could greatly alter stream ecosystems. Mussel species would be particularly vulnerable, relying on areas of the stream containing water for their substrate.

Forests—Ridges and Valleys

Within private lands of the project area, forested areas are largely limited to ridges, while valleys are dominated by agricultural and residential activities. However, riparian areas of larger streams are often still forested. The exception is Buchanan State Forest, which contains at least 23 different tree communities on both ridgetops and lowlands.

Historically, tree composition in the project area was dominated by American chestnut, until an exotic fungus caused a massive die-off of this species in the early 1900s. The exact impact of the chestnut die-off is not known, but it is possible that the disappearance of this species greatly altered natural communities. For instance, at the time, the diet of the Allegheny woodrat, a species of concern found to occupy rock overhangs within the project area, probably included mostly American chestnut mast, and the disappearance of the chestnut is considered a probable cause of woodrat population declines.

The Allegheny woodrat (photo courtesy of S. Johnson)

Today, the area predominantly contains dry oak-heath-mixed hardwoods in the ridgetops, mixed hardwoods in mid-elevation areas, and white pine-hemlock-oak communities varying in location (Smith, personal communication 2005). Virginia pine is an uncommon tree species in Pennsylvania, but is rather abundant within the project area.

Forests within the project area support species such as the bobcat, black bear, and numerous game animals. One of the most significant roles of the forested ridges is its role as a forested migratory corridor for spring migrants and raptors, such as golden eagles. Tussey Mountain is one of the most well known of these ridges, which was recently named an Important Bird Area.

Many of the forests within the project area are at mid-level maturity. The biggest concern about the health of these forests is their inability to recover from disturbance, such as logging or disease, and also possible fragmentation (Smith, personal communication 2005). Foresters at Buchanan State Forest strive to use wise forestry-management practices, but must use deer exclosures to promote regeneration. However, in many cases, private landowners do not consider the inability of the forest to regenerate. High-grading, the process of removing only the largest and most valuable trees in a stand, is a serious threat to forests of the project area. This is a poor forestry practice, which leaves smaller trees that are actually stunted trees of the same age as those removed. The trees left behind are more susceptible to disease and disturbance.

Wildlife

Birds

The area comprising the Three Sisters watershed is home to bird species requiring a variety of habitats, including mature forest, grasslands, and shrubland. Data exists about the watershed's birds as a result of Pennsylvania Breeding Bird Atlas and USGS's Breeding Bird Survey. The Breeding Bird Atlas uses volunteers throughout Pennsylvania to document birds that are breeding in designated geographic areas, or "blocks." The first Bird Atlas Project was conducted from 1983–1989 and the second Atlas

Project is currently underway (2004–2008). The Breeding Bird Survey involves the regular documentation of breeding birds along predetermined driving routes throughout the United States. Breeding Bird Survey Route 192 (Stonybreak) passes through the project area's boundaries. A list of bird species that have been identified within the project area is in Appendix F.

The most significant characteristic of the watershed, with regard to birds, is Tussey Mountain, which is important for the migration of raptor species, including golden eagles. Recently named the 81st Important Bird Area, Tussey Mountain forms a north–south linear ridge across the watershed.

Birds of conservation concern are those that are considered to be facing significant declines in their populations either globally or on a regional scale. Partners in Flight (PIF) is an agency that focuses on documenting breeding birds throughout North American. The National Audubon Society is a similar agency that documents trends in bird populations in the United States and implements bird conservation objectives, such as the Important Bird Area program. PIF maintains lists of priority species by region, while Audubon maintains the Audubon Watchlist for the entire United States.

Much of PIF's information is developed from studying trends in data from the Breeding Bird Survey. Most notable on the PIF list of species of concern for the Ridge and Valley Province region is the high percentage of declining shrubland species. Mature forest species and some grassland species found within the watershed are also considered of concern. There is some debate over the value of maintaining shrubland habitat because shrubland may not have historically been an important land use in the region. Nonetheless, many shrubland species are showing noticeable declines, such as the golden-winged warbler and field sparrow.

Though the project area is largely forested, it faces some obstacles with regards to its ability to support forest birds. This includes lack of forest diversity, whitetail deer overpopulation, and pest and disease outbreaks (such as gypsy moth and hemlock wooly adelgid infestations), and oak decline. In many cases, effective control agents for these latter threats are not known. Decreases in forest diversity are often the result of young forests aging. Larger and more mature trees result in less light to the understory and fewer and smaller understory plants. This understory vegetation is needed to support populations of many high-priority forest birds.

Since birds often have fairly strict habitat requirements, the habitats available to birds can often be indicative of suitable habitat for other species. A variety of mature forest, early-successional, and grassland habitats within a forest landscape is important for healthy bird populations. This can mean maintaining smaller areas, such as power line and pipeline rights-of-way, in grassland or shrubland, or managing current agricultural areas to protect certain species. Forestry can be done in a manner that maintains a variety of age structures in order to protect forest health and habitat availability, and to be economically profitable. However, utilizing forests in a way that satisfies these competing interests is often difficult when there are a variety of groups and individuals who are affected by the outcome.

Amphibians and Reptiles

The distribution of amphibians and reptiles in Pennsylvania is generally dictated by geologic and hydrologic factors. The Allegheny Front is an abrupt change in elevation, which extends from northern Pennsylvania into West Virginia. It is bordered on the east by the Ridge and Valley Province and on the west it forms the Allegheny Mountains. This front has an elevation change of up to 2,000 feet and is an obstacle to dispersion for some more terrestrial amphibian species. In addition, some of the more aquatic salamander and turtle species remain confined to major drainages such as the Ohio River.

A wood turtle found within the project area

Examples of this can be seen in the amphibian and reptile distribution of the project area. Though the assemblage is not particularly diverse, the area supports some uncommon species. One such species is the Ridge and Valley salamander, which reaches its greatest abundance in the portion of the Ridge and Valley Province containing the project area. The salamander is found in drier areas of deciduous and mixed conifer hardwood forests, often on hillsides and ridgetops (Hulse et al. 2001). Though the common musk turtle has not been identified within the watershed, its distribution suggests that it is also a likely inhabitant. This turtle is confined to the Ridge and Valley Province and coastal plain, but has not been found in any streams that empty into the Ohio River in Pennsylvania (Hulse et al. 2001). Like most turtle species with disjunct populations, this species of turtle is largely aquatic. Marbled salamanders, which have also been identified near the project area, are a conspicuous species of mole (burrowing) salamanders that inhabit permanent ponds. This species is likely present, though not abundant within the watershed. Additionally, the eastern hognose snake has been able to disperse across the Allegheny Front through the broad valleys of the Ridge and Valley Province and could be found within the project area.

Due to the hydrologic and geologic constraints mentioned previously, many species abundant throughout much of Pennsylvania are not found within the watershed. This includes the queen snake, mudpuppy, and eastern spiny softshell turtle, which are generally confined to the Ohio River drainage, and Wehrle's salamander, which is not found east of the Allegheny Front. Common to the watershed are species of headwater salamanders, such as dusky and longtail salamanders. Species characteristic of standing water and wetland, such as spotted salamanders and four-toed salamanders, are likely present but not abundant. The five-lined skink and northern fence lizard are inhabitants of rock outcrop areas.

Mammals

A mammal can be described as a warm-blooded, hairy animal that produces milk and bears live young. Over 70 mammal species currently live, or formerly lived, in Pennsylvania.

Mammals inhabit a variety of habitats, including forests, farm fields, shrubland, and grassland. However, in Pennsylvania, the highest levels of mammal diversity are associated with forest habitats. Mammals are particularly sensitive to fragmentation, caused by development and roads that separates one area of forest from another. This is especially true of larger mammals, which have broader home ranges, or areas where they must travel to find food and resources. In fact, the Pennsylvania Gap Analysis Project, which studied trends in animal diversity across Pennsylvania, found that mammal diversity was closely correlated with the amount of forestland available.

As a result of these trends, the Sideling Hill Creek, Fifteenmile Creek, and Town Creek watersheds are predicted to have one of the highest levels of mammal diversity in either Pennsylvania or Maryland. Among the 57 predicted species for the project area are the conspicuous black bear and bobcat, as well as uncommon species, such as the long-tailed shrew and the spotted skunk.

Black bears (*Ursus americanus*) can be found across the state of Pennsylvania but are most common in forested areas (Fergus 2005). They are highly adaptable mammals, varying in habitat preferences, reproductive behaviors, and home ranges depending on the resources available. Mainly vegetarians, black bears feed in open areas and wetlands in warmer months and shrubby areas in the fall, and will also eat small mammals and amphibians. In cases where little natural habitat is available, black bears are known

to invade areas of human habitation. They undergo a long dormant period, or hibernation, in winter, utilizing hollow trees, rock ledges, and other crevices.

The bobcat (*Lynx Rufus*) is the only wild cat in Pennsylvania or Maryland. Rarely seen, this species can weigh up to 35 pounds, but seldom weighs more than a large house cat (Fergus 2005). The species commonly feeds on small rodents, but bobcats have been known to eat amphibians and insects. Bobcats mainly inhabit mountainous, deep, forested areas but can also be found in swamps and agricultural areas. Shrubby areas or areas of recent clear-cuts, preferably within a remote or largely forested area, are required for their survival. These shrubby areas provide an abundance of rodents and small animals for the bobcat to eat. A number of habitats within the wildlife management areas (Maryland), state game lands (Pennsylvania), and state forests of the project area contain excellent bobcat habitat. This includes clear-cut areas and areas managed for game species. Bobcats are currently hunted in Pennsylvania, but no hunting licenses were issued in Bedford and Fulton counties in 2005. There is no hunting season for bobcats in Maryland.

The project area has the only documented sighting for the spotted skunk (*Spilogale putorius*) in Pennsylvania. These skunks are much smaller and more agile than the more common striped skunk. Dens may be found in underground burrows, beneath farm buildings, in hollow logs, and in rock crevices. This species prefers dry, rocky woodlands typical of the project area. One of its most distinctive characteristics is its behavior to warn off predators. The skunk will do a "handstand" on its front feet and may walk for several yards in this manner before spraying. No sightings of this species of concern in Pennsylvania have been made in the state since the 1960s. The watershed is at the eastern limits of the species' range. Although sightings have not been verified for decades, it is possible that this species may still exist within the project area because they have not been well studied (Jim Hart, personal communication 2005).

Relatives of moles, shrews are small, insectivorous mammals with long, pointed noses and beady eyes. Within Pennsylvania, there are at least seven species of shrews. One of the most uncommon of these is the long-tailed shrew (*Sorex dispar*), a secretive shrew found in mountainous areas with rocky slopes. Although this species inhabits nearly the entire Appalachian Mountain range, it is rarely seen. Within Pennsylvania, it is mainly found within or adjacent to the Ridge and Valley Province, which includes the project area.

Mussels

Freshwater mussels are shelled, hinged invertebrates found in both standing and flowing waters. The United States has the highest population of freshwater mussels in the world, though many are thought to be declining or already extinct. Mussels are filter feeders, meaning they trap and filter plankton and other material in the water. Their food, temperature, and oxygen requirements make mussels good indicators of water quality. Because mussels reproduce by attaching larvae, called glochidia, to fish hosts, they can also be indicators of the health of fish populations. If a glochidia is attached to the wrong species, it can be killed by the fish's immune system or cast off.

One of the biggest sources of stress to mussel populations is silt. Excess silt enters streams from streambanks and other areas where vegetation has been removed. This silt increases the movement of large materials on the streambed when flows are high. During high flood events, mussels can be dislodged from the streambed and/or buried, which blocks access to food and oxygen, causing suffocation.

The yellow lampmussel

High fluctuations in flow patterns, or extreme flooding or drought events, also affect mussel populations by increasing temperatures and lowering oxygen availability. The natural geology of the Three Sisters watershed is such that streams have extremely low-flow periods during the summer months, which naturally affects the presence of mussel species. Due to the similar physiographic characteristics among the watersheds, similar conditions and species would also be found in the Fifteenmile Creek and Town Creek drainages. However, differences in land use could affect mussel populations.

In 2001, WPC staff and trained volunteers conducted a survey of mussels in Sideling Hill Creek. This is the most recent account of mussels for the project area (WPC 2001). The investigators compared the number and types of live mussel species found, with shells of those species found in Sideling Hill Creek which were recently dead and long-dead (termed subfossils) to determine if there had been a significant change in abundance over time. It was found that the type and abundance of species has not changed significantly, indicating that habitat quality still adequately supports the mussel community. During the survey, seven species of mussels were identified in Sideling Hill Creek (Table 4-2). This includes two green floaters (*Lasmigona subviridis*), a globally rare species (very few left in the entire world). The most abundant species were the eastern elliptio (*Elliptio complanata*), plain pocketbook (*Lamsilis cardium*), and northern lance (*Elliptio producta*), which are the species most tolerant to the extreme hydrological conditions present in Sideling Hill Creek. The brook floater (*Alasmidonta varicose*), which has been previously identified within the watershed, was not found during the 2001 survey.

Table 4-2. Mussels of Sideling Hill Creek

green floater	*Lasmigona subviridis*
brook floater*	*Alasmidonta varicosa*
triangle floater	*Alasmidonta undulata*
northern lance	*Elliptio producta*
eastern elliptio	*Elliptio complanata*
plain pocketbook	*Lampsilis cardium*
yellow lampmussel	*Lampsilis cariosa*
creeper	*Strophitus undulatus*

*absent in recent investigations

Other Wildlife

The types of butterflies and moths present may point to the types of habitats available, because these animals require specific host plants during each life stage (larval and adult). The central Appalachian shale barrens host plant communities that are found nowhere else in Pennsylvania, and in only a few places in the country. A number of butterflies and moths are specific to these shale barren communities. For instance, butterfly larvae feed on shale barren species, such as rock cress (Olympia marble butterfly), dwarf cinquefoil (southern grizzled skipper), and roundleaf ragwort (northern metalmark). At least three species of moth feed on lichens attached to rocks within the shale barren community (lead-colored lichen moth, Packard's lichen moth, and unnamed lichen moth). Additional moth species of special concern include the southern pine looper moth, and unnamed noctuid (owl) moth.

The zebra swallowtail is a common butterfly, which uses paw paw as a host plant

A listing of wildlife species within the watershed is listed in Appendix F.

Important Areas for Conservation

Conservation Lands

This plan uses conservation lands as a term to describe public or private lands with management plans that include the protection of natural areas as a primary objective (Figure 2-6). This gives these lands some guaranteed protection from development pressures. However, these include those granted almost complete protection, as well as those where the owner allows some type of land disturbance, such as logging or mineral extraction. Even within these conservation lands, management plans should adequately address the needs of species and natural communities that require protection.

A total of 37.8 percent of land within the Pennsylvania portion of the project area is in public ownership, and a total of 62.25 percent of the Maryland portion is in public ownership.

Pennsylvania

State Forest

Approximately 40 percent of **Buchanan State Forest**, managed by Pennsylvania Department of Conservation and Natural Resources, is located within the Sideling Hill Creek, Town Creek, and Fifteenmile Creek watersheds in Pennsylvania.

State Game Lands

Pennsylvania state game lands are public lands purchased primarily with the proceeds of hunting licenses. They are managed to support both game and non-game species, with a focus on recreational hunting.

All but a small portion of the 6,310-acre parcel of **State Game Lands 49** is located within the Sideling Hill Creek watershed. Headwater streams originating within State Game Lands 49 include McKees Run, East Branch Sideling Hill Creek, and Trough Run.

Slightly less than half of the 7,310-acre parcel of **State Game Lands 97** is located within the headwaters of the Town Creek watershed. Streams originating within State Game Lands 97 include Lick Creek and Sweet Root Creek.

Private Holdings

Near the point where Sideling Hill Creek meets Piney Creek, WPC owns two properties dedicated to conservation. These properties make up the **Silver Mills Natural Area** and include excellent examples of shale barren communities.

Maryland

State Forest

Much of **Green Ridge State Forest**, a 46,000-acre oak-hickory forest is located on the Maryland side of the Three Sisters watershed. It is managed by the MD DNR for wildlife conservation and recreational purposes.

Wildlands

Maryland's Wildland Preservation System is Maryland's counterpart to the federal Wilderness Preservation System. Wildlands are, "limited areas of land or water which have retained their wilderness character, although not necessarily completely undisturbed, or have rare or vanishing species of plant or animal life or similar features of interest worthy of preservation for use of present and future residents of

the State..." (MD DNR[2]). Wildland areas overlay existing public lands, are largely unfragmented, and are designated by the Maryland General Assembly. An area must be larger than 500 acres to be considered for wildland status.

Public access and fishing, hunting, and trapping are permitted in wildland areas, subject to existing laws, regulations, and policies. Activities prohibited in wildlands include, "the use of motorized vehicles and mechanized equipment, the harvesting of timber, the construction of new roads, buildings, and other structures, manipulation of vegetation for wildlife management or other purposes, and the introduction of non-indigenous species" (MD DNR[2]).

Deep Run Wildland Area is a 1,260-acre area within the Fifteenmile Creek watershed within Green Ridge State Forest and includes a variety of topographic features and habitats, such as cove hardwoods, pine woodlands, north- and south-facing forest communities, and shale barrens. The Deep Run/Big Run trail passes by this wildland area.

Maple Run Wildland Area is a 2,760-acre area within Green Ridge State Forest selected based on its representative shale barren habitats.

Potomac Bends Wildland Area is a 2,034-acre area within Green Ridge State Forest selected based on its unique shale barren communities, including plants found mainly within shale barrens along the Potomac River.

Sideling Hill Wildland Area is a 922-acre portion of Sideling Hill Wildlife Management Area (WMA) selected for wildland status because the Sideling Hill Creek watershed is considered to be an important priority for conservation in Maryland.

Wildlife Management Areas

In Maryland, Wildlife Management Areas (WMA) are areas dedicated to wildlife management activities and low-intensity, wildlife-related recreation, including hunting and wildlife observation. Many WMAs were purchased with federal funds that restrict intensive development and prohibit or limit certain types of outdoor recreation activities and uses. Over 40 WMAs are located throughout the state. Four of these are in the project area. Specific management objectives have been developed for each WMA, depending on the location and type of habitat.

The goal of the **Sideling Hill WMA,** a 3,100-acre tract of mixed oak forest with scattered oak stands and Virginia pine, is to provide forest wildlife habitat and protection for water quality in Sideling Hill Creek. The steep shale barrens along sections of the creek support endemic plants, meaning that they do not occur anywhere else. MD DNR identified Natural Heritage Areas on this WMA in 1986, affording protection to a number of rare, threatened, and endangered plants.

The **Belle Grove WMA** was purchased in the 1920s and 1930s to raise wild turkeys. The 355-acre tract now contains forests and fields, though it is primarily composed of a mixed oak forest. Game birds are no longer raised, although turkeys, grouse, deer, and other animals are abundant.

Warrior Mountain WMA is a 4,400-acre forested WMA. The area is abundant with forest songbirds, turkeys, whitetail deer, and other wildlife. Abandoned farms and cemeteries, some dating to the mid-19th century, dot the landscape.

Billmeyer WMA is a 713-acre WMA that was purchased in the 1920s to raise game birds that would help bolster low game populations on other WMAs. Today, this WMA supports numerous outdoor interests.

Heritage Conservation Fund Sites

A Heritage Conservation Fund Site is not an official land unit designation, but includes properties that have been acquired specifically for the protection of identified endangered plant or animal species and significant habitats. Revenue for acquisition of these funds comes from government bonds, general funds, and other sources. There are a total of four sites within the watershed:

Aaron Straus: Sideling Hill Creek watershed
Sugar Hollow: Town Creek watershed
Turkey Camp: Sideling Hill Creek watershed
Hanging Prairie Shale Barren: Town Creek watershed

Woodmont Natural Resource Management Area

A Natural Resource Management Area (NRMA) is managed by the State Forest and Park Service for the optimal use of the resources on the site, including wildlife management and agriculture. NRMAs do not accommodate intensive recreational uses and are typically used for hunting, fishing, wildlife observation, and water access. A very small portion of Woodmont NRMA extends to the project area and is adjacent to Sideling Hill WMA in Maryland.

Natural Heritage Areas

Natural Heritage Inventories (NHIs) are surveys conducted to identify important natural communities and species of special concern in a county. Administered by the Bedford County Planning Commission, the Bedford NHI was completed by WPC in 1998 (Wagner 1998). The NHI for Fulton County, which comprises a smaller portion of the watershed, will be completed in fall 2006. NHIs are a best effort to evaluate important natural areas based on aerial images and on-the-ground investigations, but important areas may exist that are not included in the inventories. NHIs have no regulatory authority, though municipalities may choose to incorporate information from them into land-use documents, and both organizations and individuals may choose to implement suggested recommendations.

Although Maryland does not have a program comparable to Pennsylvania's Natural Heritage Program, it has recognized significant natural areas. The names of these areas are included in the following description of NHIs, though specific descriptions are not available for these areas.

WPC continues to collect additional data to update its databases and NHIs, which identify specific areas of biodiversity, termed BDAs, LCAs, and DAs.

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

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

A portion of Sweet Root Natural Area

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

A total of 29 BDAs, two LCAs, and three DAs are located within the Pennsylvania portion of the project area. In addition, five comparable areas of documented high biodiversity are found within the Maryland portion of the watershed (Figure 4-1). BDAs and LCAs are given a ranking based on their importance to biological diversity and ecological integrity in the county. The following pages describe these areas, including whether they have any formal protection as a conservation land. It is recommended that appropriate buffers be established around BDAs to protect wildlife, maintain hydrology, and prevent invasive species from entering the sites. Additional recommendations are given, if applicable.

Sideling Hill Creek

1. **Sideling Hill Creek BDA**
   Significance: Exceptional
   Location: Mann and Monroe townships
   Description: A section of the Sideling Hill Creek valley, the creek butts against steep shale slopes, deep channels, and rocky riffles; it includes a Dedicated Area owned by WPC, which is part of State Game Lands 49.
   Rare Occurrences: Two representative Appalachian shale barren communities; four Pennsylvania endangered plants; three Pennsylvania threatened plants; three Pennsylvania rare plants
   Threats and Stresses: Improperly managed agricultural practices and road maintenance (to produce algal blooms); crossing of streams
   Recommendations: Establish buffers and riparian zones adjacent to streams; careful road maintenance.

2. **Johnson Branch Headwaters BDA**
   Significance: Exceptional
   Location: Mann and Monroe townships
   Description: A section of the Sideling Hill Creek valley, the creek butts against steep, shale slopes, deep channels, and rocky riffles; it includes a Dedicated Area owned by WPC, which is part of State Game Lands 49.
   Rare Occurrences: Two representative Appalachian shale barren communities; four Pennsylvania endangered plants; three Pennsylvania threatened plants; three Pennsylvania rare plants
   Threats and Stresses: Improperly managed agricultural practices and road maintenance (to produce algal blooms); crossing of streams
   Recommendations: Establish buffers and riparian zones adjacent to streams; careful road maintenance.

3. **Piney Creek Slope BDA**
   Significance: High
   Location: Mann Township
   Description: A section of slope at a tributary of Piney Creek, this BDA contains a moderately steep, dry south-facing slope supplying food to animals of special concern.
   Rare Occurrences: Two animals of special concern
   Threats and Stresses: Disturbances that alter food plant habitat, including pesticide and herbicide use

Recommendations: Work with landowner; avoid pesticide use.

4. **East Branch Tributary BDA**
   Significance: Notable
   Location: Monroe Township
   Description: A tributary to the East Branch of Sideling Hill Creek contains a xeric central hardwood-conifer forest community with a plant that grows almost exclusively in the Ridge and Valley Province under a variety of conditions.
   Rare Occurrences: Pennsylvania endangered plant
   Threats and Stresses: Dramatic changes in light level, surface water flow, or competition levels; threat does not currently appear to be high
   Recommendations: Work with landowner on more detailed management recommendations.

5. **Sideling Hill Creek, Maryland Natural Area 1**

6. **Sideling Hill Creek, Maryland Natural Area 2**

7. **Sideling Hill Creek LCA**
   Significance: Important landscape feature containing an Exceptional Value stream and exceptional, high, and notable BDAs
   Description: This rugged, largely undeveloped landscape area contains an Exceptional Value stream and numerous species of special concern, making it one of the most important in Pennsylvania.
   Threats and Stresses: Activities affecting water quality, such as inputs of nutrients, sediment, pesticides, and changes in water temperature; new concentrated animal feeding operations; influx of people from Washington, D. C. and Baltimore, Md. without proper planning in place
   Recommendations: Conservation efforts should continue among individual organizations to continue working with municipalities on planning; a nutrient management plan for the entire watershed and further incentives to encourage BMPs would be extremely helpful.

8. **Silver Mills Natural Area DA**
   Significance: Excellent, protected portion of Sideling Hill Creek BDA
   Location: Mann Township
   Description: Near the point where Piney Creek meets Sideling Hill Creek, WPC owns two properties dedicated to biodiversity; State Game Lands 49 adjoins this natural area.
   Rare Occurrences: A Pennsylvania endangered plant
   Threats and Stresses: Changes in hydrology; direct disturbance; road maintenance activities; illegal dumping on slope
   Recommendations: Work with Pennsylvania Game Commission to agree on management strategies; address dumping issues; establish a monitoring program.

Fifteenmile Creek

1. **Polish Mountain South BDA**
   Significance: High
   Location: Southampton Township
   Description: On the western slope of Polish Mountain and north of a pipeline right-of-way is this BDA, which contains a dry oak forest on the western slope.
   Rare Occurrences: A Pennsylvania endangered plant
   Threats and Stresses: Species requires open, dry habitat with minimum competition; alterations in habitat and changes in nutrients, water flow and herbicides could have a negative impact

Recommendation: Work with landowner to develop management strategy; Southampton Township should be given information about the site.

2. **Polish Mountain Slope BDA**
   Significance: High
   Location: Southampton Township
   Description: On the top of Polish Ridge, near the headwaters of Polish Mountain, this site contains oak forest on the upper slopes and common herbaceous species, such as wood sorrel and white snakeroot, on the shaley, lower slope. A species of concern is found in an open, shaley portion of the slope above the road, where light levels are high.
   Rare Occurrences: One Pennsylvania endangered plant
   Threats and Stresses: Direct disturbance of habitat
   Recommendations: Maintenance plan for road that considers possible impacts to endangered plant.

3. **Lebanon Church Slopes BDA**
   Significance: High
   Location: Mann Township
   Description: Near Lebanon Church of Artemas, a narrow strip of sparse vegetation and shale, including a plant species of special concern, are located at this site.
   Rare Occurrences: One Pennsylvania endangered plant
   Threats and Stresses: Competition from aggressive exotic species like spotted knapweed
   Recommendations: Work with landowner to develop management plan that addresses exotic species control.

4. **Artemas Barrens BDA**
   Significance: High
   Location: Mann Township
   Description: An Appalachian shale barren community is the focus of this BDA, located where a number of small tributaries meet Fifteenmile Creek; Virginia pine, chestnut oak, scrub oak, dwarf hackberry, and false pennyroyal are some of the species at this site.
   Rare Occurrences: An exemplary Appalachian shale barren community; one Pennsylvania endangered plant; one animal of special concern
   Threats and Stresses: Well buffered, this site has few stressors; however, spotted knapweed and black locust are two aggressive plants that could possibly out-compete the natural community.
   Recommendations: Work with landowners to establish conservation goals; search for possible sources of invasive species on upland area.

5. **Fifteenmile Creek Slope BDA**
   Significance: Notable
   Location: Mann and Southampton townships
   Description: Several miles south of Fifteenmile Creek's headwaters and within Buchanan State Forest, this BDA contains a xeric central conifer forest community.
   Rare Occurrences: Pennsylvania endangered plant
   Threats and Stresses: Disturbance from road maintenance and direct disturbance
   Recommendations: Coordinate with Bureau of Forestry to work on goals for conservation; consider sensitivity of site in road maintenance activities.

Town Creek

1**. Sweet Root Gap BDA**
Significance: Exceptional
Location: Southampton Township
Description: Located at the headwaters of Sweet Root Creek, this BDA is primarily in Buchanan State Forest and State Game Lands 97, with the lower section on private lands; the area contains a dry oak forest community on the middle and upper slopes and a wetter, more mesic community on the lower slopes. Much of the valley and lower slope, containing an old-growth conifer forest community, is owned by the Bureau of Forestry and was once considered a Dedicated Area. However, the old-growth stands have recently been infested by the hemlock wooly adelgid, and most have died. Additionally, most of the lower slopes have been high-graded by a private landowner, and this may affect its status as an exceptional BDA.
Rare Occurrences: An old-growth northern conifer forest community; two Pennsylvania threatened animals, three Pennsylvania rare plants; two Pennsylvania endangered plants
Threats and Stresses: Siltation; increased light; loss of buffer
Recommendations: A management plan for the area (if not already existing)

2. **Warriors Ridge BDA**
Significance: High
Location: Southampton Township
Description: A portion of a narrow, limestone-based formation running along Tussey Mountain, this BDA is a large, contiguous forested section containing species such as red oak, chestnut oak, sugar maple, and shagbark hickory; it is one of the least-disturbed portions of the ridge line and provides important interior forest habitat.
Rare Occurrences: Dry-mesic acidic central forest community; a Pennsylvania endangered plant
Threats and Stresses: Fragmentation through human disturbance; direct disturbance of plants
Recommendations: Involvement of many private landowners in the management of this area; further surveys and monitoring of plant communities, including endangered plant.

3. **Hewitt North Barrens BDA**
Significance: High
Location: Southampton Township
Description: A southward-facing slope located in the valley between Polish Mountain and Warriors Ridge, this BDA contains species characteristic of Central Appalachian shale barren community, including one species of special concern.
Rare Occurrences: Central Appalachian shale barren community; one Pennsylvania endangered plant
Threats and Stresses: Presence of exotic species such as garlic mustard; direct disturbance of the slopes; introduction of pesticides and herbicides; changes in surface water flow and tree canopy
Recommendations: Working with landowner to emphasize the significance of the site and consider management arrangement for invasive species and special concern species.

4. **Hewitt North Barrens # 2 BDA**
Significance: High
Location: Southampton Township
Description: Another Appalachian shale barrens community, this site contains different species than North Barrens, difficult slopes and exposed shale, containing species such as eastern red cedar, chestnut oak, pignut oak, white ash, reindeer lichen, and ebony spleenwort.

Rare Occurrences: Appalachian shale barrens community
Threats and Stresses: Activities that would fragment or disturb the slopes; mossy stonecrop, a non-native species that could affect the native species at the site
Recommendations: Further monitoring; working with landowner on management plan

5. **Bear Gap Run BDA**
Significance: High
Location: Southampton Township
Description: This BDA is located at the mainstem of Bear Gap Run, a headwater stream meeting Flintstone Creek; a notable feature is the large patches of scree (boulder fields) on the south-facing slopes.
Rare Occurrences: One Pennsylvania endangered plant
Threats and Stresses: Entirely within Buchanan State Forest, browsing by deer may be the most immediate threat.
Recommendations: Incorporate area into state forest management plan (if it has not been done already).

6. **Warrior Ridge North BDA**
Significance: High
Location: Monroe Township
Description: A narrow, low-elevation ridge running between Tussey Mountain and low, shale-rich hills, containing a forest community of red oak, pitch pine, and scrub oak; much of this BDA is in State Game Lands 97 or Buchanan State Forest; the gypsy moth infestation eliminated many of the oaks and has increased light to the understory.
Rare Occurrences: One exemplary natural community; one Pennsylvania endangered plant
Threats and Stresses: Invasive species (because of increased light); deer
Recommendations: Monitor plant of special concern; investigate deer impacts.

7. **Rainsburg Gap BDA**
Significance: High
Location: Southampton and Monroe townships
Description: This tributary cuts through Tussey Mountain and has a steep-sided slope dominated by yellow birch and hemlock; the BDA is partly State Game Lands 97, partly Buchanan State Forest, and partly private lands.
Rare Occurrences: Two plants of concern (one Pennsylvania rare) and one animal of concern
Threats and Stresses: Changes in the water quality; activities that would fragment the surrounding forest
Recommendations: A management strategy or agreement between landowners that would incorporate the needs of the special concern species.

Shale barrens are home to animal species such as the northern fence lizard

8. **Elk Lick Creek Barrens BDA**
Significance: High
Location: Southampton Township
Description: Steep slopes formed by Elk Lick Creek support an Appalachian shale barrens community and herbaceous species, such as dwarf dandelion, birdsfoot violet, and pasture rose.
Rare Occurrences: Appalachian shale barrens community; Pennsylvania endangered plant
Threats and Stresses: Disturbances to slope; changes in water flow or increase in nutrients; disturbance on upland area above slope

Recommendations: Work with landowner; due to the location, the timber value of this site is low.

9**. Blues Gap BDA**
Significance: High
Location: Southampton Township
Description: A south-facing, dry slope along Blues Gap Run containing species such as Virginia pine, black locust, and oak, and also shrubs, herbs, and grasses.
Rare Occurrences: Two species of lepidopteran (butterflies) not considered endangered, but relatively uncommon in Pennsylvania
Threats and Stresses: Alteration of a power line right-of-way providing open habitat for rare butterfly and moth species (lepidopteran); spraying of herbicides and insecticides, which could unwittingly harm lepidopteran populations, including spraying for gypsy moths in nearby Buchanan State Forest.
Recommendations: Work with surrounding landowners, utility company, and state forest district to better outline possible management options.

10. **Hewitt South Barrens # 2 BDA**
Significance: High
Location: Southampton Township
Description: This BDA is comprised of a moderately steep, dry slope on the west side of Town Creek containing species such as mountain mint, fragrant cudweed, red bud, and chestnut oak.
Rare Occurrences: Central Appalachian shale barren community; Pennsylvania endangered plant; Pennsylvania rare plant
Threats and Stresses: Increased water or nutrients; road maintenance decisions
Recommendations: Landowner awareness; communicate to township to minimize road maintenance disturbance.

11. **Hewitt South Barrens # 3 BDA**
Significance: High
Location: Southampton Township
Description: South-facing slopes above Town Creek before it crosses into Maryland, containing a Central Appalachian shale barren community.
Rare Occurrences: An exemplary natural community; one Pennsylvania endangered plant; two animals of special concern
Threats and Stresses: Shale extraction site; woodland encroaching upon prime habitat
Recommendations: Work with landowner to establish management strategy and limit use of site for shale extraction.

12. **Wilson Run Slopes BDA**
Significance: Notable
Location: Southampton Township
Description: A steep, south-facing slope that is south of a confluence with Bushy Run, this BDA contains a xeric central hardwood community, with species such as white oak, shagbark and sweet pignut hickory, shadbush, and deerberry; grasses and sedges grow abundantly.
Rare Occurrences: Xeric central hardwood community
Threats and Stresses: Activities that change water flow, increase nutrients, or disturb the slope
Recommendations: Work with landowner; pay attention to the conditions on the upland area.

13. **Upper Sweet Root Creek BDA**
Significance: Notable

Location: Monroe and Southampton townships
Description: At the base of Evitts Mountain, this BDA includes bands of limestone and limestone-rich soils along the valley edge. The road provides minimal competition from woody vegetation.
Rare Occurrences: One Pennsylvania endangered plant
Threats and Stresses: Activity associated with road maintenance; herbicide use on nearby agricultural fields
Recommendations: Convey this site's importance to landowners; alert township so that it can incorporate plant's requirements into maintenance schedules.

14. **Chaneysville East Barrens BDA**
Significance: Notable
Location: Southampton Township
Description: These barrens overlook the confluence of Wilson Run and Elk Lick Creek; some of the upper section of the slope, containing the barrens and the small tributaries, has been used as agricultural fields and pastures.
Rare Occurrences: Appalachian shale barren community
Threats and Stresses: Lack of sufficient buffer from upland fields; competition from pasture grasses and forbs out-competing native species
Recommendations: Convey importance of site to landowner; expand buffer on upper slopes; restrict pasturing from marginal and wooded area

15. **Martin Hill Saddle Wetlands BDA**
Significance: Notable
Location: Southampton Township, Buchanan State Forest
Description: A saddle between two high points on Tussey Mountain accumulating water in a series of small, shallow wetlands containing large patches of shrubs, sphagnum moss, and a canopy of red maple, black gum, and big-tooth aspen.
Rare Occurrences: Acidic shrub swamp community; one plant of special concern
Threats and Stresses: Ditching to drain roads; changes in groundwater flow due to surrounding impacts
Recommendations: Better study of the hydrology and additional surveys of the natural communities

16. **Pond Branch BDA**
Significance: Notable
Location: Southampton Township
Description: This BDA includes an old-growth forest patch of a Northern Conifer Forest Community, supporting a mountain stream draining to the Black Valley Branch of Town Creek. Contained in the BDA is an ephemeral natural pool community with rushes, bulrushes, and a ring of sphagnum moss.
Rare Occurrences: Northern forest conifer community; ephemeral natural pool community
Threats and Stresses: Loss of forest cover; gypsy moth and wooly adelgid infestations
Recommendations: Recognize BDA in any future management plan.

17. **Big Pond BDA**
Significance: Notable
Location: Southampton Township
Description: Occurring in a saddle depression between two high points below the crest of Tussey Mountain, this small pond contains vegetation such as marsh fern, bulrush, spike rush, mosses, and a plant of special concern.

Rare Occurrences: None
Threats and Stresses: Previous alterations; heavily cut forest (not providing enough shade); activities changing hydrology of pond
Recommendations: Further research to develop management goals

19. **Hewitt South Barrens #1 BDA**
Significance: Notable
Location: Southampton Township
Description: At the confluence of Black Valley Branch and the mainstem of Town Creek is a wide valley containing steep slopes of exposed shale bedrock, which makes up this BDA.
Rare Occurrences: A Pennsylvania rare plant
Threats and Stresses: Plant depends on steep slopes and rock outcrops limiting competition from other plants, and disturbance of plants or habitat are concerns
Recommendations: Work with landowners to develop strategy to protect the slopes.

20. **State Line Slopes BDA**
Significance: High
Location: Southampton Township
Description: A white-oak forested slope containing shaley soils located along a small tributary to Town Creek at the state line.
Rare Occurrences: One Pennsylvania endangered plant; two animal species of special concern
Threats and Stresses: Activities associated with road maintenance; pesticides
Recommendations: Work with township to convey significance of site and develop management strategy to address requirements of species of concern.

21. **Maple Run Wildland Area**
This approximately 2,000-acre area located within Green Ridge State Forest in Maryland contains excellent examples of shale barren communities. It is considered a wildland area and is entitled to special protection of its water quality, unique ecological communities, and opportunities for light recreational use.

22. **Town Creek Barrens LCA**
Significance: Important landscape feature containing exceptional, high, and notable BDAs
Location: Southampton Township
Description: The Town Creek Barrens LCA represents a group of shale barrens included in four BDAs. These BDAs are all close, are able to share genetic material, and function largely in relation to each other; the creek and the undeveloped nature of this area are key elements to this BDA.
Rare Occurrences: Many (included in individual descriptions of BDAs)
Threats and Stresses: Loss of habitat and barriers to dispersal (roads, utilities, mines, etc.); use of pesticides
Recommendations: Work with key landowners to protect majority of this LCA through watershed conservation practices, including those recommended in individual BDA sections.

23. **Sweet Root Gap DA**
Significance: Considered exceptional, for its ability to provide a higher degree of protection as a natural area within Sweet Root BDA
Location: Southampton Township
Description: Part of the Bureau of Forestry's Sweet Root Natural Area, it provides important interior-forest habitat, including an old-growth northern conifer forest community.
Rare Occurrences: Northern conifer forest community; Pennsylvania threatened animal

Threats and Stresses: Its irregular boundaries and small size may reduce the effectiveness of helping maintain the structure of the surrounding forest.
Recommendations: Extend natural area to include major tributaries to the north and a larger portion of the slopes and uplands.

24. **Pine Ridge Natural Area DA**
Significance: Excellent, as a representative mesic central forest community that will be important old-growth forest in the future
Location: Southampton Township
Description: Known as Pine Ridge Natural Area, this DA contains a mesic central forest community dedicated to protection by the hands-off management strategy of the Bureau of Forestry.
Threats and Stresses: Numerous open areas of past logging and surrounding fields, which could hinder the DA's importance in providing interior-forest habitat.
Recommendations: Limit the amount of edge habitat and provide important buffers on the west (commercial area) and east (agricultural land).

Potomac Bends

1. **Kasecamp Shale Barrens**

2. **Outdoor Club Shale Barrens**

Important Bird Areas

Pennsylvania was the first state to develop an Important Bird Area (IBA) program. Based on strict scientific criteria, a group of scientific advisors (known as the Ornithological Technical Committee) first selected 73 IBA sites encompassing over one million acres of public and private lands (PA Audubon). These areas include migratory staging areas, winter feeding and roost sites, and prime breeding areas for songbirds, wading birds, and other species. Though IBAs are granted no formal protections, they are a valuable means of educating the public about the importance of conservation. IBAs may be used by public agencies and private landowners to prioritize areas for conservation and set conservation objectives. Conserving habitat for birds can also serve to protect other species with similar habitat requirements.

In order to become an IBA, an area must be nominated and data must support its importance in one of the following: number and diversity of bird species, population of endangered and threatened species or species of special concern, representative or unique habitats, and long-term bird research.

Following the initial selection of 73 sites in 1998, subsequent IBAs were added, including the Greater Tussey Mountain IBA, which includes a portion of the Town Creek watershed. Greater Tussey Mountain is the 81st IBA in Pennsylvania and meets three of the criteria (Table 4-3). Tussey Mountain is one of the many ridges of the Ridge and Valley Province and is most notable for the spring migration of raptors, including golden eagles (PA Audubon). A large portion is composed of interior deciduous forest, and the IBA supports a diverse assemblage of breeding interior-forest, species such as Acadian flycatchers, cerulean warblers, worm-eating warblers, hooded warblers, and scarlet tanagers.

Approximately 55 percent of the 124,118-acre IBA is publicly owned (PA Audubon). Due to the large percentage in public ownership, the threat of fragmentation is minimal. However, management of public lands should consider the importance of this area to the IBA.

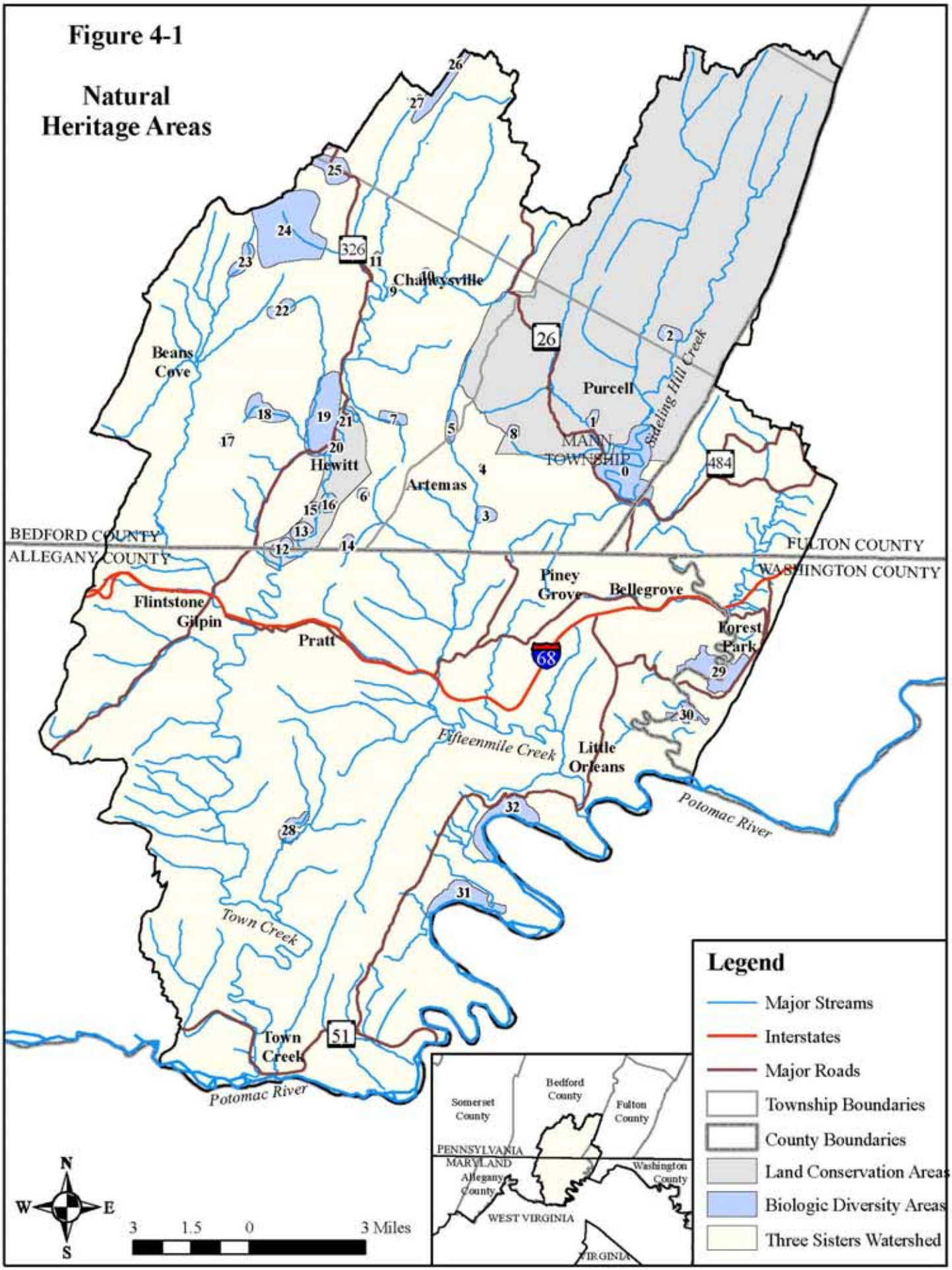


Figure 4-1
Natural Heritage Areas
Challeysville
Beans Cove
Hewitt
Artemas
Purcell
MANN TOWNSHIP
Sideling Hill Creek
BEDFORD COUNTY
ALLEGANY COUNTY
FULTON COUNTY
WASHINGTON COUNTY
Flintstone
Gilpin
Pratt
Piney Grove
Bellegrove
Forest Park
Fifteenmile Creek
Little Orleans
Potomac River
Town Creek
Town Creek
Potomac River
326
26
484
68
51
Legend
Major Streams
Interstates
Major Roads
Township Boundaries
County Boundaries
Land Conservation Areas
Biologic Diversity Areas
Three Sisters Watershed
Somerset County
Bedford County
Fulton County
PENNSYLVANIA
MARYLAND
Allegany County
Washington County
WEST VIRGINIA
VIRGINIA
N
W
E
S
3 1.5 0 3 Miles

Figure 4-1. Natural Heritage Areas

Map ID Number	Natural Heritage Area
0	Sideling Hill Creek BDA
1	Pine Creek Slope BDA
2	East Branch Tributary BDA
3	Artemas Barrens BDA
4	Lebanon Church Slopes BDA
5	Fifteenmile Creek Slopes BDA
6	Polish Mountain Slope BDA
7	Blues Gap BDA
8	Johnson Branch Headwaters BDA
9	Chaneysville East Barrens BDA
10	Wilson Run Slopes BDA
11	Elk Lick Creek Barrens BDA
12	State Line Slopes BDA
13	Hewitt South Barrens # 3 BDA
14	Polish Mountain South BDA
15	Hewitt South Barrens #2 BDA
16	Hewitt South Barrens #1 BDA
17	Big Pond BDA
18	Pond Branch BDA
19	Warriors Ridge BDA
20	Hewitt North Barrens #2 BDA
21	Hewitt North Barrens BDA
22	Martin Hill Saddle Wetlands BDA
23	Bear Gap Run BDA
24	Sweet Root Gap BDA
25	Rainsburg Gap BDA
26	Warriors Ridge North BDA
27	Upper Sweet Root Creek BDA
28	Maple Run Wildland Area
29	Sideling Hill Creek Md. Natural Area 2
30	Sideling Hill Creek Md. Natural Area 1
31	Outdoor Club Shale Barrens
32	Kasecamp Shale Barrens

Table 4-3. IBA Criteria Met by Great Tussey Mountain IBA

Criteria	Representative Characteristics
Exceptional concentration or diversity of birdlife	Spring migration site for 16 species of diurnal raptors including a high concentration of golden eagles
Representative rare, threatened, or unique habitats with birds characteristic of those habitats	Exceptional representative interior forest within the Ridge and Valley Physiographic Province
Site of long-term research and/or monitoring	Ongoing research includes spring raptor migration count and the breeding bird survey routes, two of which are almost entirely along the ridge

Species of Special Concern

Species of plants and animals are given rankings at the state and global levels based on the number of times the species has been documented in that geographic area. Most species have a rank assigned to them, even if they are not threatened or endangered. Table 4-4 describes the ranking systems used at the state and global levels. A species is commonly considered to be of "special concern" in Pennsylvania if it has a ranking of "vulnerable" or lower. The Pennsylvania Natural Heritage Program (PNHP) is responsible for collecting and managing data related to species in the state and establishing these rankings (PNHP). PNHP is a partnership among WPC, PA DCNR, and TNC. The Maryland Natural Heritage Program is responsible for tracking species in Maryland. Global ranks are assigned based on data collected at similar state offices nationwide as part of a network called NatureServe. Appendix G gives state and global rankings for species of concern.

Harperella, a federally endangered species

The Endangered Species Act of 1973 (and its amendments) provides broad protection for species of wildlife and plants, both in water (aquatic) and on land (terrestrial), that are listed as threatened or endangered in the United States or elsewhere. An endangered species is a species that is considered to be in danger of becoming extinct throughout its range. A threatened species is a species at risk of becoming endangered unless special action is taken. A candidate species is one that is proposed for listing as endangered or threatened at the state or local level by a state or federal agency. In Pennsylvania, threatened or endangered status is determined by the appropriate state agency. For instance, the Pennsylvania Game Commission is responsible for assigning state statuses to bird and mammal species, while the Pennsylvania Fish and Boat Commission is responsible for fish, amphibians, and reptiles. Because there is no state agency that oversees invertebrates, such as moths and butterflies, these species can only receive state-endangered or -threatened status if they are federally listed. Therefore, there may be some species that technically meet the state-endangered or -threatened requirements, but have not officially been given this designation.

Provisions are made for listing species, as well as for the development of recovery plans and the designation of critical habitat for listed species. As part of both federal and state acts, environmental assessments of properties for species of concern are required before large-scale building or development projects can be permitted. However, rather than stopping development altogether, changes in design or timing of construction often can be made to protect habitat for these species.

Subsequent sections list state and federal threatened and endangered species in each subwatershed. It is possible that a species may be considered endangered in one state and not the other because of the range of habitats available in that state. A species may also be ranked as federally endangered or threatened at the national level, with only a small number of occurrences in the entire country. In Maryland, a species may also be designated "In Need of Conservation," meaning that immediate action is needed to prevent the species from being added to the threatened list.

Table 4-4. State and Global Species Rankings

State Rank Codes		Global Rank Codes	
SX	Extirpated	GX	Presumed Extinct
SH	Historical	GH	Possibly Extinct
S1	Critically Imperiled	G1	Critically Imperiled
S2	Imperiled	G2	Imperiled
S3	Vulnerable	G3	Vulnerable
S4	Apparently Secure	G4	Apparently Secure
S5	Secure	G5	Secure
SU	Unrankable	GU	Unrankable
S?	Unranked	G?	Unranked
HYB	Hybrid	HYB	Hybrid
SE	Exotic		
SA	Accidental		
SZ	Zero Occurrence		
SP	Potential		
SR	Reported		
SRF	Reported Falsely		

Sideling Hill Creek Watershed

Species of concern within the Sideling Hill Creek watershed include a number of shale barren plants, such as mountain pimpernel and Harris' goldenrod (Table 4-5). Other plants, such as dwarf spiraea and marsh speedwell, are found in wetland depressions. Of note is the federally endangered harperella, and a plant species found in similar floodplain environments as harperella, sweet-scented Indian plantain. The green floater mussel, which is not found in any other subwatershed in the project area, is a regionally rare species mostly inhabiting ponded areas within streams of good to excellent water quality. The Allegheny woodrat is also a notable species found here.

Table 4-5. Threatened and Endangered Species in the Sideling Hill Creek Watershed

Scientific Name	Common Name	State Status	Federal Status
Plants			
Adlumia fungosa	climbing fumitory	MD threatened	no status
Amelanchier stolonifera	running juneberry	MD threatened	no status
Arctostaphylos uva-ursi	bearberry	MD endangered	no status
Astragalus canadensis	Canada milkvetch	MD endangered	no status
Calamagrostis porteri	Porter's reedgrass	MD endangered	no status
Carya laciniosa	big shellbark hickory	MD endangered	no status
Diplazium pycnocarpon	glade fern	MD threatened	no status
Euphorbia obtusata	blunt-leaved spurge	MD endangered	no status
Hasteola suaveolens	sweet-scented Indian plantain	MD endangered	no status
Iris cristata	crested iris	MD endangered	no status
Iris cristata	crested dwarf iris	PA endangered	no status
Lysimachia hybrida	lowland loosestrife	MD threatened	no status
Melica nitens	three-flowered melicgrass	MD threatened	no status
Minuartia michauxii	rock sandwort	MD threatened	no status
Phlox subulata ssp. brittonii	moss pink	PA endangered	no status
Polygala polygama	racemed milkwort	MD threatened	no status

Table 4-5. Threatened and Endangered Species in the Sideling Hill Creek Watershed (continued)

Scientific Name	Common Name	State Status	Federal Status
Plants (continued)			
Polygala senega	Seneca snakeroot	MD threatened	no status
Potamogeton tennesseensis	Tennessee pondweed	PA endangered	no status
Prunus alleghaniensis	Allegheny plum	MD threatened	no status
Ptilimnium nodosum	harperella	MD endangered	endangered
Senecio antennariifolius	cat's-paw ragwort	PA endangered	no status
Solidago arguta var. harrisii	Harris' goldenrod	PA endangered	no status
Spiraea betulifolia	dwarf spiraea	PA threatened	no status
Stellaria alsine	trailing stitchwort	MD endangered	no status
Taenidia montana	mountain pimpernel	MD threatened	no status
Trifolium virginicum	Kate's mountain clover	MD threatened	no status
Veronica scutellata	marsh speedwell	MD endangered	no status
Woodsia ilvensis	rusty woodsia	MD threatened	no status
Zanthoxylum americanum	northern prickly-ash	MD endangered	no status
Birds			
Dendroica fusca	Blackburnian warbler	MD threatened	no status
Mammals			
Neotoma magister	Allegheny woodrat	MD endangered	no status
Miscellaneous Invertebrates			
Calephelis borealis	northern metalmark	MD threatened	no status
Cicindela ancocisconensis	a tiger beetle	MD endangered	no status
Satyrium edwardsii	Edwards' hairstreak	MD endangered	no status
Erynnis martialis	mottled duskywing	MD endangered	no status
Fixsenia ontario	northern hairstreak	MD endangered	no status
Mussels			
Alasmidonta undulata	triangle floater	MD endangered	no status
Lasmigona subviridis	green floater	MD endangered	no status
Alasmidonta heterodon	dwarf mussel	MD endangered	endangered

Fifteenmile Creek Watershed

The Fifteenmile Creek watershed hosts one of the largest populations of endangered harperella. This species is sensitive to changes in flow regime and invasive species, which pose a threat to the watershed. Another notable species of concern is the Maryland endangered Appalachian grizzled skipper. Once considered a subspecies of the southern grizzled skipper, the Green Ridge State Forest is one of the premier areas to see this butterfly, which is thought to be declining due to gypsy moth applications. The species is found in sparsely grassy and barren habitats adjacent to oak and pine forests containing its host plant, dwarf cinquefoil (*Potentilla Canadensis*). Table 4-6 lists threatened and endangered species for the watershed.

Table 4-6. Threatened and Endangered Species in the Fifteenmile Creek Watershed

Scientific Name	Common Name	State Status	Federal Status
Plants			
Astragalus distortus	bent milkvetch	MD threatened	no status
Carex pedunculata	long-stalked sedge	MD endangered	no status
Dicentra eximia	wild bleeding-heart	MD threatened	no status
Dryopteris campyloptera	mountain wood-fern	MD endangered	no status
Euphorbia obtusata	blunt-leaved spurge	MD endangered	no status
Hieracium traillii	Maryland hawkweed	PA endangered	no status
Lithospermum latifolium	American gromwell	PA endangered	no status
Lonicera canadensis	Canada honeysuckle	MD endangered	no status
Lupinus perennis	wild lupine	MD threatened	no status
Matelea obliqua	climbing milkweed	MD endangered	no status
Melica nitens	three-flowered melicgrass	MD threatened	no status
Melica nitens	three-flowered melicgrass	PA threatened	no status
Minuartia michauxii	rock sandwort	MD threatened	no status
Oryzopsis asperifolia	white-fruited mountainrice	MD threatened	no status
Parthenium integrifolium	American feverfew	MD endangered	no status
Polygala polygama	racemed milkwort	MD threatened	no status
Polygala senega	Seneca snakeroot	MD threatened	no status
Prunus alleghaniensis	Alleghany plum	MD threatened	no status
Ptilimnium nodosum	harperella	MD endangered	endangered
Scutellaria leonardii	Leonard's skullcap	MD threatened	no status
Smilacina stellata	star-flowered false Solomon's seal	MD endangered	no status
Solidago arguta var. harrisii	Harris' goldenrod	PA endangered	no status
Symphoricarpos albus	snowberry	MD threatened	no status
Taenidia montana	mountain pimpernel	MD threatened/ PA endangered	no status
Zanthoxylum americanum	northern prickly-ash	MD endangered	no status
Trifolium virginicum	Kate's Mountain clover	MD threatened/ PA endangered	no status
Valerianella chenopodiifolia	goose-foot cornsalad	MD endangered	no status
Birds			
Thryomanes bewickii altus	Bewick's wren	MD endangered	no status

Table 4-6 Threatened and Endangered Species in the Fifteenmile Creek Watershed (continued)

Scientific Name	Common Name	State Status	Federal Status
Miscellaneous invertebrates			
Calephelis borealis	northern metalmark	MD threatened	no status
Cicindela ancocisconensis	a tiger beetle	MD endangered	no status
Pyrgus wyandot	Appalachian grizzled skipper	MD endangered	no status
Satyrium caryaevorum	hickory hairstreak	MD endangered	no status

Town Creek Watershed

The Town Creek watershed is home to a number of shale barren plants, several birds of concern, and the Allegheny woodrat (Table 4-7). Of specific note is the Pennsylvania threatened evening primrose, a member of the primrose family that is adapted to hot, shale barren environments. This flower is found only in shale barren environments of southern Pennsylvania, southern Virginia, and West Virginia and is found at 12 locations in Pennsylvania. Evening primroses are erect herbs with alternate leaves and yellow flowers two inches wide. The shale barren primrose opens at twilight, from June to October. The unusual butterflies and moths found in shale barren habitats pollinate this species. The presence of the southern pine looper moth and southern grizzled skipper have been confirmed in the watershed, and many other lepidopterans likely frequent these shale barren habitats in the watershed. Threats to the evening primrose are road expansion, right of way maintenance, and quarrying.

Another unique species found within the Town Creek watershed is the Appalachian cave spider. Little is known about this orange-colored troglobite. Troglobite is a word used to describe animals that are specially adapted to a cave environment. These species are sensitive to groundwater pollution and hydrological alterations associated with development.

Table 4-7. Threatened and Endangered Species in the Town Creek Watershed

Scientific Name	Common Name	State Status	Federal Status
Plants			
Adlumia fungosa	climbing fumitory	MD threatened	no status
Agrimonia striata	woodland agrimony	MD endangered	no status
Alnus viridis	mountain alder	PA endangered	no status
Bromus latiglumis	broad-glumed brome	MD endangered	no status
Carex schweinitzii	Schweinitz's sedge	PA threatened	no status
Delphinium exaltatum	tall larkspur	PA endangered	no status
Dicentra eximia	wild bleeding-heart	MD threatened/ PA endangered	no status
Gentiana andrewsii	fringe-tip closed gentian	MD threatened	no status
Ligusticum canadense	nondo lovage	PA endangered	no status
Lithospermum latifolium	American gromwell	PA endangered	no status
Melica nitens	three-flowered melicgrass	MD threatened/ PA threatened	no status
Minuartia michauxii	rock sandwort	MD threatened	no status
Oenothera argillicola	shale barren evening primrose	PA threatened	no status

Table 4-7. Threatened and Endangered Species in the Town Creek Watershed (continued)

Scientific Name	Common Name	State Status	Federal Status
Plants (continued)			
Parthenium integrifolium	American feverfew	MD endangered	no status
Paxistima canbyi	Canby's mountain lover	MD endangered	no status
Prunus alleghaniensis	Alleghany plum	MD threatened	no status
Ruellia strepens	rustling wild petunia	MD endangered	no status
Scirpus ancistrochaetus	northeastern bulrush	PA endangered	no status
Scutellaria leonardii	Leonard's skullcap	MD threatened	no status
Solidago arguta var. harrisii	Harris' goldenrod	PA endangered	no status
Spiraea betulifolia	dwarf spiraea	PA threatened	no status
Spiranthes ochroleuca	yellow nodding lady's tresses	MD endangered	no status
Symphoricarpos albus	snowberry	MD threatened	no status
Taenidia montana	mountain pimpernel	MD threatened/ PA endangered	no status
Thalictrum coriaceum	thick-leaved meadow-rue	PA endangered	no status
Trifolium virginicum	Kate's Mountain clover	MD threatened/ PA endangered	no status
Woodsia ilvensis	rusty woodsia	MD threatened	no status
Birds			
Accipiter gentilis	northern goshawk	MD endangered	no status
Dendroica fusca	Blackburnian warbler	MD threatened	no status
Mammals			
Neotoma magister	Allegheny woodrat	PA threatened	no status
Miscellaneous Invertebrates			
Calephelis borealis	northern metalmark	MD threatened	no status
Pyrgus wyandot	Appalachian grizzled skipper	MD endangered	no status
Mussels			
Alasmidonta varicosa	brook floater	MD endangered	no status

Potomac Bends

Though small in size, the Potomac Bends tributaries contain a high level of diversity (Table 4-8). This can be explained, in part, by the high number of shale barrens in this small geographic area. Of note is Kate's Mountain clover, first described in the 1800s on Kate's Mountain in West Virginia. The one-foot tall plant has narrow, clover-like leaflets and round white flowers. Mountain pimpernel is another species of concern found within the project area that was first identified on Kate's Mountain.

Also within the Potomac Bends, as well as Town Creek and Sideling Hill Creek, is the Allegheny woodrat, likely one of the most fascinating species of concern listed for the project area. Once abundant in the eastern United States, the woodrat's habitat primarily includes south-facing caves and rocky outcrops. Since 1920, the species has experienced a mysterious and drastic decline in numbers. Its decline

has been attributed to a variety of factors, including the effects of habitat disturbance, the chestnut blight, and raccoon roundworms. Its unique life history has made the species particularly vulnerable. Within Pennsylvania, the species is found sporadically throughout the Ridge and Valley Province and is relatively abundant within the project area (compared to other areas). In Maryland, the species is only found in a small western portion.

Table 4-8. Threatened and Endangered Species in the Potomac Bends Watershed

Scientific Name	Common Name	State Status	Federal Status
Plants			
Astragalus distortus	bent milkvetch	MD threatened	no status
Bromus latiglumis	broad-glumed brome	MD endangered	no status
Cinna latifolia	slender wood reedgrass	MD threatened	no status
Diarrhena americana	twin oats	MD endangered	no status
Euphorbia obtusata	blunt-leaved spurge	MD endangered	no status
Matelea obliqua	climbing milkweed	MD endangered	no status
Melica nitens	three-flowered melicgrass	MD threatened	no status
Minuartia michauxii	rock sandwort	MD threatened	no status
Prunus alleghaniensis	Alleghany plum	MD threatened	no status
Scutellaria leonardii	Leonard's skullcap	MD threatened	no status
Symphoricarpos albus	snowberry	MD threatened	no status
Taenidia montana	mountain pimpernel	MD threatened	no status
Paronychia virginica var. virginica	yellow nailwort	MD endangered	no status
Trifolium virginicum	Kate's Mountain clover	MD threatened	no status
Triosteum angustifolium	narrow-leaved horse-gentian	MD endangered	no status
Birds			
Thryomanes bewickii altus	Bewick's wren	MD endangered	no status
Mammals			
Neotoma magister	Allegheny woodrat	MD endangered	no status
Miscellaneous Invertebrates			
Calephelis borealis	northern metalmark	MD threatened	no status
Fixsenia ontario	northern hairstreak	MD endangered	no status
Mussels			
Alasmidonta varicosa	brook floater	MD endangered	no status

Conservation Concerns

Current and Historical Land-Use Practices

During the Industrial Revolution, which was the very late 1800s and early 1900s, most forests within the project area were clear-cut or selectively cut for hemlock and white pine. Since that time, most of the forestland has regenerated. However, the hemlock presence has not returned to its original abundance. Today, forests are comprised of trees of nearly the same age (approximately 70–100 years old). Both young, early-successional trees and old-growth trees are largely absent. These forests will reach maturity

at nearly the same time, creating landscapes with trees more susceptible to disease and with less young forest available to harvest in the future.

Forest management should consider the importance of maintaining forests of different age classes while incorporating sustainable forestry management techniques. One of the biggest threats to forest resources is poor forestry management. High-grading, or the practice of removing only the best-quality trees from a forest, is common in the project area. In this case, the trees that remain to regenerate are weaker, less healthy trees. Other methods, such as seed tree, or shelterwood, may be better for forests in the long-term and result in more economic returns. Shelterwood refers to a heavy thinning in which some trees are left uncut to provide a seed source for regeneration. Seed tree is similar to a shelterwood cut, except fewer trees are left for regeneration purposes and these trees are often cut after regeneration is established (North Carolina Cooperative Extension Agency 2001).

Forest management within the project area faces many challenges but should take into consideration past land use, topography, forest age, the ability of the forest to regenerate, the impact of disease, and reducing the impact of whitetail deer. Forested floodplains may be particularly vulnerable to logging pressures because they may contain high-quality timber; however, such practices can negatively impact streambanks and wildlife corridors and contribute to the spread of invasive species.

Past plowing can also have a significant effect on forests by changing the soil composition, which can take centuries to develop. Forests where significant plowing has occurred may have less-defined soil horizons and altered nutrient cycling, which can ultimately impact forest communities. Although agricultural practices are currently a low threat, evidence suggests that they may be causing high nutrient loads and habitat degradation in some areas of stream (more information in the Water Resources chapter). Every effort should be made by local municipalities and conservation organizations to have farmers employ best management practices and take advantage of incentive programs.

Development Pressures

The project area is vulnerable to development, largely due to its location along key transportation arteries connecting urban centers in Baltimore, Md. and Washington, D.C. The Cacapon-Town Creek watershed, which is a larger area containing the project area, saw a 31 percent increase in developed areas from 1982 to 1997 (Ingerson 2002). However, development still remains minimal. Despite this, it could be an issue in the near future as many people move to the area for second homes. Between 1980 and 2000, the number of second homes in the area grew an estimated 25 percent (Ingerson 2002). Much of Allegany County, Md. is zoned for commercial and urban/mixed use. Washington County, which contains a low percentage of the watershed but may be indicative of future trends in the region, lost nearly 19,000 acres of forestland between 1986 and 1999, largely due to development (Ingerson 2002). The population of the county increased by 8.5 percent between 1976 and 1991 and by 12 percent between 1991 and 2002, while the population of Allegany County actually decreased.

Because much of the forested land within the watershed is public land, the land use most vulnerable to development is agricultural. Maryland is losing an average of 8,600 acres per year of agricultural fields and wildlife habitat to development (Zumbrun, personal communication 2006). That is equivalent to losing green space the size of Green Ridge State Forest every seven years (Zumbrun, personal communication 2006). As farming becomes less profitable, family farms may increasingly be sold for residential homes. Farm earnings have decreased significantly in recent years. There are several tools available to help local areas maintain a rural character. The Pennsylvania Agland Conservation Easement Program was designed to allow state, county, and local governments to purchase development rights, or easements, on agricultural lands (PA Farmland Preservation Association 2004). Pennsylvania counties in the program have appointed agricultural land preservation boards, with a state board created to oversee this program. Another preservation tool that has mixed success is the use of transferable development

rights, or TDRs, which allow developers in "growth" areas to purchase development rights from landowners in "preservation" areas in exchange for increased building density. However, this tool is not currently being used within the project area and has been proven to be profitable mainly in more-developed areas.

Invasive Species

Invasive species are nuisance plant or animal species that spread quickly and easily crowd out native, or resident, species. Invasive plant species thrive on disturbance, such as removal of native communities, exposure to sunlight and nutrient-enriched conditions, and altered water flows. Some of the most serious invasive species in Pennsylvania include Japanese knotweed *(Polygonum cuspidatum)*, multiflora rose (*Rosa multiflora*), and autumn olive (*Elaeagnus umbellate*). Japanese knotweed is not yet a serious invader in the watershed, but it can spread quickly in disturbed areas along streams and has been found downstream along the Potomac River, the C&O Canal National Historical Park, and mouths of tributaries entering the Potomac. Though not as common in the project area as in much of Pennsylvania, multiflora rose and autumn olive have the potential to spread to abandoned farm fields and forest areas (DCNR[2]). Multiflora rose and exotic honeysuckle (*Lonicera spp.*) may already be impacting riparian zone communities, which may harbor rare plants and the rare tiger beetle (TNC 2004).

The most significant invasive species threats include species such as *Ailanthus* and *Microstegium* (TNC 2004). *Ailanthus* grows in forest openings, taking the place of other species, and can be brought in on logging equipment. Studies have shown that forests with *Microstegium*, a highly invasive grass species, have thinner organic soil horizons and higher soil pH than uninvaded areas. In the future, *Microstegium* on the exposed cobble or sand bars in the creek could replace the federally endangered species, harperella (TNC 2004).

Also of special concern is the impact of invasive species on shale barren communities. A study completed by TNC in 1996 showed that shale barren communities with rare species are most vulnerable to invasives. Species such as spotted knapweed (*Centaurea maculosa*), brome grass (*Bromus sterilis*), garlic mustard (*Alliaria petiolata*), crownvetch (*Coronilla varia*), butter and eggs (*Linaria vulgaris*), Japanese honeysuckle (*Lonicera japonica*), black bindweed (*Polygonum convolvulus*), and common mullein (*Verbascum thapsus*) are considered threats to these communities (TNC 2004).

The best way to control invasive plant species is to keep natural landscapes intact by utilizing methods including forestry BMPs, using fertilizers properly, and maintaining natural stream flows. Once invasive species are found, it is best to remove them manually by cutting or pulling, and to replace them with native plants. If they become overly abundant, many species can be removed by experts with chemical and/or mechanical removal. Control of invasive animal species is even more difficult and usually involves the introduction of natural predators.

Forest within Billmeyer WMA showing healthy understory regeneration

Deer Overbrowsing

The impact of deer on forest regeneration should be given consideration when managing a forest (Latham et al. 2005). Unfortunately, due to high densities of whitetail deer, forest regeneration can be poor, even with forestry management techniques. It is estimated that deer populations in Bedford County are 15–45 percent above densities needed to maintain healthy forest management (DCNR[1]), which is not as high as much of Pennsylvania but may still inhibit forest regeneration.

Table 4-9. Serious Invasive Species Threats in Southcentral Pennsylvania (Source: PA DCNR)

Scientific Name	Common Name
Alliaria petiolata	garlic mustard
Carduus nutans	musk thistle
Cirsium arvense	Canada thistle
Cirsium vulgare	bull thistle
Datura stramonium	jimsonweed
Lythrum salicaria, virgatum	purple loosestrife
Microstegium vimineum	Japanese stilt grass
Phragmites australis	common reed
Polygonum cuspidatum	Japanese knotweed
Sorghum bicolor spp. Drummondii	shattercane
Sorghum halepense	Johnson grass
Elaeagnus umbellata	autumn olive
Lonicera maackii	Amur honeysuckle
Lonicera morrowii	Morrow's honeysuckle
Lonicera tartarica	Tartarian honeysuckle
Rosa multiflora	multiflora rose
Ailanthus altissima	tree of heaven
Celastrus orbiculatus	Oriental bittersweet
Lonicera japonica	Japanese honeysuckle

As a result of overpopulation of whitetail deer, the diversity of understory vegetation has decreased in many cases. Ferns dominate, and forests may take on a park-like appearance. Fire once burned through the forests on a regular basis and kept thin bark species, such as red maple, from being dominant. Because deer prefer oaks and fires are now suppressed, many forests in the area are dominated by red maple. Deer exclosures, though they can be expensive, may provide some success. In 2004–2005, the Pennsylvania Game Commission began the Deer Management Assistance Program, in which hunters receive coupons to harvest antlerless deer on specific public and private lands enrolled in the program. This program may increase the ability of landowners to manage deer on their properties.

Acid Deposition

Acid deposition appears to be significantly impacting natural communities within the project area. The Maryland Biological Stream Survey found that fish presence decreased drastically in sites with low acid-neutralizing capacity, or ability to buffer changes in pH from acid deposition. Recent studies showed that nearly 25 percent of the streams within the Town Creek watershed and over 50 percent of streams within the Sideling Hill Creek watershed in Pennsylvania did not meet standards for alkalinity, a measure of acid-neutralizing capacity (RVS 2001a; RVS 2001b).

Acid rain can have a negative impact on terrestrial wildlife as well. The positively charged ions in acid rain can cause negatively charged ions that are important for forest health, such as magnesium and calcium, to leach out of the soil. Acid rain damages leaves by disrupting the process of evapotranspiration and gas exchange, making plants more vulnerable to disease. It also causes toxic metals, such as zinc, copper, and aluminum, which have been taken up by plants from the atmosphere, to be released into soil and streams. These metals can stunt forest growth (Bourodimos 1974).

The primary causes of acid rain are sulphur dioxides and nitrogen oxides from smokestacks and motor vehicles. Compared to other types of environmental problems, people often feel helpless in the effort to stop acid rain. However, some actions have been successful. For instance, sulphur dioxide emissions have been reduced by at least 40 percent in most states since 1980 due to an innovative cap and trade program, which limits the amount of sulphur dioxide pollution a coal plant can produce. However, no such cap program has been implemented for nitrogen oxides from power plants, and therefore acid rain has not been reduced significantly (U.S. EPA[1]).

Individual choices to reduce energy usage can have a cumulative effect on reducing these compounds that cause acid rain. Encouraging state representatives to support legislation that toughens emission requirements for nitrogen oxides is also important.

Conservation Strategies

Conservation Action Planning

Conservation Action Planning (CAP) is a methodology developed by TNC for implementing and measuring the success of conservation projects. It has been used in parks, reserves, and conservation areas around the world. TNC began using CAP in a 140,000-acre landscape, which it calls Allegany Forests, approximately five years ago. This area included the Sideling Hill Creek and Fifteenmile Creek watersheds and a large portion of Town Creek watershed.

Though TNC has been using CAP in the Allegany Forests for many years, much of this work has been in the Maryland portion. In 2005, TNC began working more closely with WPC to reassess CAP efforts in both Pennsylvania and Maryland. This involved a series of workshops that continued into 2006. These workshops included the development of additional strategies and specific timelines for completing work. The extent of the project area was also expanded to include the entire Town Creek, Sideling Hill Creek, and Fifteenmile Creek area and key forested areas in the Buchanan and Green Ridge state forests, including those falling outside of these three watersheds. An inherent characteristic of CAP is that it is constantly being revisited to incorporate new threats and findings.

CAP involves a number of key steps, which TNC and WPC are utilizing for the project area. These include:

- Developing a **project team** to engage in the CAP process and implementation of CAP objectives.
- Identifying a **vision**, **scope**, and list of **targets** for the project area.
- Assessing the viability, or **health of the targets** by developing indicators of health and indicator rankings.
- Identifying critical **threats** to the targets.
- Conducting **situational analysis**, which involves creating diagrams that show the relationships among threats, targets, and factors driving the threats.
- Developing **strategies**, or possible ways of addressing the threats.
- Developing a list of **measures** to determine whether implemented actions are working or not working.

Much of what has been identified through CAP has been discussed in this watershed conservation plan, though reference to CAP is not mentioned specifically. Appendix H gives more specific information about conservation strategies developed, as well as a situational analysis diagram highlighting the CAP process for the Allegany Forests Project area.

The efforts of WPC and TNC may have significant implications for the future of the project area, especially if these agencies are able to utilize their resources to successfully work with local governments and private and public landowners.

Needs for the Future

Additional Biodiversity Surveys

Despite the attention that has been drawn to the project area, the need still exists to further investigate the status of biodiversity within the Sideling Hill Creek, Town Creek, and Fifteenmile Creek watersheds. For instance, the spotted skunk (*Spilogale putorius*) has not been documented in the watershed for over 40 years, and further information is needed about this species' status. Also needed is better documentation of the status and protection of current and historical Allegheny woodrat sites, since they often return to unoccupied sites.

In 1998, WPC conducted plant surveys within the watershed and updated records of species of special concern. However, there are many plant species that were not found during these recent inventories and further documentation of their status is needed. This includes species such as Tennessee pondweed (*Potamogeton tennesseensis*) and Bayard's malaxis (*Malaxis bayardii*). Also, in the Maryland portion, further documentation is needed of current locations for federal plant species of special concern, Canby's mountain love, or *Paxistima canbii*.

Finally, of great interest are invertebrate animal species. Several of the butterflies that utilize shale barren habitats are of global concern, such as the southern grizzled skipper (*Pergus wyandot*) and a noctuid moth (*Properigea sp.).* However, in many cases, little is known about the biology of these species or their status within the project area. There may also be additional butterflies that have not been identified. In addition, several species of clubtail dragonflies that are of concern in Pennsylvania prefer pristine streams such as those in the project area, but little investigation has been made of these species. In order to make wise management decisions, it will be important to have records of the locations and special needs of many of these species.

Harperella Studies

Harperella is a federally endangered species found within the watershed, for which few known locations exist. Even though this species has been found only in the Maryland portion of the Sideling Hill Creek watershed, activities upstream in Pennsylvania also affect the health of this population. The National Park Service has been conducting efforts to re-establish harperella at the C&O Canal National Historic Park. Further investigation of this species, including an understanding of potential threats, would be useful. This may include mapping the species' distribution over time in order to understand dispersal patterns.

Protection of Biological Diversity Areas

In 1998, WPC wrote a Natural Heritage Inventory for Bedford County, Pennsylvania. This inventory has been discussed in this chapter, detailing important places in need of conservation within the watershed. However, the NHI has not been well utilized by municipalities or organizations. The potential exists to develop a mechanism for monitoring the health of BDAs, such as through a volunteer stewardship program, and to develop an incentive program for landowners to protect BDAs.

Invasive Species Management

In general, invasive species have not had a huge impact on the project area. As a result, there may be more of an opportunity to prevent the spread of these species in the future. Species such as *Microstegium*, though currently not of great concern, may pose a specific future threat to shale barren communities and

certain types of forest. Developing a program to understand and remove invasive species could be beneficial at this initial stage.

Forest Health

Though a large portion of the project area is forested, further investigation is needed of the health of the forest and possible management techniques and mechanisms for maintaining it. Some important questions that need to be addressed are: what is the percent of riparian zones that are forested, and are there priority areas where riparian zones are needed to protect streams and wildlife?; what is the percent of intact, healthy forest present, and how much is needed to support current wildlife?; and what percent of forest cover is in various successional stages and how will this affect the future health of forests within the project area?

Management Recommendations:

Goal 4-1. Conserve the watershed's native biodiversity through monitoring, planning, and protection strategies.

Develop stronger partnerships among organizations working within the watershed to discuss threats to natural resources and develop protection strategies; this may include regular meetings with multiple conservation groups.	High
Provide educational programs for municipal and county officials about land-use planning and other tools that incorporate conservation goals into making communities more attractive and protecting biodiversity.	High
Educate citizens about biological diversity and the vital importance of habitats in protecting species.	Medium
Develop more detailed management plans by working with landowners of biologically diverse areas, including inventories of natural features and invasive or exotic species monitoring plans for the properties.	Medium
Provide educational field trips to elected officials emphasizing natural resources and the value of those resources to the region.	Medium
Develop a land steward program for biological diversity areas through which volunteers would be responsible for regular monitoring of these areas and educating landowners.	Medium
Encourage local Pennsylvania residents to contact a Pennsylvania Game Commission biologist to develop a wildlife management plan for their property.	Medium
Educate the public about the use and purpose of Natural Heritage Inventories in planning, with an additional focus on understanding the importance of the natural resources that exist.	Low

Goal 4-2. Implement specific strategies to conserve rare and unique communities, flora, and fauna located within the watershed.

Prioritize and select shale barren communities for protection through public land management opportunities and private land acquisition and easement.	High
Work to understand the ecology of harperella and mitigate threats to this species, such as altered hydrologic cycles and invasion by Japanese stiltgrass.	High
Protect or improve habitats that support threatened and endangered species and species of concern through acquisition, easements, and/or landowner education.	Medium
Identify important riparian habitats for protecting tiger beetles and work to implement targeted strategies for controlling invasive Japanese knotweed in these areas.	Medium
Ensure that forest management practices take into account, and are consistent with, the ecological and geographic requirements of Allegheny woodrat populations.	Medium

Ensure that forest management practices take into account, and are consistent with, the ecological and geographic requirements of Camby's mountain lover populations.	Low

Goal 4-3. Utilize and improve County Natural Heritage Inventories.

Conduct additional studies to monitor biodiversity, including surveys for historical species of concern for which the current status is unknown, in conjunction with the Pennsylvania and Maryland Natural Heritage Programs.	Medium
Incorporate Natural Heritage Inventories into municipal plans.	Medium
Study and expand areas to be included in County Natural Heritage Inventories as Biological Diversity Areas.	Low
Update the Bedford County Natural Heritage Inventory, organizing it by watersheds and making it user friendly.	Low

Goal 4-4. Protect and improve wildlife habitats.

Increase habitat by planting riparian buffers or allowing them to grow back, through streambank fencing programs.	High
Encourage streamside-property owners to leave a buffer from the edge of the stream when mowing their lawn.	Medium
Improve aquatic life for fish, mussels, and other organisms by implementing best management practices and other restoration activities.	Medium
Promote the preservation of riparian areas through education about their benefits for wildlife, flood prevention, and groundwater supplies.	Medium
Work with utility companies to limit herbicide use and to utilize management techniques in rights-of-way, which may harbor at-risk butterfly and moth species.	Low

Goal 4-5. Minimize the spread of exotic and invasive species and increase use of native plantings.

Develop an eradication or control strategy for removing invasive species, especially from high-quality areas or areas where an invasive species is expanding its territory.	High
Encourage the use of native plants in landscaping and wildlife habitat plantings.	High
Promote native tree plantings in streambank fencing projects.	High
Conduct a watershed-wide invasive species plant survey by subwatershed to develop a list of areas where invasive species pose the greatest threats to biodiversity.	Medium
Increase funding to control the hemlock wooly adelgid on ecologically important hemlock stands on private lands.	Medium
Develop monitoring plans for invasive species on private properties by working with landowners, especially those whose properties contain high-quality natural communities.	Medium
Compile an Internet database of exotic and invasive species sightings that can be accessed and added to by the public.	Low

Goal 4-6. Promote and utilize deer management strategies that protect the watersheds' natural resources.

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

CHAPTER 5. CULTURAL RESOURCES

Archaeological and Historical Resources

Settlers cutting ice in Mann Township
(photo courtesy of Eloise Vance)

Historical Overview

Settlement

The first European explorers to the Three Sisters watershed area arrived circa 1630. Prior to their arrival, various Native American tribes and nations utilized the area for hunting and farming ground. During the early settlement period, conflicts between settlers and Native Americans were common. Around 1710, an English party from eastern Virginia settled in Bedford County. The first pioneers settled in the Fulton County region as early as 1719.

When Bedford County was established in 1771, it included a large area throughout central and western Pennsylvania. Smaller areas split from Bedford County, and by 1850, 26 different counties had formed from the original Bedford County. Fulton County (one of the new counties) was created in 1850 from the eastern edge of Bedford County. Originally, the new county name was going to be Liberty, but instead was named after Robert Fulton, inventor of the steamboat (Fulton County, Pennsylvania).

In Maryland, Washington County (named for George Washington) was created from Fredrick County by resolve of the Constitutional Convention of 1776. In 1789, Allegany County was formed from Washington County and included present day Garrett County. The name Allegany is derived from the Native American word "Allegiwi," which means "beautiful stream" (Allegany County Maryland Planning Department 2002a).

During the 1700s, settlers were drawn to the region by the natural resources, waterways, rich farmland, and free land grants. These early settlers appreciated the value of owning their own land. They cleared the land for farming and built barns, homes, churches, and schools. The abundance of timber in number, girth, and quality gave birth to a forestry industry, which has thrived into the 21st century.

Early settlers had a great respect for education. In 1766, the first one-room school in Monroe Township was operated in a log cabin (Monroe Township Comprehensive Plan 2004). One-room schools were eliminated around 1950 and consolidated into larger school districts.

After settling in an area, some families created their own churches and cemeteries (Monroe Township Comprehensive Plan 2004). The Three Sisters watershed has numerous family cemeteries within its boundaries. Shreve's Chapel on Big Creek Road and Robinsonville Methodist Church on Robinsonville Road are just two of the remaining cemeteries.

Southampton Township was formed in 1799, with the current boundaries being set after Monroe Township seceded in 1840 and Mann Township seceded in 1876. Southampton is the second-largest township by square mileage, but the least populated (Southampton Township Comprehensive Plan 2004). One-third of the township is designated as state forest or state game lands.

Monroe Township, which had already been settled earlier by a few families, was formed in 1840 when it split off from Southampton Township. This largest township in Bedford County is comprised mostly of wilderness (Monroe Township Comprehensive Plan 2004).

Union Township was settled in 1770. It was not officially formed into a township until January 1864 when it separated from Bethel Township. The majority of the founding residents–47 percent–were of German descent.

Mann Township, named after the Honorable Job Mann, became its own township in December 1876 after it separated from Southampton Township.

Pre-industrial

Agriculture was the predominant activity during the early settlement period after the timber was removed. In 1794, rye and wheat were the chief products for the farmers. Many farmers were Scots-Irish or German immigrants and used their crops to create whiskey, ale, and beer, which could be transported easily and sold for cash (Mann Township Comprehensive Plan 2004). When the federal government imposed a tax on their cash commodity, many of the farmers supported the Whiskey Rebellion. They felt that the tax was unjust, oppressive, and discriminating against their way of life. One keg of whiskey was equivalent to 24 bushels of rye and wheat (Mann Township Comprehensive Plan 2004).

In 1728, Joseph Powell led a group of 13 settlers, comprised of trappers, hunters, and millwrights, into the valley surrounding Town Creek (Southampton Township Comprehensive Plan 2004). These men knew how to carve farmland out of the surrounding wilderness. Powell set up a trading post along Sweet Root Creek near an area now known as the old Iroquois Indian Trail (Southampton Township Comprehensive Plan 2004).

Robert Fleehart, one of the early settlers that came to the region with Joseph Powell, built the first mill in the area near Sweet Root (Southampton Township Comprehensive Plan 2004). A second mill, which utilized Town Creek for power, was built in 1731 by John Spergen. It was over 150 years old when it was destroyed by floodwaters in 1889 (Southampton Township Comprehensive Plan 2004).

Michael Huff, another early settler, mined a saltpeter (potassium nitrate) cave near Sweet Root Creek for Jacob Rowland, who made gunpowder for the Continental Army during the Revolutionary War (Southampton Township Comprehensive Plan 2004). The gunpowder was made of saltpeter, sulfur, and charcoal.

Industrial

Most of the development within the watershed occurred after the Civil War (Mann Township Comprehensive Plan). The development was based on the expanding timber industry and centered around villages such as Artemas, Piney Creek, Inglesmith, Silver Mills, Purcell, Chaneysville, and Beans Cove. These villages contained a general store, post office, school, blacksmith shops, and gristmills. One of the original general stores is still open today, operating as the Road Kill Café and General Store.

During the 19th century, Green Ridge State Forest was used commercially and the forest's condition suffered under these early uses. In the early 1800s, Richard Caton and William Carroll had an iron ore and timbering business at Green Ridge that included a steam-powered sawmill built in the 1830s (Green Ridge State Forest 2000). The Mertens family acquired the property during the late 1800s and early 1900s and converted the forest into an apple orchard. It was promoted as, "the largest apple orchard in the universe" (Green Ridge State Forest 2000).

The state took ownership of the forest in 1931. Since then, forest managers have allowed young stands of trees to mature, improved wildlife habitat and fisheries, reduced wildfires, protected water quality, and provided a variety of recreation opportunities (Green Ridge State Forest 2000). Timber harvesting continues to be an important management tool for improving the health of the forest. Timber management is based on a 100-year rotation age where each year approximately 175 acres of timber are harvested into an average of 800,000 board feet of saw timber and 135,000 cubic feet of pulpwood (Beals, personal communication 2005).

Between 1904 and the early 1930s, logging companies were selling cutover lands to the state for two dollars an acre. Much of that land is part of the Buchanan State Forest, which is a second- and third-growth forest (Pennsylvania Department of Environmental Resources). The forest is producing valuable timber, yielding 2.7 million board feet of lumber products and over a half million cubic feet of pulpwood annually (Pennsylvania Department of Environmental Resources).

By 1940, the population growth slowed and the economy stabilized. In Allegany County, factories provided stable employment through the 1970s (Allegany County Comprehensive Plan). As factories aged, and new technology became available, operations scaled back or closed.

In the early 1960s, the discovery of gas fields created a need to bring additional workers to the area. Area roads also needed improvements in order to handle the large equipment needed at the gas fields (Mann Township Comprehensive Plan).

Post office in Little Orleans, Md.

<u>Postal Delivery</u>

In early Colonial times, correspondents depended on friends, merchants, and Native Americans to carry messages between the Colonies. However, most correspondence ran between the colonists and England. In 1639, the first official notice of a postal service in the colonies appeared in Boston, Massachusetts (U.S. Postal Service). William Penn established Pennsylvania's first post office in 1683 (U.S. Postal Service).

The present postal service descends from the system planned by Benjamin Franklin and history rightfully accords him credit for establishing the basis of the postal service for the American people (U.S. Postal Service).

In May 1775, as the Colonies began to separate from England, a Continental Congress was organized to establish an independent government. One of the first questions before the delegates was how to convey and deliver the mail. Benjamin Franklin was appointed chairman of the committee to establish a postal system and was later appointed as the first Postmaster General (U.S. Postal Service).

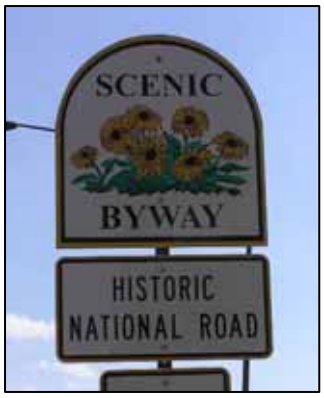
In the days prior to telephones, radios, and televisions, communication from the outside world could only be obtained through mail and newspapers. Mail would be delivered to the post office and picked up there by the recipients. Many families, particularly the agricultural families, waited days, weeks, or even months before picking up their mail. They had to coordinate trips for supplies, food, or equipment to pick up mail.

The Postmaster General responsible for rural delivery was John Wanamaker from Pennsylvania in 1893 (U.S. Postal Service). Farmers were delighted with the new service, although there were people against it because of safety and cost. As mail delivery evolved from foot to horseback, stagecoach, steamboat, railroad, automobile, and airplanes, infrastructure was needed. After the postal service turned

down many rural delivery routes because of the road conditions, local governments began extending and improving existing highways.

Transportation

One of the longest Native American trails in America, the **Warriors Path** of the Six Nations, ran through Southampton Township and along Sweet Root Creek, connecting central New York to the Carolina Mountains (Southampton Township Comprehensive Plan). It served as the chief transportation route through the area during the early settlement period.



Highway road marker depicting the National Road U.S. Route 40

The **National Road** (U.S. Route 40) was the first highway built entirely with federal funds (National Park Service 2005). It passes through western Maryland and the Three Sisters watershed. Congress authorized the road in 1806, and construction began in 1811. The road closely paralleled the military road opened by George Washington and General Braddock in 1754–55. By 1818, the road was completed to Wheeling, Virginia (now Wheeling, West Virginia). The road was pushed through Ohio and Indiana reaching Illinois, opening the Ohio River Valley and the Midwest for settlement and commerce (National Park Service 2005).

With travelers heading west, small towns along the National Road's path began to grow. Many of these towns and villages had taverns, blacksmith shops, and livery stables. Taverns were probably the most important and numerous businesses found on the National Road. They offered three basic things to travelers—food, drink, and lodging.

During the heyday of the National Road, traffic was heavy throughout the day and into the early evening. The stagecoach and the Conestoga wagon were two vehicles typically found on the road. The stagecoach was designed with speed in mind and was able to average 60 to 70 miles a day, while the Conestoga wagon averaged 15 miles a day and was designed to carry heavy freight (National Park Service 2005).

Originally envisioned by President George Washington, the **Chesapeake and Ohio Canal** (C&O Canal) could transport goods, such as furs, whiskey, and corn, west. Construction began on July 4, 1828, and it was not until 22 years and $14 million later that the canal was completed on October 10, 1850 (National Park Service).

Beginning in Georgetown, Washington, D.C., and ending in Cumberland, Maryland, the C&O Canal extended 184.5 miles in length, 60–80 feet wide, and six feet deep (National Park Service). During construction of the canal, 11 aqueducts were needed to carry the canal across major river tributaries entering into the Potomac River. Sideling Hill, Fifteenmile, and Town creeks were three of the 11 aqueducts built.

The C&O Canal was plagued with many shortcomings. Transporting goods the entire distance of the canal took seven days, working 18 hours a day. The canal reached its peak of usage in 1871 when 850,000 tons of coal was transported (National Park Service). Materials needed to build the railroad were brought in on the canal. Once built, the canal struggled to compete with the railroad, and eventually the railroad captured almost all of the business from the canal.

During the C&O Canal's operation from 1850 to 1924, repeated flooding closed the canal for months or whole seasons, depending on the severity of the flooding. After a devastating flood in 1924, repairs were never made and the canal ceased commercial operations.

In the early 1850s, technological advances—the locomotive and the railroad, as well as the completion of the C&O Canal—were changing the way people traveled. Residents of the watershed fought against the establishment of the railroad because they feared what it would do to the National Road. By 1852, the Pennsylvania Railroad was completed to Pittsburgh and shortly after, the Baltimore & Ohio Railroad reached Wheeling (National Park Service 2005). During this time, many businesses closed and some areas of the watershed became isolated from outside markets.

In the early 20th century, the National Road was given a reprieve with the invention of the automobile. With the automobile gaining popularity, many of the old wagon and coach roads were repaired and improved for automobile traffic. The Federal Highway Act of 1921 encouraged states to build a connected system of highways and roads (National Park Service 2005). By the mid-1920s, a system of numbered highways was in place, creating U.S. Route 40 from the National Road. Hotels, motels, restaurants, diners, and service stations replaced businesses that survived during the coach and wagon days. Route 40 served as a major highway until 1956 when the interstate system was created, again diverting much of the traffic away from the historic route.

During the 20th century, an interest in historic preservation arose, and heritage corridors were created. The National Road Corridor was designated as a National Historic Civil Engineering Landmark in 1976 and a State Heritage Park in 1994. In 2006, Scenic Route 40 from Bellegrove to Fifteenmile Creek in Allegany County was designated a "last chance scenic place" due to ongoing developmental pressures. This seven-mile segment and its surrounding viewshed, the area viewable from the road, make up one of the most visually enjoyable and well-preserved portions of the Maryland Historic National Road Scenic Byway (Zumbrun, personal communication 2006).

Important People

In 1755, **General Edward Braddock**, commander of the British and Colonial troops during the French and Indian War, scaled the rocky inclines of what is now Green Ridge State Forest. General Braddock came through the area on his way from Fort Cumberland in Maryland to Fort Duquesne in Pittsburgh.

George Washington was with General Braddock on his march to Fort Duquesne. After Braddock was fatally wounded, Washington took command of the troops. Later, after Washington became the first President of the United States, he envisioned a river and canal system along the Potomac River to transport goods, such as furs, whiskey, and corn. This vision was realized by the construction of the C&O Canal a century later.

Benjamin Wright is recognized as the "Father of American Civil Engineering." Although Wright did not have formal training, he was selected to be the chief engineer of the C&O Canal. Originally a lawyer and surveyor, he became an engineer by experience. Prior to working on the C&O Canal, he was a key engineer involved in the completion of the Erie Canal.

In the 1730s**, Thomas Cresap** tried to expand the northern boundary of Maryland. He surveyed the source of the Potomac River as far south as possible and settled German immigrants into disputed areas. Only with the designation of the Mason-Dixon Line in 1746 was the dispute resolved (National Park Service). In western Maryland, he is known as a "border ruffian," and in Pennsylvania as the "Maryland Monster"(National Park Service). Cresap died in 1787, but his name lives on in Cresaptown.

In the 1800s, **Charles Carroll** owned most of the area that is now Green Ridge State Forest. Charles was one of the signers of the Declaration of Independence. His business interests included iron ore and timber.

Historical Notes, Sites, Structures, and Districts

In 1966, the National Historic Preservation Act established the National Register of Historic Places. Listed properties include districts, sites, buildings, structures, and other objects significant to American history, architecture, archeology, engineering, and culture. A listing in the register contributes to preserving properties, but it does not interfere with the property owner's rights. Sites located within the watershed are listed in Table 5-1.

Hewitt Covered Bridge spans Town Creek

The Pennsylvania Historical Museum Commission manages the register for Pennsylvania, and the Maryland Historical Trust (MHT) handles that role in Maryland. In each state the historic preservation officer submits nominated properties to a state review board. If the property owner, or the majority of the owners if the property is owned by more than one person, objects to the nomination, it is sent to the National Park Service for a determination of eligibility, without formally listing the property in the National Register (National Park Service 2001).

Pennsylvania, the Covered Bridge Capital of the World, had 1,500 covered bridges at one time. Two hundred and nineteen covered bridges still exist, of which 119 are utilized by vehicular traffic. **Hewitt Covered Bridge**, located in Hewitt, Pa., is the only covered bridge located within the Three Sisters watershed. It was built in 1879, spans 88.5 feet over Town Creek, and is still open to vehicular traffic.

Breakneck Road Valley Historic District is a collection of farms and parcels of considerable age, settled, developed, and maintained by a tightly knit collection of families (MHT). The land has stayed with the families of the original settlers and has not changed substantially in physical appearance for 100 years. The valley is primarily agricultural, with three non-agricultural structures: a church and two non-functioning schoolhouses. Non-domestic structures on the property include barns, springhouses, smokehouses, slave cabins, and minor structures like corncribs and paddocks.

The **Flintstone Hotel** is a large two-and-a-half-story structure built in 1807 for John Davis, a prosperous landowner. By 1850, the residence was serving as an inn for travelers and visitors to the area's mineral springs. When converted into a hotel, seven rooms were added to the structure, including a tavern room. The Flintstone Hotel was one of the largest structures of its time in Allegany County, attracting visitors such as Henry Clay and Theodore Roosevelt.

The **Stone House** was supposedly built in 1819 as a tavern for Jonas Street. All that remains is the shell of an early 19th century stone structure. The deteriorated condition of this structure is a loss to the architecture of the county.

Chesapeake and Ohio Canal National Historical Park (C&O Canal NHP) was built between 1828 and 1850, and ran 184.5 miles from Georgetown, Washington, D.C., to Cumberland, Maryland. The canal was primarily used for hauling coal from western Maryland to Washington, D.C. until 1924. Hundreds of original structures, including locks, lock houses, and aqueducts, serve as reminders of the canal's role as a transportation structure.

Western Maryland Railway Right of Way is located between milepost 126, at the intersection of the C&O Canal NHP and Long Ridge Road in Woodmont, and milepost 160, just west of Maryland Route 51. The 34-mile abandoned section was acquired by the United States for the C&O Canal NHP. It was one of the last major phases of the trans-Allegheny railroad expansion in the early 20th century.

Old National Pike Milestones marked the route of the old National Pike from Baltimore to Cumberland, Maryland. They were laid beginning at the Baltimore Courthouse, then spaced one mile apart and placed on the north side of the National Pike. The dimensions and composition of the stones vary from section to section. The only inscription on the stones was the mileage to Baltimore, for example, "38 M to B."

Table 5-1. National Register of Listed and Eligible Properties
(Source: National Park Service, Pennsylvania Historical Museum Commission, and Maryland Historical Trust)

Historic Site	Location	Status	Date
Bedford County			
Beans Cove Methodist Church	Beans Cove, Pa.	Eligible	8/19/1998
Clyde E. and Thelma D. Grove Farmstead	Monroe Township	Eligible	10/12/1994
Hewitt Covered Bridge	Hewitt, Pa.	Listed	4/10/1980
Fulton County			
No sites identified within the watershed.			
Allegany County			
Breakneck Road Historic District	Flintstone, Md.	Listed	5/29/1980
Old National Pike Milestone	Bellegrove, Md.	Listed	11/27/1975
Flintstone Hotel	Flintstone, Md.	Listed	12/22/1976
Stone House	Pleasant Valley, Md.	Listed	12/22/1976
Washington County			
No sites identified within the watershed.			
Multiple			
Chesapeake and Ohio Canal National Historic Park	Allegany and Washington counties	Listed	10/15/1966
Western Maryland Railway Right of Way, Milepost 126 to 160	Allegany and Washington counties	Listed	7/23/1981

Although not listed on the National Registry, additional historical sites are important to the history of the region. The Carroll Chimney, located along Carroll Road in Green Ridge State Forest, is one of those sites. It was built in 1836 and served as a stream-powered sawmill.

Recreation

The Three Sisters watershed is fortunate to have numerous recreational opportunities and natural areas. There are opportunities for hiking, biking, fishing, hunting, horseback riding, boating, camping, wildlife watching, and off-road or all-terrain vehicle (ATV) riding. Areas such as Green Ridge State Forest, Buchanan State Forest, Pennsylvania state game lands, and Wildlife Management Areas provide the resources to enjoy these activities.

Recreational Resources

The Three Sisters watershed, with its rural character and high-quality waters, has a variety of recreational resources and opportunities.

Parks

Sweet Root Natural and Picnic Areas are located one mile north of Chaneysville along Route 326. The picnic area adjoins the 1,400-acre Sweet Root Natural Area. The area was officially designated in 1970 to be "preserved for scientific, scenic, and educational values," by the State Forest Commission (PA DCNR). In 1979, the natural area was designated for amphibian and reptile protection, prohibiting the catching, killing, or possession of naturally occurring species of amphibians and reptiles (PA DCNR).

The Sweet Root Picnic Area is a popular spot for maintenance and construction crews to stop for lunch

The natural area has a rich history dating back to the Revolutionary War. Remnants of a Civilian Conservation Corps camp, an early sawmill, and one of the early trading posts in Bedford County are located on the site. A saltpeter cave is located just north of the Sweet Root Gap.

Pine Ridge Natural Area, located one mile southeast of Chaneysville, contains 568 acres. The area is now part of a state-owned tract known as the Resettlement Lands. The Resettlement Lands include 13,000 acres of marginally productive farms that the federal government purchased during the Depression of the 1930s, with the purpose of encouraging families to resettle on farmlands that were more productive. The natural area is preserved as a representative sample of the natural succession that has occurred as a result of human occupancy, use, and abandonment of the land.

Located within the natural area are various trails for hiking and horseback riding. Historical sites are also located at Pine Ridge Natural Area, including remnants of barns and houses, a granary, several apple orchards, and a small family cemetery.

Martin Hill Wild Area is made up of 11,500 acres located in southern Bedford County. Motorized traffic is not permitted inside the boundaries of this site to keep it as natural as possible. This site provides an attractive area for wildlife.

Blankley Picnic Area is a quiet, peaceful place for a picnic. It is located high in the bend of Friends Cove. While traveling to the picnic area, there are several scenic overviews of Friends Cove, Rainsburg Gap, and Sweet Root Gap.

A portion of the **C&O Canal NHP** is located within the Three Sisters watershed, adjacent to the Potomac River. The C&O Canal NHP is 184.5 miles long and offers an array of recreational opportunities, including three access points located at the mouths of Sideling Hill, Fifteenmile, and Town creeks.

A unique feature along the canal, that was once promoted as one of the wonders of the world, is the Paw Paw Tunnel. It is located along the Potomac River between Fifteenmile Creek and Town Creek in the Potomac Bends. This brick-lined tunnel is over 3,118 feet long, and was completed in 1850 after 14 years of construction. The name came from the pawpaw (or papaw), a locally grown fruit that is sometimes called American custard apple, Indiana banana, or West Virginia banana.

Pennsylvania State Game Lands 97 has a rock outcrop at the northern end, offering visitors a 300-degree view of the surrounding area. This area is known as the **Tussey Ridge Lookout**. Birds of prey, including bald eagles, broad-winged hawks, Cooper hawks, red-shouldered hawks, osprey, American kestrels, red-tailed hawks, and golden eagles can be seen soaring past (Fall Foliage and Hawk Watching Lookouts).

State Forest

Two state forests are located within the Three Sisters watershed—Buchanan State Forest in Bedford County, Pennsylvania and Green Ridge State Forest in Allegany County, Maryland.

Buchanan State Forest, like all Pennsylvania state forests, is managed by Pennsylvania Department of Conservation and Natural Resources (PA DCNR). The forest is managed for recreation activities such as hiking, biking, ATV and snowmobile usage, fishing and hunting, wildlife and plant life habitat protection and study, and timber management. It was named in honor of the fifteenth president of the United States, James Buchanan. Seventy-five thousand acres of forestland are located in five principal tracts of the state forest; two of these tracts are located within the Three Sisters watershed.

Green Ridge State Forest is the second-largest state forest in Maryland, with 44,000 acres [Maryland Department of Natural Resources (MD DNR) 2005]. The forest is characteristic of dry upland areas primarily containing second-growth, even-aged oak and pine. Located in an area that receives an annual average of 36 inches of rainfall, shale barrens are pockets of desert-like habitats in the forest. At the beginning of the 20th century, the entire forest was clear-cut and planted with apple trees in the hopes of creating the largest apple orchard in the world.

Trails

Links among communities, trails provide alternative transportation, recreation, and educational opportunities. Trails can be used for a variety of activities, including hiking, bicycling, horseback riding, ATVs, cultural and historical cultivation, and environmental education. A variety of trails exist within the watershed.

In 2005, the Green Ridge State Forest Hiking Trail was designated a national recreation trail. Two of the three national recreation trails are located within the project area. Both trails are part of the Potomac Heritage National Scenic Trail System. In 2006, Green Ridge State Forest Hiking Trail and Pennsylvania's Mid State Trail became a part of the Great Eastern Trail, a network of trails that connect and extend from Florida to the Great Lakes (Zumbrun, personal communication 2006).

Green Ridge State Forest contains over 27 miles of hiking trails. These trails trace narrow ridges and forested stream valleys with varying terrains. Hikers can enjoy scenic day trips of varying lengths or multi-day backpacking trips. There are four Adirondack shelters that have been placed at rural and scenic areas at approximately eight-mile intervals along a 24-mile trail for backpackers.

Scenic Overlook Trail is a short trail, approximately 50 yards, traveling from the Green Ridge Forest Visitors Center to an overlook of Town Hill and Green Ridge mountain ridges.

Pine Lick Trail is a six-mile trail that utilizes a footbridge to cross Fifteenmile Creek. The trail follows the stream valley north to the historic Mason-Dixon Line and includes numerous stream crossings. It extends from the Pennsylvania state line to Fifteenmile Creek Road.

Twin Oaks Hiking Trail is named for a one-room schoolhouse known as the Twin Oaks School. The trail travels two miles through diverse ecosystems, such as mature oak stands, wildlife clearings, and pine plantations. The Pine Lick Trail intersects with the Twin Oaks Trail, creating a four-mile circuit to extend the hike.

Long Pond Trail is a difficult eight-mile trail along Fifteenmile Creek and C&O Canal Lock 58. The ascent is rewarded with a spectacular view. The trail extends from Fifteenmile Creek Road to Canal Lock 58.

Deep Run/Big Run Trail is a seven-mile trail passing through a state-designated wildland and shale barrens. It extends from Fifteenmile Creek to Kirk Road. "Wildland" is a designation given to areas offering the highest level of protection to forest and other habitats in Maryland (Maryland Department of Legislative Services 2005).

Log Roll Trail travels seven miles through the scenic area known as the Log Roll. During the timbering era in the late 1880s, logs were dragged from nearby hills and rolled down these slopes into Town Creek below. From the C&O Canal, this trail begins with many unbridged stream crossings and ends with a breathtaking view of the Town Creek Valley.

Green Ridge State Forest Fall Color Driving Tour is a 30-mile self-guided auto tour highlighting the fall colors of scenic western Maryland. During the tour, cultural and historical sites, and natural scenery, are showcased.

Green Ridge State Forest Mountain Bike Trail is a 12-mile bike loop commonly known as "The Ridge." The trail winds up and down the ridges and valleys of the forest. Stream crossings, fallen trees, steep turns, and sustained climbs are some obstacles riders encounter. There are four places where cyclists can shorten their ride and return to the start/finish point.

Trailhead sign for Tarkiln Trail, part of the Buchanan State Forest trail system

Within the **Buchanan State Forest** portion of the watershed, there are 10 trails (in addition to the ATV trail at the Martin Hill Natural Area), including Gap Trail, Frank Beck Trail, Jackson Trail, Bear Gap Trail, May Trail, Evitts Trail, Tarkiln Trail, Wasson Trail, Reservoir Trail, and Mid State Trail. No specific information about the trails, with the exception of the Mid State Trail, is currently available.

The ***Mid State Trail*** system is a long-distance hiking trail of approximately 261 miles, traveling from Green Ridge State Forest in Maryland, through central Pennsylvania, and ending in north-central Pennsylvania near Blackwell, in Tioga County. The Mid State Trail is almost entirely located on public land: state forests, state game lands, and parks.

All-Terrain Vehicles (ATV)

A popular recreational activity is riding ATVs. The improper or illegal use by some riders has given ATVs a bad reputation. An off-road vehicle (ORV), off-highway vehicle (OHV), or ATV is any motorized vehicle capable of cross-country travel on land, water, snow, ice, marsh, swampland, or other natural terrain.

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

Martin Hill Natural Area ATV Trail

Within the watershed there are two ATV trails, found at Buchanan State Forest and at Green Ridge State Forest. Located in the Buchanan State Forest is the **Martin Hill Natural Area ATV Trail**. It is approximately 18 miles long and is open to the public beginning the Friday before Memorial Day until the last full weekend in September (PA DCNR).

The **Green Ridge ORV Trail** is an 18-mile loop designated for ORVs. It is located on East Valley and Stafford roads. ORVs must have a MD DNR identification tag displayed prominently on the left front portion of the vehicle and have a licensed driver on board. The Green Ridge ORV Trail is the most heavily used ORV/ATV trail on state public lands in Maryland (Zumbrun, personal communication 2006). In 2005, over 2,000 of the 4,000 ATV permits purchased in Maryland were issued at Green Ridge State Forest headquarters (Zumbrun, personal communication 2006).

Efforts need to be taken to educate riders to recreate in a way that causes the least amount of disturbance to the environment. The establishment of additional environmentally sound public trails or parks for ATV riders is needed. Establishing additional locations would continue to reduce the liability and damage occurring on private property.

Camping

There are a handful of options when camping within the watershed. Public camping is available at Green Ridge State Forest and Buchanan State Forest, but it is not permitted on Pennsylvania state game lands. At **Green Ridge State Forest** there are over 100 primitive sites. Some of the sites are located along the roadway, and four Adirondack-style shelters are provided for the use of backpackers. Before planning to camp on public lands, visitors should always verify site regulations and learn if reservations are required.

Buchanan State Forest permits low-impact camping; however, there are no facilities available.

In addition to camping on public lands, there are two campgrounds within the Three Sisters watershed. The **Four Quarters Farm** is a private "Interfaith Sanctuary" campground open to anyone who wants to join. The campground hosts several festivals each summer that are open to the public. On the site are several swimming holes available to members and festival registrants.

The **Little Orleans Campground and Park Area** is located on 222 acres of woodlands with Fifteenmile Creek flowing through it. Campsites include a fire ring and picnic table, and RV sites include electric, water, and sewage facilities. In addition, the campground has a camp store, game room, sports fields and courts, swimming pools, and fishing opportunities. The campground is located near Green Ridge State Forest, the Potomac River, C&O Canal NHP, and various other recreational opportunities.

Boating

Kayaking and canoeing are popular recreational activities. However, there are very few public access points to the streams, and boating can only be done during periods of adequate flow. Access to the waterways should be provided. Although a water trail exists for the Potomac River, establishing specific water trails for Sideling Hill, Fifteenmile, and Town creeks could assist in the identification of potential access points, provide documentation of existing resources, and identify any hazards along the waterways for boaters and anglers.

There is only one public boat launch within the watershed. It is located at the confluence of the Potomac River and Fifteenmile Creek at the C&O Canal NHP.

Fishing

The Three Sisters watershed provides numerous opportunities for anglers. Many local residents say that this area has some of the best fishing available. However, since the watershed is located in two states, anglers should be aware of their location while fishing and be sure to have the appropriate state's fishing license.

Town Creek is the only trout-approved waterway within the Pennsylvania portion of the watershed. In order for streams, lakes, ponds, and reservoirs to be classified as approved trout waters, they must meet criteria qualifying them to be stocked with trout by the Pennsylvania Fish and Boat Commission. Town Creek is stocked at the confluence of Elk Lick Creek and Wilson Run to the Pennsylvania–Maryland border. In Maryland, there are two portions of the mainstem, approximately one mile from Oldtown in Green Ridge State Forest, that have been designated as delayed harvest areas. Species such as brown trout, rainbow trout, smallmouth bass, rock bass, and red-breasted sunfish are known to be located in this region.

In Pennsylvania, the Town Creek subwatershed is designated as a High Quality Cold Water Fishery, except for the mainstem of Flintstone Creek, from Lost Creek to the Pennsylvania–Maryland border, which is designated as a High Quality Trout Stocked Fishery. In Maryland, Town Creek is protected for recreational trout waters and public water supply. It is managed as a special fishery by periodic stocking and seasonal catching. The tributaries leading into Town Creek are designated as natural trout waters and public water supply. Water use designations are described in Table 5-2.

In Maryland, Fifteenmile Creek and Sideling Hill Creek are designated for use as recreational trout waters and public water supply. These areas are also stocked within the Maryland portion. In Pennsylvania, Fifteenmile Creek is designated as a Warm Water Fishery, and Sideling Hill Creek is designated as an Exceptional Value waterway.

Green Ridge State Forest also provides many opportunities for anglers, including White Sulphur and Orchard ponds, in addition to Sideling Hill, Fifteenmile, and Town creeks. Town Creek's two delayed harvest areas are located within the state forest.

Table 5-2. Water Use Designation Descriptions

Water Use Designation		Description
HQ-CWF	High Quality Cold Water Fishery	▪ The water has long-term water quality, based on at least one year of data, which exceeds levels necessary to support the propagation of fish, shellfish, and wildlife and recreation in and on the water by being better than the water quality criteria. ▪ The surface water supports a high-quality aquatic community. ▪ 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.
HQ-TSF	High Quality Trout Stocked Fishery	▪ The water has long-term water quality, based on at least one year of data, which exceeds levels necessary to support the propagation of fish, shellfish, and wildlife and recreation in and on the water by being better than the water quality criteria. ▪ The surface water supports a high-quality aquatic community. ▪ 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.
WWF	Warm Water Fishery	▪ Maintenance and propagation of fish species and additional flora and fauna, which are indigenous to a warm-water habitat.
EV	Exceptional Value Waters	▪ The water has long-term water quality, based on at least one year of data, which exceeds levels necessary to support the propagation of fish, shellfish, and wildlife and recreation in and on the water by being better than the water quality criteria. ▪ The surface water supports a high-quality aquatic community. ▪ Located in a state park or state forest natural area, national landmark, federal or state wild river, federal wilderness area, national recreational area, national wildlife refuge or state game propagation and protection area, or is in an outstanding national, state, regional, or local resource water; or is of exceptional recreational or ecological significance.
III-P	Natural Trout Waters and Public Water Supply	▪ Sustainable growth and propagation of trout. ▪ Capable of supporting self-sustaining trout populations and their associated food organisms. ▪ Used as a public water supply.
IV-P	Recreational Trout Waters and Public Water Supply	▪ Capable of holding or supporting adult trout for put and take fishing. ▪ Managed as a special fishery by periodic stocking and seasonal catching. ▪ Used as a public water supply.

Hunting

Within the Three Sisters watershed, there are two Pennsylvania state game lands, four Maryland Wildlife Management Areas, and two state forests, one in Pennsylvania and one in Maryland. Some sportsmen's groups and other conservation organizations also open their land to hunters. Table 5-3 lists the public lands open to hunting.

Table 5-3. Public Lands Open to Hunting

Public Land Area	Acres
Belle Grove WMA	355
Billmeyer WMA	710
Buchanan State Forest	75,000
Green Ridge State Forest	44,000
Sideling Hill WMA	3,100
State Game Lands 49	6,310
State Game Lands 97	7,312
Warrior Mountain WMA	4,400

Belle Grove Wildlife Management Area (WMA) and **Billmeyer WMA** are managed to provide opportunities for wildlife-related recreation. In the 1920s and 1930s, these areas were utilized as game bird farms, with wild turkeys being the primary focus at the Belle Grove site. Today, these two tracts have plentiful wildlife in forests and fields, providing natural beauty and recreation for many outdoor interests. The areas are open to public hunting with the appropriate licenses and stamps. However, trapping is available by permit only. The habitats support good populations of whitetail deer, wild turkeys, ruffed grouse, woodcock, gray squirrels, and cottontail rabbits.

The Perry Barnes Game Reserve is located in the Billmeyer Wildlife Management Area

Hunting is one of the most popular recreational activities at **Green Ridge State Forest**. Whitetail deer, wild turkey, ruffed grouse, rabbits, coyotes, woodcocks, red fox, gray fox, and squirrel are commonly hunted species. There is also a 25–100 yard public shooting range offering hunters a safe area to target shoot. A permit and service charge are required to use the shooting range.

Sideling Hill WMA was established to provide forest wildlife habitat and protection for water quality in Sideling Hill Creek. The area is managed to provide habitat for game and non-game wildlife species, including whitetail deer, wild turkey, gray and fox squirrels, ruffed grouse, and songbirds. Hunting is permitted at the site with the appropriate licenses and stamps. Trapping requires a permit. In 1986, MD DNR identified Natural Heritage Areas on this 3,100-acre tract, affording protection to a number of rare, threatened, or endangered species of plants (MD DNR 2004c).

State Game Lands 49 and 97 are managed to provide hunting opportunities for specified game species, and other related activities. They are under the control of the Pennsylvania Game Commission (PGC).

Warrior Mountain WMA is managed to provide habitat for a variety of forest and upland wildlife. This 4,400-acre tract has served as an outdoor wildlife classroom for many years. Whitetail deer, wild turkey, gray squirrels, cottontail rabbits, and ruffed grouse are common inhabitants of this area. The agricultural fields and orchards are planted and maintained, providing habitat for game and non-game wildlife. The areas are open to public hunting with the appropriate licenses and stamps. However, trapping is available by permit only.

In addition to public lands available to hunters, there are 200 acres of farmland open to hunting through the PGC's Safety Zone program in Bedford County (Koppenhaven, personal communication 2005). Hunters can also hunt on private property after obtaining permission from landowners.

In 1936, the Cooperative Farmland Program was established by the PGC to protect farmland property against acts of vandalism and to increase hunting opportunities. It provides landowners with advice and incentives to conserve soil, increase wildlife habitats, and incorporate other profitable practices. There are two programs: the Safety Zone program and the farmland program. The Safety Zone program targets individual landowners, with a minimum of 50 acres, who open their land for public hunting. The farmland program includes several landowners enrolled in the Safety Zone program blocked together. Having property in the farmland program provides better incentives for the landowners. In Bedford and Fulton counties, there is one landowner enrolled in the Safety Zone program; no landowners have enrolled in the farmland program. More agricultural landowners should consider participating in the Cooperative Farmland Program.

Environmental Education

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

The agricultural community was the first to utilize environmental education by teaching conservation practices. The practice then expanded to include land-use problems, preservation of natural resources, water quality improvements, and protection of native plant and animal species. Educating the public about important environmental challenges and developing knowledgeable citizens actively participating in addressing these challenges is critical to sustaining the balance between environmental and human activities, ensure the health and welfare of the watershed, protect human health, advance quality education, expand employment opportunities, promote sustainable development, and protect our natural heritage (Pennsylvania Department of Education 2002).

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

The **Pennsylvania Game Commission (PGC)** provides a variety of educational programs. Wildlife Conservation Officers provide age-appropriate educational programs in the schools. They also provide two teacher workshops, called Project Wild and PA Song Birds. Project Wild is training for educators about the environment, the outdoors, and their interactions. This program is designed to assist educators of grades K–12. It evaluates the activities and cross-references them with the Pennsylvania Department of Education's (PDE) environment and ecology standards developed in 2002. PA Song Birds is a program similar to Project Wild that provides teacher workshops and lesson plans. It is co-sponsored by the PGC, PA DCNR, and Audubon Society. In addition to the workshops and programs, the PGC has reference materials available to all educators.

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

Pennsylvania Department of Environmental Protection (PA DEP) provides a range of environmental education opportunities. They host several workshops and conferences, attend community festivals, and provide resource information and educational programs. PA DEP is just one of many groups that assist with the local and statewide Envirothon competitions. An Envirothon is an environmental competition that is designed to cultivate a desire to learn more about the natural environment. Not only do

Envirothon competitions teach environmental facts and realities, but they also instill an understanding of the ecological and community factors that are involved in environmental decisions and actions.

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

Watershed education programs are offered through Pennsylvania State Parks, a part of PA DCNR. Programs provide school-aged children field learning experiences through hands-on activities (Table 5-4).

MD DNR provides a variety of environmental education programs, including hunter safety classes, training for educators, Project Wild, Project Wet, Project Learning, Envirothon competition, Becoming an Outdoor Woman (BOW), classroom presentations, and summer camps. The majority of the environmental education programs from the MD DNR include hands-on activities.

Table 5-4. Watershed Education Programs Offered by PA DCNR

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

Maryland Department of the Environment's (MDE) environmental education efforts include providing consistent information focused on environmental goals and outcomes. Most of these efforts focus on being available to reach numerous and diverse audiences, sometimes in their local settings and often at recreational events.

MDE offers a variety of environmental programs, including displays, presentations, and demonstrations that travel to schools and events. School programs are designed for elementary, middle school, and high school students. For presentations and events, MDE partners with County Recycling Coordinators. MDE in the Classroom is available to public and private schools, scout groups, after-school programs, and camps. In addition, MDE can provide activity lessons for grades K–9 to help educators. They also participate in the Envirothon and the Maryland Green Schools program.

Allegany and Washington County Forestry Boards offer educational programs to forest landowners and students. As a part of the Maryland Forestry Board Foundation, they promote the wise stewardship of natural resources, particularly those that involve teaching individuals about forests and renewable resources (Maryland Forest Service 2005b). Forestry boards in each county occasionally host workshops to educate forest landowners about specific issues.

The forestry boards help sponsor the annual Natural Resources Careers Conference. This is a one-week summer camp for high school students interested in pursing careers in forestry or natural resource management. Each county forestry board selects two students and sponsors their attendance. Forestry board members also get involved in teaching the various subjects and organizing field trips.

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

Penn State Cooperative Extension works with individuals, families, businesses, communities, and schools through informal educational opportunities. Local offices provide residents with easy access to the resources and expertise of Pennsylvania State University through educational programs, publications, and events.

Potomac Conservancy is a non-profit organization started in 1993 by a group of individuals concerned about inappropriate development, clear-cutting, and other activities having a negative impact on the Potomac Gorge. The Potomac Conservancy conducts a comprehensive land protection program; develops and implements a variety of land and water restoration projects; provides counseling and other conservation support services for other land trusts; fosters a stewardship ethic by providing meaningful, hands-on volunteer and education programs for adults and young people; and partners with other organizations and agencies to achieve land protection and restoration goals.

Potomac Riverkeeper, Inc. is a non-profit organization working to protect and restore the Potomac River and its tributaries, from its headwaters in West Virginia to the Chesapeake Bay, through citizen action, advocacy, and enforcement. Potomac Riverkeeper was formed by citizens and conservation leaders out of concern for the need to respond to multiple threats with a single independent advocate dedicated to protecting the Potomac River and its tributaries. Representatives from Potomac Riverkeeper, Inc. provide environmental education through presentations to interested groups, speaking at conferences, and producing a newsletter.

Ridge and Valley Stream Keepers (RVS) are a localized group of volunteers that work to protect watersheds in Bedford and Fulton counties in Pennsylvania. The group monitors local waterways and conducts trash cleanups. RVS works to educate stakeholders and decision makers on an individual basis.

Town Creek Landowners Association helps to educate citizens about new legislation that affects landowners and their rights.

Town Creek Steering Committee, a part of the MD DNR Forest Service, provides educational tours, newsletters, and an educational calendar for landowners within the Town Creek watershed.

Western Pennsylvania Conservancy (WPC) protects, conserves, and restores land and water for the diversity of the region's plants, animals, and their ecosystems. Through science-based strategies, collaboration, leadership, and recognition of the relationship between humankind and nature, WPC achieves tangible conservation outcomes for present and future generations.

WPC maintains a presence in the watershed at its Sideling Hill Creek Center, engaging the local communities as a means to educate, inspire, and equip others to advance conservation. Assistance is provided to local landowners through WPC's Sustainable Countrysides program. WPC assists the watershed community by providing educational programs to interested groups upon request, working with individual landowners to implement best management practices, and providing information about planning for appropriate economic development and growth.

WPC provides environmental education to landowners on an individual basis

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

Management Recommendations:

Goal 5-1. Increase awareness of local environmental issues.

Educate residents and officials to understand the economic benefits and importance of watershed protection.	High
Encourage school districts to work with conservation groups and agencies to educate students about watersheds.	Medium
Educate local students, beginning in elementary school, about environmental issues affecting the watershed.	Medium
Increase awareness of watershed-related issues through the distribution of materials and educational programs.	Medium
Increase funding for environmental education programs targeting landowners and school districts.	Low

Goal 5-2. Encourage a better appreciation of the local history.

Establish an auto tour highlighting historical sites and events.	Medium
Host community events or festivals commemorating local historical events and places.	Medium
Incorporate local history into history classes taught in local school districts.	Medium
Install interpretive signage at historical locations.	Medium
Establish a local historical society to preserve historical sites and relics.	Medium
Work with elected officials to offer incentives or tax breaks for the restoration of historic buildings.	Low

Goal 5-3. Enhance recreational opportunities.

Increase funding to maintain and enhance existing recreational facilities.	High
Develop low-impact recreational facilities, such as campsites and trails.	High
Establish additional access points and boat launches at strategic places.	Medium
Provide amenities at trail heads and municipal parks, such as parking, composting toilets, and hand pumps.	Medium

Goal 5-3. Enhance recreational opportunities (continued).

Improve facilities, such as parking areas and signage along the Mid State Trail to prepare for the additional usage that will come from the establishment of the Great Eastern Trail that will travel from Florida to New York.	Medium
Link recreational facilities through the extension of trails and the establishment of more trailheads providing additional access to existing and new recreational sites.	Medium
Enhance the area around Pond View Loop Road at southern Tussey Mountain to be applicable for outdoor recreation, to provide a habitat education opportunity, and to encourage formal establishment of the area as the Pond View Loop Recreation Area.	Medium
Establish additional municipal parks.	Medium

Goal 5-4. Encourage recreational activities on public property and minimize the infringements on private landowners.

Encourage and educate visitors to utilize recreational resources available to the public and to respect property owner rights by not trespassing on private property.	High
Encourage property owners concerned with trespassing to mark the boundaries of their property with posted signs.	Medium
Encourage agricultural landowners to participate in the Cooperative Farmland Program opening additional land to public hunting.	Medium

Goal 5-5. Encourage environmentally sound practices when operating recreational vehicles.

Monitor the use of recreational vehicles to ensure their impacts to the environment are minimal.	Medium
Prohibit the use of recreational vehicles in areas at risk of being affected by their use. Steep slopes, streambanks, stream crossings, and habitat for rare, threatened, or endangered species are examples of areas at risk.	Medium
Educate riders of recreational vehicles to recreate in a way that causes the least disturbance to the environment.	Medium
Establish additional trails and parks for the use of recreational vehicles to reduce the damage occurring to private property.	Low

Goal 5-6. Establish additional recreational programs.

Increase funding to support recreational programs.	High
Organize community sport leagues, such as baseball, basketball, and football.	Medium
Establish community or school programs to teach children how to swim.	Medium
Establish community or school programs to teach children about outdoor recreational opportunities, such as hiking, camping, fishing, hunting, etc.	Medium
Organize a community group encouraging area youth to utilize outdoor recreational opportunities, including camping, fishing, swimming, hiking, hunting, etc.	Medium

Goal 5-7. Increase awareness of recreational resources available through marketing and outreach.

Develop and distribute public land maps, identifying recreational facilities and public lands open to the public.	High
Establish a visitors or welcome center and accompanying website where visitors can obtain information about recreational opportunities.	Medium
Enhance the Buchanan State Forest website to provide more information about recreational opportunities.	Medium
Conduct an economic impact study of recreational activities to determine the impact that recreation has on the local economy.	Medium

CHAPTER 6. ISSUES AND CONCERNS

A major component of watershed conservation planning is identifying the vision and goals of watershed stakeholders. In order to accomplish this, Western Pennsylvania Conservancy (WPC) and the steering committee hosted public meetings and met with groups and individuals. Public meeting workshops, public and municipal surveys, and stakeholder interviews were used to identify the issues and concerns of watershed residents. The information gathered was used to identify the issues and concerns presented here and represents the opinions of the stakeholders, not WPC or the steering committee.

The surveys were anonymous and the results identified how stakeholders use and perceive the watershed. Key stakeholders, identified by the steering committee, were interviewed for their opinions about watershed matters. This information was used to help determine the management recommendations, which can be found in Chapter Seven.

Meeting Summaries

Watershed residents discuss issues and concerns that they have for the future of the Three Sisters watershed

Initial Meetings

In March 2005, WPC and the steering committee hosted a round of three public meetings throughout the watershed. During these meetings, the process used to develop the Three Sisters Watershed Conservation Plan was introduced to the community. Background information about the Pennsylvania Department of Conservation and Natural Resources (PA DCNR) planning process was presented. Attendees identified issues of importance, including developmental pressures, illegal dumping, sustainable agriculture, farmland preservation, and runoff. These, and other issues identified by participants, will be discussed later in this section.

Draft Presentation

In July 2006, another series of public meetings were held to present the draft of the plan. Stakeholders were given the opportunity to review the plan and provide comments (Appendix I). Public comments were collected for 30 days and incorporated into the final plan.

Issues and Concerns

Many issues and concerns addressed by the watershed community are interconnected and cannot be addressed separately. Projects should be designed to address the issues collectively whenever possible. The issues identified by watershed stakeholders are summarized in the following sections.

Developmental Pressure

Stakeholders within the Three Sisters watershed value the watershed and their rural lifestyle. As one participant put it, “New residents should adapt to our rural lifestyle and not try to change it.” Many families have been in the region for five and six generations.

However, the region is at risk for development because of the abundant natural resources and the availability of open space. Urban residents are expanding out of the cities and turning rural countryside into suburbs of the larger cities. Being within close proximity to Washington, D.C. and Cumberland, Md. makes the watershed more susceptible to sprawl, unless actions are taken to minimize the risks. County

and municipal land-use plans have been completed for the majority of the watershed and should at least be consulted, if not implemented.

A priority for watershed stakeholders is to have more enforcement of land-use ordinances so that they cannot easily be changed or overridden. Throughout the watershed, but especially in Maryland, stakeholders would like more local authority and control for zoning laws.

Water Quantity

Water withdrawal is an important issue for stakeholders within the Three Sisters watershed. Water quantity can become a major concern during low-flow and drought conditions. Groundwater levels are normally low due to the geology of the area. The majority of residents rely on groundwater and springs for their water supply. Water quantity is a commodity that should not be overlooked when developmental pressures arise.

Many streams barely flow during the summer and fall seasons

The proposed Terrapin Run housing development has many residents concerned about the effects the proposed 4,300 units will have on the water supply. According to testimony by Mark Eisner, P.G., President of Advanced Land and Water, Inc. at the Allegany County Board of Zoning Appeals, "the proposed housing unit will require 750,000 gallons of water a day and only 350,000 gallons are currently available" (Advanced Land and Water, Inc. 2006).

Smart Growth and Planning

Development can be done attentively and wisely through the implementation of cooperative land-use strategies. Smart growth principles promote the use of sound land-use planning, including mixing land uses; making development decisions predictable, fair, and cost effective; strengthening and directing development toward existing communities; fostering distinct, attractive communities with a strong sense of place; and preserving open space, farmland, natural beauty, and critical environmental areas (Smart Growth Network 1996). Smart growth also involves educating landowners about the process and its benefits. By employing smart growth principles, businesses could be attracted to the area, bringing in needed jobs while maintaining the natural setting prized by residents and tourists.

The establishment of land-use ordinances and their enforcement would help the watershed community protect itself from unwanted land uses. Each municipality or county should consider implementing or enforcing land-use ordinances in addition to their comprehensive plans.

Water Quality

A goal of stakeholders is maintaining clean and healthy waterways. Addressing concerns, such as runoff and stormwater management, underground storage tanks, and acid rain, is important to local residents.

Underground Gas and Fuel Tanks

Storage tank programs in Pennsylvania and Maryland regulate underground storage tanks for gas and fuel. To be classified as an underground tank, it must be located below the ground or pavement and have piping connected to it. Some residents are concerned about the effects that abandoned underground storage tanks impose on the watershed. When an underground storage tank is no longer needed or becomes structurally deficient, owners are required to drain the tanks and have them sealed or removed, thereby removing the threat of having future releases. Although the tanks are required to be sealed, the issue surrounds older gas station tanks that were in existence in the 1930s and if they have been closed

properly. In addition, there are so many underground storage tanks in the area, that people do not even know where they are.

Stormwater Management

Stormwater management involves planning for surface runoff into stream and river systems during rain or snowmelt events. Problems with stormwater occur when there is a large amount of impervious surface, such as driveways, roads, and parking lots. Surface runoff during storm events can cause excess sediment and pollutants to enter the streams. The development of a stormwater management plan would be beneficial to the watershed.

Acid Rain

Of all the issues raised by participants, acid rain is one of the most challenging to address. Conditions result from pollutant sources hundreds of miles away in other parts of the state and even other states. Pollutants are deposited in the watershed through rain. This is a national issue that requires cooperation among the states and national government. More information about acid rain is located in the Project Area Characteristics chapter.

Public Awareness and Education

Education is the key to actively involving citizens and improving the quality of life for watershed residents. Within the Three Sisters watershed, there seems to be a lack of respect or appreciation for the abundant natural resources that are available. This lack of concern can lead to poor environmental planning, minimal environmental awareness, missed funding opportunities, and the potential to lose valuable natural resources. Educating residents and officials so that they may understand the economic benefits and importance of watershed protection is essential to watershed improvements.

Environmental education is generally targeted to school-aged children. Adult environmental education programs are limited. Implementing programs to help landowners understand the importance of a healthy watershed could be a first step to getting them more involved. Stakeholders have identified a need to make the public more aware of environmental issues affecting the watershed community, such as illegal dumping, developmental pressures, industrial farming, and water quantity.

The Pennsylvania Department of Education (PDE) established environment and ecology standards requiring educators and students to become more involved in watersheds. Educators should look to local organizations to assist them in educating the youth. Reaching out to help the local school districts teach students about watersheds may inspire kids to become more involved in their local communities.

Illegal dumping

In addition to being unsightly, illegal dumps pose direct threats to the watershed and have a high potential to contaminate waterways. Waste containing hazardous materials soaked by rainfall may cause contaminants to leach through the soil or run off the land surface, contaminating ground or surface water. Trash and debris can directly enter the stream through heavy rainstorms, affecting water quality and stream aesthetics. Debris can collect in the stream, resulting in a clogging effect that raises water levels and causes flooding.

Locating and cleaning up illegal dumpsites is an important issue for the watershed community. The number of illegal dumpsites can be reduced through cleanups, education, and alternate disposal methods. Active participation by watershed residents and local government officials is needed to address illegal dumping issues. In addition, educating the public about the threats of illegal dumping is an important step in battling the epidemic. PA CleanWays chapters and volunteers work to clean up illegal dumps across the state by adopting roadways and trails where dumping occurs. For more information about illegal dumping and what you can do to help, contact the Bedford County PA CleanWays chapter.

Landowner rights

Buying property comes with many rights, privileges, and responsibilities for the landowner. Liability is a major concern for landowners and the reason that many landowners post their property. Respecting landowners' rights, individuals should refrain from trespassing on private lands during hiking, fishing, hunting, or other recreational activities. Having maps available that identify recreational facilities and public lands could minimize the intrusion on privately owned properties.

Municipal Cooperation

Within Pennsylvania, the townships of Mann, Monroe, and Southampton worked together to complete their comprehensive plans. These municipalities have created a regional plan that does not stop at municipal boundaries, just as the watershed does not stop at municipal boundaries. Combining their resources and efforts, these municipalities have been able to take a regional approach to addressing issues, such as illegal dumping and developmental pressures, that are pertinent in each of their townships and in the watershed. They have expressed an interest in establishing a shared management of non-road issues in their townships.

Partnerships, like that of Mann, Monroe, and Southampton townships, are hard to come by, but are necessary. Expanding the partnership to include interstate cooperation among townships, counties, and states would be beneficial to the Three Sisters watershed.

Agriculture

Agriculture is the second-leading land use within the watershed and a way of life for many residents. Preserving the rural character of the watershed also involves preserving the agricultural lands and operations.

Sustainable Farming vs. Industrial Farming

The majority of agricultural operations within the watershed are small, sustainable family-owned operations, and watershed residents would like to see this trend continued. In addition to developmental pressure, there is also the pressure for industrial farming, which has received negative feedback from many watershed residents. The reasons for much of the negative feedback are the practices of industrial farms, such as the use of hormones and antibiotics. Sustainable farms give back to the land and utilize best management practices to limit the amount of pollutants affecting the watershed.

Farmland Preservation

Preserving farmland and open space for future generations is essential. Several programs are available to help landowners protect their farms and the rural way of life. Purchasing conservation easements protects the land for agricultural uses indefinitely. Other alternatives include agricultural security areas and farmland preservation programs. Agricultural landowners should consider enrolling in the program that is best for them. Enrolling in these programs can protect their farmland from development pressures.

Recreation

Watershed residents expressed an interest in capitalizing on the available recreational opportunities. Employment opportunities within the watershed are limited due to the rural character of the watershed; however, there is potential for some recreation-based industries.

Hunting, hiking, biking, horseback riding, swimming, and fishing were among the most popular recreation activities identified. Throughout the planning process, stakeholders identified the need for more recreational opportunities and more access to existing facilities.

Linking recreational facilities through the extension of existing trails, the development of new trails, and the establishment of more trailheads, could provide additional access to recreational sites. Also, providing trailhead amenities, such as parking, composting toilets, and hand pumps could enhance a visitor's experience.

Wind Turbines

Bedford County and Southampton Township have been targeted as potential sites for wind farms. Residents are concerned about the environmental and aesthetic impacts a wind farm could have on the land. Wind power is a renewable, non-polluting form of energy harnessed through the use of wind turbines, which are arranged in collections called wind farms. Wind farms are generally situated in areas with consistent and abundant winds, meaning that mountainous regions are usually ideal.

Economically, wind energy is becoming increasingly competitive with traditional fossil-fuel-generated electric power. It also offers environmental benefits because the supply of wind is unlimited and no emissions are created. However, wind energy is not without environmental and aesthetic issues. Many feel that they do not belong and are visually displeasing in the mountain landscape of a rural countryside. Another concern that arises from the placement of wind farms is the potential for forest fragmentation. However, only one percent of the wind farm area is rendered unusable for natural habitat or farming when turbines are put in place (British Wind Energy Association 2006). Erosion can become an issue with the installation of wind farms, but soil conservation and control measures within a normal wind farm construction plan take this into account. The major environmental concern posed by wind farms is the death of birds and bats that fly into the turbines, especially as prime areas for wind farms sometimes coincide with areas of bird migration.

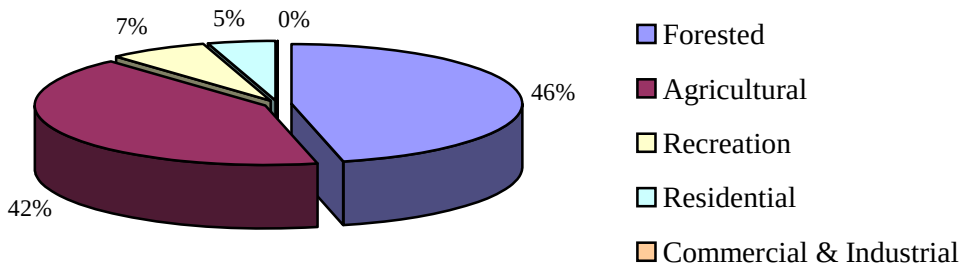
Survey Results

Watershed residents and municipal officials were asked to complete surveys to determine how stakeholders perceived the watershed and how they use the watershed. Blank copies of the surveys provided to residents and officials are located in Appendix J. Twenty-two surveys were returned, and the results are summarized below.

Land Use

When asked what they thought were the two most common lands uses within the watershed, residents and municipal officials responded that forestry and agriculture were the most common land uses. Land-use data identified that forestry and agriculture are the two major land uses. More information about land uses within the watershed is identified in the Land Resources chapter.

Figure 6-1. Common Land Uses as Viewed by Watershed Stakeholders and Municipal Officials



Watershed Attributes

Participants were asked to rank a list of watershed attributes according to their priority, with one being the most important and nine being the least important. The results are listed in Table 6-1. Municipal officials and watershed stakeholders identified water quality improvements, attractive natural settings, and preserving historical sites as the top three priorities.

Table 6-1. Values of Importance

Attribute	Public Surveys			Municipal Surveys		
	Total	Rank	Surveys Responding	Total	Rank	Surveys Responding
Water Quality Improvement	108	1	16	20	1	3
Attractive Natural Settings	92	2	15	20	1	3
Preserving Historic Sites	83	3	16	20	1	3
Recreation Opportunities	66	4	15	9	4	2
Community Activities	65	5	15	6	7	2
Educational Opportunities	62	6	16	6	7	2
New Business/Jobs	56	7	15	10	6	3
Residential Development	38	8	13	11	5	3

Recreational Opportunities

Participants were asked to list how they use or view the watershed for recreation, rating them from one to 14, with one being the most important item. Results are identified in Table 6-2. Boating, canoeing, hiking trails, fishing, and public parks were among the top recreational opportunities within the watershed. Camping was an additional recreational activity identified that was not listed in Table 6-2.

Table 6-2. Recreational Opportunities of Importance

Recreational Opportunity	Public Surveys			Municipal Surveys		
	Total	Rank	Surveys Responding	Total	Rank	Surveys Responding
Hunting	114	1	9	42	1*	3
Hiking	137	2	11	27	3	2
Bike Trails	86	3	7	17	7*	2
Horseback Riding	102	4	9	42	1*	3
Swimming	120	5	11	20	6	2
Fishing	118	6	11	36	5	3
Kayaking/Canoeing	116	7	11	17	7*	2
Photography	91	8	9	11	12	2
Bird Watching	99	9	10	12	11	2
Picnicking	91	10	10	13	10	2
Scenic Vistas	89	11	10	7	NR*	1
Boating	61	12	7	25	4	2
Public Parks	68	13	8	15	NR*	1
ATV Riding	41	14	5	24	9	3
Athletic Fields	29	15	4	3	NR*	1

* Ranking Tied

NR* – No ranking because of insufficient amount of data received

Watershed Aspects

Public survey participants were asked to identify positive and negative aspects of the Three Sisters watershed. In the sections below, their responses are listed, along with potential methods for improvement identified by survey participants.

Positive Aspects

The undeveloped natural beauty, scenic vistas, rural landscape, and peacefulness were mentioned numerous times, and are among the top positive aspects of the watershed. Residents take pride in their congenial community, and note that some families have resided in the area for as many as five and six generations. Outdoor recreational opportunities are plentiful, with the inclusion of Green Ridge and Buchanan state forests, excellent hunting opportunities, large areas of open space, and the wildlife and terrain of the watershed. Because the region is rural, stakeholders feel that there is less government intrusion than in other surrounding areas.

Negative Aspects

The negative aspects of the watershed can be separated into three categories: ethics, sprawl, and commercial agricultural practices. Within the watershed, some believe that there is a lack of respect or appreciation for the natural resources. Poor hunting ethics and the abuse of resources by some are evident. The growing amount of litter and illegal dumpsites along roads and streambanks could be contributed to this lack of respect or to the amount of sprawl threatening the watershed. The potential for development is high because of its close proximity to Cumberland, Md. and Washington, D.C. There is already one proposed housing development (Terrapin Run) in Allegany County that is too large for the resources available to the area. The third concern stakeholders have is industrial agriculture, such as animal feeding operations and the use of chemicals in agriculture.

Methods for Improvement

Watershed residents identified many possible ways to address some of the issues and concerns noted in this plan. Future negative impacts could also be reduced through smart growth planning, conservation efforts, and environmental education. The following is the list of suggestions provided by survey participants:

- Better land-use management techniques
- More assistance programs for farmers
- More assistance for loggers
- Natural versus chemical agricultural practices (renewable resources)
- Increase water quality monitoring
- Clean up roadsides, streambanks, and illegal dumpsites
- Control rules and regulations
- Establish an inventory of resources and their quality
- Stronger sense of interstate community
- Control manure management
- Provide alternative trash removal opportunities, such as Dumpsters, for trash
- Get rid of the hog farm
- Support good planning and conservation policies (smart growth)
- Monitor the number of wells being drilled in the watershed
- Do not allow sports which affect the environment and watershed (an example: ATVs)
- Monitor the use of ATVs in the watershed

Critical Needs

Municipal survey participants were asked to identify critical needs or challenges within their municipality that affect the Three Sisters watershed. All participants identified stormwater management

as a critical need. Controlling runoff from roads and agriculture is an essential part of stormwater management. Other critical challenges include limited public access to trails, illegal dumping, residential development, on-lot sewage systems, and concentrated animal farming.

Future Projects

Municipal survey participants were asked to identify projects that they envision for the future of their municipality. Their responses are as follows:

Land Resources

- Farmland preservation
- Residential development
- Illegal dumps
- Conservation Reserve Enhancement Program (CREP)
- Open space
- Prevention of illegal dumping
- Implement a subdivision ordinance

Water Resources

- Address AMD in Flintstone Creek
- Gravel road program
- Remove underground gas and fuel tanks
- Stormwater drainage and management

Biological Resources

- Establish more streambank buffers
- More stocked streams

Cultural Resources

- Environmental education in elementary school
- Stock Flintstone Creek
- Establish trailheads
- Install compost toilets and hand pumps (water) at community parks
- Stock trout

Other Resources

- Gravel on dirt roads to keep sediment out of streams
- Increase funding for maintenance of dirt and gravel roadways
- Sewage system in village of Clearville

Meeting Results

During the initial round of public meetings, participants had the opportunity to discuss what they envisioned for their watershed, including what they would like to protect and improve. Meeting participants prioritized the results of the visioning session, identified in the following section.

Protection

Table 6-3. Community Vision and Prioritization for Protection

Votes	Community Vision
31	Natural beauty – endangered viewscapes/night sky/open space – natural resources – diverse landscapes – wildlife – quiet, peaceful – mud – gardens
25	Rural lifestyle – country life – maintain rural character of the watershed/solitude and the minimum of human intrusion/open space, no traffic, no crime, safe
20	Water quality – supports a high diversity of aquatic species with some of the best fishing available – clean water – rivers and stable hydrology, including Exceptional Value and High Quality streams
14	Recreational opportunities – hunting, fishing, horseback riding, hiking, paddling
12	Intact forests – connected and large, public and private lands, state forests, and game lands
10	Tightly knit community – 5th and 6th generations, people have roots and family here, friendly atmosphere, neighbors and good people
8	Wildlife and important habitats – migratory habitat corridors/riparian zones/mountains as walls protecting the watershed – true mountains
7	History and heritage – one of the oldest terrestrial areas, migration route, fossils, reverted from logging
4	Residents recognize what they have and want to protect it
4	Opportunity to rethink development and planning and not make the same mistakes
3	Programs to limit illegal dumping such as bulky waste drop-off days
2	Clean air

Improvements

Table 6-4. Community Visions and Prioritization for Improvements

Votes	Community Vision
22	Establish more facilities for recreation, including parks and low-impact recreation for youth, swimming programs to teach kids to swim
21	Illegal dumping – change ethics of people dumping by educating them about effects of illegal dumping to water quality and their quality of life, clean up illegal dump sites, continue programs like the bulky waste days and increase the collection opportunities
21	Planning and development – discourage development in floodplains, consider water availability prior to development, water quantity during droughts, limit commercial zoning along major highway interchanges, and improve sewage treatment plant capacity – inadequate zoning – not enough enforcement of environmental protection laws/regulation – better communication technologies – more road maintenance – establish more sustainable roads (less polluting)
16	Sustainable farming – increase assistance for small-scale agriculture to be economically viable – CAFO operations – family farms have less impacts
10	Work with politicians – to support ideas and visions of watershed residents, implement Allegany County's comprehensive plan, more teeth to zoning laws (so they are not changed easily or on a whim), more local authority for zoning laws
8	Easements – increase funding to establish easements and protect them as a conservation tool
6	Create non-polluting jobs – to keep young adults in the region and improve economic viability

Table 6-4. Community Visions and Prioritization for Improvements (continued)

Votes	Community Vision
4	Better appreciation of area's history (in schools and community) – sense of identity
4	More social programs – public transportation, assistance for elderly and handicapped, help fight illiteracy
4	People to take ownership of creeks and natural resources in order to protect them
3	Industrial animal operations
3	Need for good science to tackle environmental issues such as hunting-related and sewage sludge applications
1	Not enough open-mindedness and discussion of issues among residents
1	Respect for property owner rights – hunters trespassing on private property

Future Visions

Table 6-5. Community Visions and Prioritization for Future Visions

Votes	Community Vision
40	Maintain rural character – new residents to adapt to rural lifestyle and not change it – restrict large housing developments, avoid urban sprawl, slower pace of growth
20	Joint management/shared management of non-road issues in townships – more inter-cooperation among townships – interstate communication (public officials in Pa. and Md. need to work together)
12	Economic stability – relies on sustainable natural resources, need economic stability to keep young adults in the region – create employment registry – resource-oriented local and sustainable industries (that often can be generated and sold locally) – value added
10	Protect land
8	Smart growth – use wise economic stability and growth (balance) – tax incentives for restoration of historic buildings – development that considers hydrological limitations (and the fact that water is limited due to watershed location and geology)
6	Utilize local resources, by boards of education in environmental education
6	Skilled professionals to guide county planning (lack of director in Allegany County)
5	Air quality – more attention to impacts and remedies of acid rain, impacts of mercury, and education
4	More horses
4	Protect water resources
2	Well-informed public
2	Link trails – Mid State (Pa.) to Green Ridge trails
3	Cooperation among groups – grassroots organizations to work together – establish a partnership/contact list of groups in the area – cooperate with National Park Service
2	Expand property owners association
1	Utilization of controlled burnings
1	Keeping local schools
0	Combine schools for economic reasons
0	Less government interference

Interview Results

Telephone interviews were held with key individuals identified by the steering committee. The results of the interviews are summarized below. A copy of the interview questions is located in Appendix J.

How has the watershed changed in the past 10 years?

According to participants, there is an increase in residential development. Farmland is being subdivided into smaller residential lots, and only half of the new housing developments are from new people entering the area. The other half is from descendants of existing residents wanting to stay in the area.

Another change mentioned was the weather patterns. Participants mentioned that the winters are not like they use to be and the ground does not freeze in the winter. Precipitation does not infiltrate into the ground because of its compact state causing water to run off. Streams in the region no longer flow all year round as they have in the past.

Other notable changes include an increase in timbering operations, an increase in programs available to promote agricultural best management practices, and an increase in the number of CAFO permit applications. Watershed issues and concerns for watershed health are on the rise. More people are getting involved in addressing watershed issues. The Ridge and Valley Streamkeepers monitor stream conditions and have noted an increased level of nitrates in the waterways.

Do the following meet the needs of the watershed community?

Transportation

Public transportation is limited due to the watershed's rural address; however, a rural transit van is available to take elderly and disabled people to medical appointments. Some participants were aware of this service, while the majority was not. Better advertisement of social services, like public transportation, is needed. Nonetheless, watershed residents desire better public transportation opportunities.

Interviewees stated that there are enough roads and there is no need for additional roadways. The majority of the participants agreed that area roadways are in need of improvements and ongoing maintenance. Although they are better than they used to be, roadways are experiencing a higher volume of traffic and still are in poor condition. Programs to educate crews about the proper way to do roadwork should be conducted, and crews should follow the proper techniques when maintaining roads. Proper maintenance should decrease the amount of roadwork needing to be repeated each year.

Infrastructure

Within the watershed, there is very little existing infrastructure. Currently, all sewage is on-lot septic with varying levels of maintenance. There are no municipal sewage systems, no high-speed Internet options, and no local options for television.

Employment Opportunities

Employment opportunities within the watershed are lacking. The opportunities that do exist are few and are not high-quality jobs. A majority of the residents commute to work, with most traveling more than 40 miles away. Others are required to create business for themselves. A county-wide brainstorming effort is needed to get ideas from residents about how to improve this, especially with respect to marketing local agriculture. Many residents also agree that they do not want to attract too many employment opportunities because that could fuel sprawl.

Educational Opportunities

When it comes to educational opportunities, participants are split on whether there is not enough or just the right amount. Some feel that current efforts are adequate for the region, while others feel that more is needed.

Primary and secondary school education seems adequate within the watershed, but could always use improvements. The Vo-Tech has been instrumental in helping people learn skills and offers a cooperative program providing on-the-job experience to students. There are limited opportunities for higher education. Allegany College of Maryland, located in Cumberland, is the nearest school and it is a two-year college.

As far as environmental education is concerned, there could be more or better programs available. Everett and Bedford have good Envirothon teams, but more needs to be done to involve young people with watershed organizations. Encouraging more participation in local community groups is needed for all ages within the watershed. Interviewees believe that education is improving, but is still not good enough.

Land-Use Controls/Land-Use Ordinances

The overall consensus of those interviewed was that the land-use controls are poor and inadequate. Although the majority of residents would not accept it, land-use ordinances are needed. Efforts to educate citizens about the consequences of not having zoning and land-use ordinances are needed. Unless effective land-use ordinances are adopted and utilized, residential development from the east seems imminent. The establishment of land-use ordinances should be proactive and not reactive. Enforcement of existing ordinances is also needed.

Some concern about land-use ordinances within the watershed is that traditional zoning is unfair—rewarding some residents with higher value land. Participants feel that people want things to stay the way they have always been and do not want to be told what they can and cannot do on their property. One possible solution would be to adopt a system that would allow trading of development rights among landowners. Township and county officials should take better advantage of the county planning commissions in establishing land-use ordinances.

Do the recreational opportunities available meet the needs of the watershed community?

Parks and Picnic Sites

The watershed's parks and picnic sites are scenic and well maintained. Although the number of sites is adequate, some people would like to see more facilities. Designating three to six areas for parks, picnic sites, and ball fields should be included in all land-use plans. A recreational committee to encourage and oversee park sites and facilitate sporting activities should be formed.

Hiking and Biking Trails

Though many trails exist within the watershed, interviewees believed that more are needed. Trails raise environmental awareness and attract tourists. The hiking trails in the area are enjoyable, but require a good map to follow. Trails for biking and horseback riding are limited and are in need of maintenance.

Off-Road Vehicle Riding

One of the most controversial issues within the watershed is the use of off-road vehicles or ORVs. Although there are a couple of designated areas for ORVs, there is still too much illegal use. Participants stated that more legal restrictions and enforcement are needed. The majority of the areas legally available are located in state forests. If any new ORV trails open up, they should not be on state forestlands.

Scenic overlooks are treasures in the watershed and are a great place to watch for hawks and osprey

Scenic Vistas/Photography

Existing within the watershed are numerous scenic vistas or areas for photography. Though they have the potential to bring tourism into the watershed, there is very little marketing or advertising of these locations. Protecting these vistas is important to watershed residents. However, the potential building of alternative energy wind turbines on ridgetops is threatening their existence. Interview participants suggested that scenic vistas should be called endangered viewscapes where the scenery may be degraded if development and growth is not controlled or managed.

Wildlife/Bird Watching

The watershed's abundance of contiguous forestland provides many opportunities for wildlife watching. The Tussey Mountain Important Bird Area allows visitors to view a variety of birds, particularly raptors, because it is located on the migratory bird paths. Wildlife watching is not a popular recreational activity within the watershed, even with the plethora of sites available. Residents and students should be encouraged and enlightened about the joys of wildlife watching.

Hunting/Fishing

There are many opportunities for fishing and hunting; however, streams are running dry during part of the year, decreasing the fishing season and the number of wild or native fish.

Several state game lands and state forests exist within the watershed. However, posting by private landowners increases each year, decreasing areas available for hunting. An overpopulation of the deer herd needs to be addressed, although it seems that over the past several years, fewer hunters have been successful in harvesting a deer.

Boating and Swimming

Boating within the watershed is sporadic, and depends on the height of the streams. During certain times of the year, the streams are high enough for canoeing and kayaking. However, more information could be made available to the public about the opportunities.

People also utilize the creeks for swimming. Residents enjoy local swimming holes, although nothing is advertised for these locations. Many people also use nearby Rocky Gap State Park in Maryland for boating and swimming.

Historical Sites and Structures

The Three Sisters watershed is fortunate to have numerous historical sites, although many local residents do not know about them. They include old churches, a slave graveyard, old election houses, and covered bridges. Unless the history is shared, it will be lost. Efforts to make the community aware of its history are needed, such as advertising local sites through the development of a tour or brochure. Currently there is not much respect for historical sites and artifacts.

What are some of the impacts currently affecting the resources of the watershed?

Land Resources

Impacts to the land resources also have impacts on the water and biological resources. Interviewees stated that there is a rise in the number of natural gas wells being drilled, a rise in the amount of residential development, too much use of ORVs, and poorly maintained roads interfere with the

hydrologic regime. Many of the family farms are closing and those that do exist are operating as "weekend" or part-time farms.

Agricultural practices also impact the land resources. Improving agricultural practices and following best management practices can limit impacts to the land. Improvement of agricultural practices is needed, such as not grazing animals too close to streambanks, not practicing agriculture on steep slopes, and utilizing no-till practices.

Poor logging practices are prevalent within the watershed, and adversely affect the land and streams. Currently, logging is practiced with little regard for maintaining the soil. Many landowners do not know how to deal with loggers to keep them from clear-cutting or high-grading their forests. Timbering practices need to be improved, including the education of landowners.

Water Resources

Water quality and quantity are important issues within the watershed. The area is impacted by acid rain, decreasing the pH of the water. Poorly managed riparian areas destroy streambanks and increase sediment entering waterways, along with runoff from poor logging and road maintenance practices. Some septic systems drain directly into the creeks. The quantity of water has decreased, and there is barely enough rain and snow for agricultural uses.

Biological Resources

There are several impacts to the biological resources of the watershed. Invasive species are one of the biggest problems because they out-compete native species and spread rapidly. Diseases and over-population of deer are also concerns. The deer eat forest shrubs and ground species, and do not give the species the opportunity to re-establish. In some areas, wild boars have been impacting the watershed by rooting around and destroying the woods.

Do you have any specific projects that you would like to see identified in the plan?

Participants listed the following projects and types of projects that they would like to see identified in the plan:

- Townships need better programs to deal with illegal dumping. Dump cleanups are good, but attitudes need to change more. The government should provide people with better opportunities to get rid of their junk.
- Riparian restoration and protection programs are needed, including an effective riparian habitat ordinance.
- More needs to be done to control where wind turbines are placed.
- More environmental education programs are needed.
- Encourage landowners to work on habitat restoration.
- Bedford County needs a better recycling program.
- Enhance programs to improve road maintenance.
- A greater effort must be made to adopt effective land-use ordinances. I haven't quite made up my mind on whether we should have zoning, but I definitely don't want big developments moving to the area. There needs to be an ordinance to keep people from logging and building on the floodplains.

What must the watershed conservation plan say to be successful?

Participants felt that in order for the watershed conservation plan to be successful, it needs to encourage residents to get involved and do their part. It needs to highlight how effects of the land-use practices are felt locally. The plan needs to send the message that the community's ideas toward

watershed issues must change. It must also encourage the implementation of the comprehensive plans created for each county or municipality.

The plan must call for efforts to reduce stream pollution and to decrease nutrient and sediment runoff levels. It must also call for more monitoring programs, address development threats from the cities, address riparian protection and restoration, encourage proper road maintenance, and address destructive agriculture, logging, and homebuilding practices. The plan must address all of these factors in a way that encourages and persuades local residents to adapt to changing circumstances.

For the plan to be successful, a 100-year vision for the Three Sisters watershed, that includes development and economic growth, should be created.

What must the watershed conservation plan not say to be successful?

Respondents indicated that in order for the watershed conservation plan to be successful it must be consistent with the views and wishes of watershed residents. It cannot call for more development, whether it is business, residential, or roadways. The plan must follow the communities' values without being too preachy or overbearing on landowner rights and emphasize how the activities recommended in the plan will benefit the watershed area, as opposed to areas downstream in Washington, D.C.

CHAPTER 7. MANAGEMENT RECOMMENDATIONS

This section highlights recommendations to improve the quality of life within the watershed. These management recommendations are non-regulatory and may be used by any citizen, group, or agency. Potential partners are groups with the resources best suited to assist in meeting these objectives. Potential avenues through which the objectives may be financed are also listed. Groups listed as possible partners or funding sources are suggestions and should not be limited to those provided due to ever-changing circumstances.

Public meeting workshop participants prioritizing issues brought up during the evening's visioning session

The recommendations were derived from correspondence and comments regarding the issues and concerns identified by local citizens throughout the planning process. The issues and concerns are discussed in further detail in the Issues and Concerns chapter. The watershed community developed the management recommendations through comments, interviews, public meeting workshops, and the completion of surveys. The prioritization of the recommendations was determined by the steering and advisory committees, and by the public during the draft review phase. These rankings are based upon impacts to the watershed, feasibility, and probability of funding.

This matrix of recommendations includes goals, methods to achieve the goals, potential partners, and potential funding sources. They are listed by priority, with the higher priorities for each goal and method listed first. An additional listing of potential funding sources and the type of projects that might be funded is included in Appendix K. Acronyms used in the management recommendation matrices are listed in Table 7-1.

Table 7-1. Acronyms Used in the Management Recommendations Matrices

BMP	Best Management Practice
MBSS	Maryland Biological Stream Survey
MEDA	Maryland Economic Development Association
MD DNR	Maryland Department of Natural Resources
MDA	Maryland Department of Agriculture
MDE	Maryland Department of the Environment
MDOT	Maryland Transportation Department
MHT	Maryland Historical Trust
NPS	National Park Service
NRCS	United States Department of Agriculture Natural Resources Conservation Service
PABS	Pennsylvania Biological Survey
PA DCED	Pennsylvania Department of Community and Economic Development
PA DCNR	Pennsylvania Department of Conservation and Natural Resources
PA DEP	Pennsylvania Department of Environmental Protection

PDA	Pennsylvania Department of Agriculture
PennDOT	Pennsylvania Department of Transportation
PFBC	Pennsylvania Fish and Boat Commission
PGC	Pennsylvania Game Commission
PGS	Pennsylvania Geological Survey
PHMC	Pennsylvania Historic Museum Commission
RVS	Ridge and Valley Streamkeepers
SAC	Southern Alleghenies Conservancy
SEO	Sewage Enforcement Officer
TNC	The Nature Conservancy
USDA	United States Department of Agriculture
USGS	United States Geological Survey
U.S. EPA	United States Environmental Protection Agency
WOSA	Woodland Owners of the Southern Alleghenies
WPC	Western Pennsylvania Conservancy
WREN	League of Women Voters Water Resources Education Network

Project Area Characteristics

Goal 1-1. Protect the watershed from unwanted and undesirable land uses.

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
1. Establish and enforce land-use ordinances supportive of county and municipal comprehensive plans.	Municipal and County Officials, County Planning Commissions	Local Government, PA DCED, MEDA	**High**
2. Establish land-use ordinances protecting the communities from undesirable land uses.	Municipal Officials, Planning Commissions, Citizens, Community Groups, Businesses	Local Government, PA DCED, MEDA	**High**
3. Strengthen the regulation of land-use ordinances so they are not changed easily.	Municipal and County Officials, Planning Commissions	Local Government, PA DCED, MEDA	**High**
4. Monitor the amount of commercial zoning along major highway interchanges, to support county and municipal comprehensive plans.	County Officials, Planning Commissions	Local Government PA DCED, MEDA	**Medium**

Goal 1-2. Utilize smart growth practices and comprehensive land-use plans when addressing development pressures.

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
1. Encourage the use of smart growth practices in local planning to support good planning and conservation policies.	Municipal, County, and State Officials, U.S. EPA, Planning Commissions, PA DEP, MDE	Foundations, Private Sources, MDE, PA DEP, U.S. EPA, Local Government	**High**
2. Consult and implement county and municipal land-use plans.	Municipal and County Officials	Local Government, Private Sources	**High**
3. Encourage the use of conservation by design strategies when community development activities arise.	Municipal and County Officials, Developers, Planning Commissions, NPS	Local Government, Private Sources	**High**
4. Encourage participation by natural resource managers to actively participate in municipal and county planning meetings, commissioner or municipal official meetings, and become involved in the development of comprehensive plans.	Conservation Groups, MD DNR, DCNR, PGC, Municipalities and Counties, NPS	PA DCNR, MD DNR, Private Sources	**Medium**

Goal 1-2. Utilize smart growth practices and comprehensive land use plan when addressing development pressures (continued).

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
5. Complete a comprehensive plan for Union Township, Fulton County.	Union Township Supervisors, Fulton County Planning, Citizens, Community Groups	PA DCED, Private Sources, Local Government	**Low**
6. Maintain skilled professionals in positions to guide county planning efforts.	County Officials, Planning Commissions	Local Government	**Low**

Goal 1-3. Protect the rural character and pace of life and create a stronger sense of community.

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
1. Limit the amount of residential development based upon limitations of the physical characteristics of the region, including the consideration of water-use limitation in permitting decisions.	Planning Commissions, Municipal and County Officials, Scientists, NRCS, USGS	PA DEP, MDE, NRCS, USGS, Foundations, Private Sources	**High**
2. Establish a joint or shared management of non-road issues among townships.	Township Officials	Private Sources, Local Government	**High**
3. Establish interstate communication and cooperation between townships, counties, and states.	Municipal, County, and State Officials	Private Sources, Local Government	**High**
4. Avoid urban sprawl by restricting large housing developments.	Municipal and County Officials, Planning Commissions	Foundations, Private Sources, Local Government	**Medium**
5. Maintain local schools to protect the sense of community around them.	Municipal and County Officials, Planning Commissions, School Districts	Government Funding, Foundations, Private Sources	**Medium**

Goal 1-4. Enhance area roadways through the installation of best management practices.

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
1. Implement practices identified in the Better Roads Clean Streams assessment of dirt and gravel roads.	Municipal and County Officials, Departments of Transportation, Dirt and Gravel Roads Program, WPC, TNC	Departments of Transportation, Private Sources, Foundations	**High**

Goal 1-4. Enhance area roadways through the installation of best management practices (continued).

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
2. Provide required workshops and/or training sessions to train road masters on sustainable maintenance practices.	Road Masters, Departments of Transportation	Foundations, Private Sources	**High**
3. Increase funding available to provide sustainable maintenance practices on area roadways.	Municipal and County Officials, Departments of Transportation	Departments of Transportation, Private Sources	**High**

Goal 1-5. Establish economic stability needed to maintain a balanced workforce.

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
1. Increase economic stability that promotes sustainable natural resource use, such as establishing local resource-oriented sustainable industries like value-added and farmers' markets. Value added industries increases the value of a product through addition stages of production, such as wood staining, or building furniture from local timber.	Businesses, Citizens, Chambers of Commerce	Private Sources	**High**
2. Create non-polluting jobs to keep young adults in the region and improve economic viability.	Businesses, Municipal and County Officials, NPS, Planning Commissions	Private Sources	**Medium**
3. Encourage residents to support local businesses through the development of a local business directory.	Businesses, Citizens, Municipal and County Officials, Chambers of Commerce	Private Sources	**Medium**
4. Create an employment registry listing all filled and vacant jobs.	Municipal and County Officials, Planning Commissions, Businesses	Private Sources, Local Government	**Medium**
5. Encourage local business owners to establish a cooperation or network of industries to spread the word about each other's businesses.	Businesses, Chambers of Commerce	Private Sources, Local Government	**Medium**

6. Establish a website promoting the local businesses.	Municipal and County Officials, Businesses, Planning Commissions	Private Sources, Local Government	**Low**

Goal 1-5. Establish economic stability needed to maintain a balanced workforce (continued).

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
7. Investigate the possibilities of combining local schools to determine if any economic gain could be made through school consolidations.	Municipal and County Officials, Planning Commissions, School Districts	Private Sources	**Low**

Goal 1-6. Minimize threats to air quality.

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
1. Educate residents about the impacts that acid rain and mercury have on the environment.	U.S. EPA, PA DEP, MDE, Conservation Groups	U.S. EPA, PA DEP, MDE, Foundations, Private Sources	**High**
2. Identify impacts of acid rain and mercury and work to minimize or remediate these impacts.	U.S. EPA, PA DEP, MDE, Conservation Groups	U.S. EPA, PA DEP, MDE, Foundations, Private Sources	**High**
3. Educate residents about local issues affecting air quality.	U.S. EPA, PA DEP, MDE, Conservation Groups	U.S. EPA, PA DEP, MDE, Foundations, Private Sources	**Medium**
4. Work with neighboring states to reduce emissions from industries emitting critical pollutants impacting the air quality.	U.S. EPA, Environmental Agencies of Neighboring States	Foundations, U.S. EPA, Private Sources	**Low**

Land Resources

Goal 2-1. Encourage the use of sustainable farming practices.

Methods to achieve goal:	***Potential Partners:***	***Potential Funding:***	***Priority:***
1. Educate agricultural landowners about programs available to increase sustainability and assist them financially, such as best management practices and new techniques that would be beneficial to the landowner and the environment.	USDA, NRCS, Conservation Groups, Farm Bureaus, PA DEP, MDE, MDA, PDA, Conservation Districts	Foundations, Private Sources, PA DEP, MDE, USDA, MDA, PDA, Conservation Districts	**High**
2. Increase financial assistance to small-scale agriculture, helping it become economically viable and environmentally responsible.	USDA, NRCS, Farm Bureaus, Conservation Districts, MDA, PDA	Foundations, Private Sources, Conservation Districts, Government Funding	**High**
3. Encourage agricultural landowners to create and implement nutrient management plans for their properties.	Conservation Groups, USDA, NRCS, Farm Bureaus, PA DEP, MDE, MDA, PDA	Foundations, Private Sources, PA DEP, MDE, MDA, PDA	**Medium**
4. Work with legislatures to enforce regulations placed on industrial agriculture, protecting the health of the watershed.	PA DEP, MDE, USDA, NRCS, U.S. EPA	Government Funding	**Medium**
5. Encourage agricultural landowners to enroll in incentive programs like the Conservation Reserve Enhancement Program and Conservation Reserve Program.	PA DEP, MDE, U.S. EPA, NRCS, USDA, PDA, MDA, Conservation Districts	Foundations, Private Sources, PA DEP, MDE, U.S. EPA	**Medium**
6. Conduct an agricultural liming demonstration project to determine if farmers are under-liming for optimal productivity and whether they can be encouraged to increase the use of lime on their fields.	Conservation Districts, Conservation Groups, PA DEP, MDE, MDA, PDA	PA DEP, MD MDE, MDA, PDA, Private Sources, Foundations	**Low**
7. Conduct feasibility studies and demonstration projects designed to integrate biological by-products of agriculture and forestry with energy production in ways that make these industries more self-sufficient, more economically sustainable, and less of an environmental impact.	NRCS, Conservation Districts, USDA Rural Development, SAC, Conservation Groups, PA DEP, PA DCNR, PA Farm Bureau, PDA, MDA	PA DEP, USDA, Private Sources, Foundations, MDA, PDA	**Low**
8. Limit the amount of industrial agriculture through the establishment and implementation of land-use ordinances.	Municipal and County Officials, Planning Commissions	Private Sources	**Low**

Goal 2-1. Encourage the use of sustainable farming practices (continued).

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
9. Encourage agricultural producers to utilize organic sources of nutrients for crop production, including bioenergy crop production, as a component of nutrient management planning.	NRCS, Conservation Districts, USDA Rural Development, PA DEP, PA DCNR, PDA, MDA, USDA	PA DEP, NRCS, USDA, PDA, MDA, Private Sources, Foundations	**Low**

Goal 2-2. Protect forest resources by utilizing best management practices.

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
1. Decrease forest fragmentation by maintaining contiguous forest tracts and/or by maintaining travel corridors between non-contiguous forest tracts.	WOSA, Conservation Groups, Landowners, PGC	PA DCNR, MD DNR, WOSA, Private Sources, Foundations	**High**
2. Educate forestland owners by providing them with accurate information regarding sound silviculture practices, forest management plan development, and insect and disease problems that can affect forest health.	Foresters, PGC, Landowners, WOSA, Conservation Groups, Cooperative Extensions, Conservation Districts	PA DCNR, MD DNR, Private Sources, Foundations, WOSA	**High**
3. Encourage public land managers to adopt and utilize management plans that protect forest landscapes.	Conservation Groups, PA DCNR, MD DNR	PA DCNR, MD DNR, Foundations, Private Sources	**High**
4. Encourage the development and use of forest stewardship plans or forest management plans and participation in forest stewardship and tree farm programs.	Landowners, WPC, Foresters, WOSA, Conservation Groups	PA DCNR, MD DNR, WOSA, Private Sources	**High**
5. Continue hosting workshops and conferences to encourage and compare forestry best management practice and investigate sustainable forestry certification opportunities.	WOSA, PA DCNR, Landowners, Loggers	PA DCNR, PA DEP, Foundations, Private Sources	**Medium**
6. Discourage the use of high-grading practices, such as diameter-limit harvest and selective cutting, and encourage timber harvesters to use sustainable best management practices under the direction of a professional forester.	Foresters, Conservation Groups, Conservation Districts, WOSA, PA DCNR, MD DNR	PA DCNR, MD DNR, WOSA, Private Sources	**Medium**
7. Support laws and regulations to maintain whitetail deer populations at levels that will ensure healthy forests, productive agricultural lands, and healthy deer populations.	Foresters, PGC, PA DCNR, MD DNR, Conservation Groups	Conservation Organizations, PGC, PA DCNR, MD DNR	**Low**

Goal 2-2. Protect forest resources by utilizing best management practices (continued).

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
8. Encourage the Pennsylvania legislature to expand Clean and Green to protect forest and open space along with other lands and encourage the Maryland legislature to establish a program similar to Clean and Green.	Conservation Groups, PA DEP, PA DCNR, Legislators, MDE, MD DNR	PA DEP, MDE, Private Sources, Foundations	**Low**
9. Encourage farmland/forestland tax matching programs to provide incentives to keep land in agriculture/forest and not convert it to residential use.	Conservation Groups, PA DCNR, PA DEP, MD DNR, MDE, PGC, Municipalities, Counties, and States	Government Funding, Foundations, Private Sources	**Low**

Goal 2-3. Protect farmland from developmental pressures.

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
1. Increase funding to establish easements and to protect them as a conservation tool.	Conservation Groups, Conservation Districts, Farm Bureaus, NRCS, Municipal, County, and State Officials	Government Funding, Foundations, Private Sources	**High**
2. Encourage landowners to establish conservation easements protecting their land for agricultural and conservation uses indefinitely.	Conservation Groups, Agricultural Landowners, Farm Bureaus, Conservation Districts, NRCS, Municipal, County, and State Officials	Government Funding, Foundations, Private Sources	**High**
3. Encourage participation of agricultural landowners in farmland preservation programs.	Municipal, County, and State Officials, NRCS, Agricultural Landowners, Farm Bureaus, Conservation Districts, Conservation Groups	Government Funding, Foundations, Private Sources	**Medium**
4. Establish an incentive program to encourage agricultural landowners to maintain their land for agricultural uses.	Conservation Groups, Agricultural Landowners, Farm Bureaus, Conservation Districts, NRCS	Government Funding, Foundations, Private Sources	**Medium**

Goal 2-4. Maintain the ecological, recreational, and visual significance of natural and open space areas.

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
1. Protect large forest tracts and key riparian areas by working with landowners to keep these tracts intact through enrollment in forestland stewardship programs, purchase of conservation easements, or acquisition of land.	Conservation Groups, PA DCNR, MD DNR, Forest Landowners, WPC	PA DCNR, MD DNR, Foundations, Private Sources	**High**
2. Protect ecologically significant areas through land acquisition and/or purchasing conservation easements.	Conservation Groups, PA DCNR, MD DNR, PGC, WPC	PA DCNR, MD DNR, Foundations, Private Sources	**High**
3. Develop a strategic plan to prioritize areas for protection through acquisition and conservation easement purchases.	Conservation Groups, PA DCNR, MD DNR, Landowners, WPC, Municipal and County Officials	PA DCNR, MD DNR, Foundations, Private Sources	**High**
4. Limit sprawl by restricting the number and types of developments that can be established through the creation and implementation of land-use ordinances.	Municipal and County Officials, Planning Commissions, WPC	Local Government, Private Sources	**High**

Goal 2-5. Decrease the amount of illegal dumping.

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
1. Consider establishing a program similar to PA CleanWays in Maryland.	Conservation Districts, PA CleanWays, Community Groups	MD DNR, MDE, Foundations, Private Sources	**High**
2. Continue programs, such as bulky waste days and waste drop-off locations that provide alternative methods for waste disposal.	Municipalities, Community Groups, PA CleanWays	Foundations, Private Sources	**High**
3. Host special cleanup days to remove illegal dumps.	Conservation Districts, PA CleanWays, RVS, Community Groups, Municipalities	PA DEP, MDE, Foundations, Private Sources	**Medium**
4. Identify and inventory dumpsites and establish an ongoing monitoring program to determine recent dumping activity at illegal dumpsites.	Conservation Districts, PA CleanWays, RVS, Community Groups	PA DEP, MDE, Foundations, Private Sources	**Medium**
5. Establish and increase funding for programs that educate residents about illegal dumping and alternative methods for trash removal.	Conservation Districts, PA CleanWays, Community Groups, Municipalities	Foundations, Private Sources	**Medium**

Goal 2-5. Decrease the amount of illegal dumping.

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
6. Establish a hotline or other means to report illegal dumping activity.	Conservation Districts, State Police, Counties and Municipalities, PA CleanWays, Citizens	Private Sources, Local Government	**Low**

Goal 2-6. Protect ecological resources by reducing impacts from industry.

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
1. Continue to educate loggers and landowners about management practices and their advantages for the landowner and sustainability of the forest.	MD DNR, PA DCNR, Loggers, Landowners, Forestry Associations, Sustainable Forestry Associations	MD DNR, PA DCNR, Forestry Associations, Foundations, Private Sources	**High**
2. Increase funding to assist loggers who utilize best management practices.	MD DNR, PA DCNR, Loggers, Landowners, Forestry Associations, Master Logger Programs	MD DNR, PA DCNR, Forestry Associations, Foundations, Private Sources	**High**
3. Monitor the number of gas and water wells being drilled to protect the resources and the rural character.	MDE, PA DEP, PA DCNR, MD DNR, Municipal Officials, USGS, PGS	MDE, PA DEP, PA DCNR, MD DNR, Foundations, Private Sources	**High**
4. Remove leaky underground gas and fuel storage tanks.	PA DEP, MDE, Businesses	PA DEP, MDE, Private Sources	**Medium**

Water Resources

Goal 3-1. Minimize the amount of erosion and sedimentation that enters area waterways.

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
1. Reduce erosion and sedimentation by incorporating best management practices into all earth-moving activities, including logging, construction and development, and natural resource extraction; work with state agencies to enforce regulations in protected watersheds.	PA DEP, PA DCNR, MDE, MD DNR, Businesses	PA DEP, PA DCNR, MD DNR, MDE, Private Sources, Foundations	**High**
2. Implement recommendations resulting from Better Roads Clean Streams study.	TNC, WPC, Municipalities, PennDOT, MDOT	PA DEP, MDE, Local, State, and Federal Government	**High**
3. Increase funding for maintenance of dirt and gravel roads program.	PennDOT, MDOT, Municipalities and Counties, TNC	PA DEP, MDE, Private Sources, Foundations	**High**
4. Promote tax incentives and cost-share programs for streambank fencing, barnyard stabilization, and other best management practices.	Municipalities and Counties, Conservation Districts, Cooperative Extensions	Private Sources, Foundations, Local, State, and Federal Government	**Medium**
5. Support the Ridge and Valley Streamkeepers annual restoration project, like the 2006 Riparian Project.	RVS, Conservation Groups, Landowners, PGC, PA DCNR	PA DEP, PA DCNR, MD DNR, MDE, Private Sources, Foundations	**Medium**
6. Investigate sources and potential sources of sediment and nutrients using flow and sediment information from stream gauges and Chesapeake Bay Foundation nutrient and sediment budgets.	Conservation Groups, Conservation Districts, PA DEP, MDE	PA DEP, MDE, Private Sources, Foundations	**Low**

Goal 3-2. Increase awareness of water quality issues.

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
1. Educate homeowners about the effects of the overuse of fertilizers, pesticides, and herbicides on groundwater.	Conservation Groups, Conservation Districts, Landowners, Cooperative Extensions, RVS, Landowner Associations	PA DEP, PA DCNR, Private Sources, Foundations	**High**

Goal 3-2. Increase awareness of water quality issues (continued).

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
2. Develop and implement education workshops and/or outreach programs to educate residents about stream designation criteria, non-point source and point source pollution, and how to research and report violations.	Conservation Districts, Conservation Groups, PA DEP, MDE, MD DNR, PA DCNR	PA DEP, MDE, U.S. EPA, MD DNR, PA DCNR, Private Sources, Foundations	**Medium**
3. Encourage interested organizations and individuals to work together in determining if a petition to change Fifteenmile Creek to EV status is feasible. If feasible, petition for status change.	Conservation Groups, Conservation Districts, PA DEP, PFBC, Municipalities	PA DEP, Private Sources, Foundations	**Medium**
4. Promote groundwater quality awareness when conducting education and outreach programs, and provide educational information about potential threats to water supply.	Conservation Groups, Conservation Districts, PA DEP, MDE, Businesses	PA DEP, MDE, Water Companies, Private Sources, Foundations	**Medium**

Goal 3-3. Protect area water resources to maintain or improve water quality.

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
1. Determine what impact salt and ashes, utilized to remove snow and ice on roadways, have on the water quality and investigate alternative practices.	Conservation Groups, Conservation Districts	PA DEP, MDE, Private Sources, Foundations	**Medium**
2. Work with local and state agencies to better enforce regulations protecting water quality, particularly for High Quality, Exceptional Value, III-P, and IV-P designated streams.	Conservation Districts, Conservation Groups, PA DEP, MDE, MD DNR, PA DCNR	PA DEP, MDE, U.S. EPA, MD DNR, PA DCNR, Private Sources, Foundations	**Medium**
3. Lobby for stricter requirements for nitrous oxide emissions in order to reduce the impacts of acid rain.	Conservation Groups, PA DEP, MDE	PA DEP, MDE, U.S. EPA	**Medium**
4. Determine what the acceptable pH is for streams within the watershed and whether acid rain is negatively impacting aquatic life.	Conservation Districts, RVS, Conservation Groups, PA DEP, MDE	PA DEP, MDE, U.S. EPA, Private Sources, Foundations	**Medium**
5. Support a regional strategy for the production of bioenergy crops utilizing excess nutrients from animal waste.	NRCS, USDA Rural Development, PA DEP, PA DCNR, SAC, MDE, MD DNR, Conservation Districts	NRCS, USDA, PA DEP, PA DCNR, MDE, MD DNR, Private Sources, Foundations	**Medium**

Goal 3-3. Protect area water resources to maintain or improve water quality (continued).

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
6. Investigate the possibility of conducting a demonstration project within the Sideling Hill Creek watershed to determine if an in-stream lime treatment could decrease acidity in the stream.	Conservation Groups, PA DEP, MDE, U.S. EPA	PA DEP, MDE, U.S. EPA, Private Sources, Foundations	**Medium**
7. Incorporate watershed protection components into existing municipal and county ordinances; new ideas may be developed by beginning a dialogue with other municipalities or counties that have taken such an approach.	Municipalities and Counties, Conservation Groups, County Planning Commissions	PA DEP, MDE, Private Sources, Foundations, Local Government	**Medium**
8. Encourage area residents to monitor groundwater levels in an effort to track ground levels that can be used as baseline data to determine loss of groundwater.	Conservation Groups, RVS, Conservation Districts, Landowners	PA DEP, MDE, Private Sources, Foundations, WREN	**Medium**
9. Develop and implement total maximum daily loads on impaired streams.	PA DEP, MDE, Conservation Districts, Conservation Groups	PA DEP, MDE, U.S. EPA, Private Sources, Foundations	**Low**

Goal 3-4. Protect the source and quantity of water resources available.

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
1. Develop a water budget for each of the three watersheds, in order to better understand the sources and amounts of water available and the types of development activities that can be supported with the available resources.	Conservation Districts, Conservation Groups, PA DEP, MDE	PA DEP, MDE, Private Sources, Foundations	**High**
2. Determine percent of impervious cover and use this estimate as a reference to identify future land-use changes.	Municipalities and Counties, Conservation Districts, Conservation Groups, PA DEP, MDE	PA DEP, MDE, Private Sources, Foundations	**High**
3. Use Indicators of Hydrology Alteration Modeling Program to determine if streams are at healthy flow levels.	PA DEP, MDE, Conservation Groups	PA DEP, MDE, Private Sources, Foundations	**High**
4. Establish additional monitoring stations along Sideling Hill Creek, Fifteenmile Creek, and Town Creek.	USGS, PA DEP, MDE, U.S. EPA, Conservation Groups	USGS, PA DEP, MDE, U.S. EPA, Conservation Groups	**Medium**

Goal 3-4. Protect the source and quantity of water resources available (continued).

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
5. Establish guidelines that require installation of low-flow devices for all new construction.	Municipalities and Counties, Businesses, Conservation Groups, Planning Commissions	PA DEP, MDE, Private Sources, Foundations	**Low**

Goal 3-5. Encourage and implement agricultural best management practices.

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
1. Encourage the establishment and maintenance of riparian vegetation and implementation of best management practices as a cost-effective means of non-point source pollution reduction.	Conservation Groups, NRCS, Conservation Districts	PA DEP, MDE, Private Sources, Foundations, MD DNR	**High**
2. Encourage farmers to develop nutrient management plans to boost productivity and protect water resources.	Conservation Groups, NRCS, Conservation Districts, Landowners	NRCS, PA DEP, MDE, Private Sources	**Medium**
3. Encourage the establishment of riparian buffers along all waterways through the education of stakeholders and/or local land-use controls.	Conservation Groups, Conservation Districts, RVS, Landowners	PA DEP, MDE, Private Sources, Foundations, MD DNR	**Medium**
4. Encourage diverse farming operations that are environmentally responsible and economically viable.	Conservation Groups, Conservation Districts, NRCS, Landowners	PA DEP, MDE, Private Sources, Foundations	**Medium**
5. Encourage extensive use of pasture on animal-dependent farms (e.g. dairy and beef) to minimize the concentration of animals in feedlots.	Conservation Groups, Conservation Districts, NRCS, Landowners	PA DEP, MDE, Private Sources, Foundations	**Low**

Goal 3-6. Monitor watershed conditions to identify threats and determine their impacts to the water quality.

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
1. Expand the Ridge and Valley Streamkeepers monitoring program, through the recruitment of volunteers, to include Fifteenmile Creek.	RVS, Landowners	PA DEP, MDE, Private Sources, Foundations	**High**
2. Study agricultural practices, residential developments, road maintenance practices, and forestry practices to obtain a better understanding of the impact that sediment pollution has on stream systems.	WPC, TNC, Conservation Groups, Conservation Districts	PA DEP, MDE, U.S. EPA, Foundations, Private Sources	**High**

Goal 3-6. Monitor watershed conditions to identify threats and determine their impacts to the water quality (continued).

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
3. Develop a network of volunteers to collect rainwater and measure its pH, in order to determine the effects of acid rain.	Conservation Groups, RVS, Conservation Districts, Landowners, Students	PA DEP, MDE, Private Sources, Foundations	**Medium**
4. Host workshops or trainings for adult and student volunteers about stream monitoring.	Conservation Groups, Citizens, Landowner Associations	PA DEP, MDE, Private Sources, Foundations	**Medium**
5. Continue efforts to collect water quality information on a seasonal basis and compare past and present monitoring results to check for changes in conditions, either positive or negative.	Conservation Groups, Conservation Districts, Landowners, Students	PA DEP, MDE, Private Sources, Foundations	**Medium**
6. Utilize volunteers to measure the amount of woody debris, which supports aquatic life, entering streams, especially in headwater areas.	Conservation Groups, Conservation Districts, Landowners, Students	PA DEP, MDE, Private Sources, Foundations	**Medium**
7. Conduct sub-basin watershed assessments.	Conservation Groups, Conservation Districts, Landowners	PA DEP, MDE, Private Sources, Foundations	**Low**

Goal 3-7. Manage stormwater to maximize groundwater recharge.

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
1. Develop a stormwater management plan and implement the recommendations.	Municipalities and Counties, PA DEP, MDE, Conservation Districts	PA DEP, MDE, Private Sources, Foundations	**High**

Goal 3-8. Encourage and support alternative and traditional sewage treatment opportunities to reduce sewage pollution entering streams and groundwater.

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
1. Establish and/or continue cost-share programs to assist homeowners in septic repair, maintenance, and replacement.	PA DEP, MDE, Landowner Associations	Bay Restoration Fund, MDE, PA DEP, Private Sources, Foundations	**High**

Goal 3-8. Encourage and support alternative and traditional sewage treatment opportunities to reduce sewage pollution entering streams and groundwater (continued).

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
2. Perform a watershed-wide assessment of on-lot and municipal sewage systems to identify raw sewage discharges, combined sewage overflows, and sanitary sewage overflows.	Municipalities and Counties, Conservation Districts, Landowners	PA DEP, MDE, Private Sources, Foundations	**Medium**
3. Encourage PA DEP and MDE to approve more alternative sewage treatment types in rural areas; construct demonstration types for alternative systems, and develop outreach information.	Conservation Groups, PA DEP, MDE, Landowners, SEO	PA DEP, MDE, Private Sources, Foundations	**Medium**
4. Regularly update and enforce Act 537 Sewage Plans for Pennsylvania municipalities. Deny proposed sewage upgrades that are not compatible with local goals and enforce existing regulations for current facilities.	SEO, PA DEP, Municipalities	PA DEP, Private Sources	**Medium**
5. Improve capacity of existing sewage treatment plants.	Municipalities and Counties, PA DEP, MDE	PA DCED, MEDA, Private Sources, Foundations	**Low**
6. Establish sewage systems in populated areas, like the village of Clearville.	Municipalities, and Counties, PA DEP, MDE	PA DCED, MEDA, Private Sources, Foundations	**Low**

Goal 3-9. Reduce flooding opportunities in the area with proper and sound maintenance of floodplains.

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
1. Develop or update existing floodplain ordinances.	Municipalities and Counties, FEMA	Private Sources, Local Governments	**High**
2. Discourage development of primary and secondary residences in floodplain areas.	Municipalities and Counties, Landowner Associations, Conservation Groups	Private Sources, Local Governments	**High**

Biological Resources

Goal 4-1. Conserve the watershed's native biodiversity through monitoring, planning, and protection strategies.

Methods to achieve goal:	***Potential Partners:***	***Potential Funding:***	***Priority:***
1. Develop stronger partnerships among organizations working within the watershed to discuss threats to natural resources and develop protection strategies; this may include regular meetings with multiple conservation groups.	Community Groups, Conservation Groups, Conservation Districts, Citizens, NPS, Landowner Associations, Municipal and County Officials	PA DEP, MDE, Foundations, Private Sources	**High**
2. Provide educational programs for municipal and county officials about land-use planning and other tools that incorporate conservation goals into making communities more attractive and protecting biodiversity.	Conservation Groups, Planning Commissions, Municipal and County Officials, PA DEP, PA DCNR, MD DNR, MDE, PGC, PFBC	Foundations, Private Sources, PA DEP, PA DCNR, MDE, MD DNR, PFBC, PGC	**High**
3. Educate citizens about biological diversity and the vital importance of habitats in protecting species.	Conservation Groups, PA DCNR, MD DNR, RVS	PA DCNR, MD DNR, Foundations, Private Sources	**Medium**
4. Develop more detailed management plans by working with landowners of biologically diverse areas, including inventories of natural features and invasive or exotic species monitoring plans for the properties.	Conservation Groups, Landowners, PA DCNR, MD DNR	PA DCNR, MD DNR, Foundations, Private Sources	**Medium**
5. Provide educational field trips to elected officials emphasizing natural resources and the value of those resources to the region.	Conservation Groups, Citizens, Municipal, County, and State Officials	PA DEP, PA DCNR, MDE, MD DNR, Foundations, Private Sources	**Medium**
6. Develop a land steward program for biological diversity areas through which volunteers would be responsible for regular monitoring of these areas and educating landowners.	Conservation Groups, Citizens, PA School of Forestry	Foundations, Private Sources	**Medium**
7. Encourage local Pennsylvania residents to contact a Pennsylvania Game Commission biologist to develop a wildlife management plan for their property.	Conservation Groups, Citizens, PGC	PGC	**Medium**

Goal 4-1. Conserve the watershed's native biodiversity through monitoring, planning, and protection strategies (continued).

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
8. Educate the public about the use and purpose of Natural Heritage Inventories in planning, with an additional focus on understanding the importance of the natural resources that exist.	Conservation Groups, WPC, PA DCNR, PGC, PFBC, MD DNR	PA DCNR, MD DNR, Foundations, Private Sources	**Low**

Goal 4-2. Implement specific strategies to conserve rare and unique communities, flora, and fauna located within the watershed.

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
1. Prioritize and select shale barren communities for protection through public land management opportunities and private land acquisition and easement.	Conservation Groups, PA DCNR, MD DNR, NPS	Foundations, Private Sources	**High**
2. Work to understand the ecology of harperella and mitigate threats to this species, such as altered hydrologic cycles and invasion by Japanese stiltgrass.	Conservation Groups, PA DCNR, MD DNR, NPS	Foundations, Private Sources, PA DCNR, MD DNR	**High**
3. Protect or improve habitats that support threatened and endangered species and species of concern through acquisition, easements, and/or landowner education.	Conservation Groups, PA DCNR, MD DNR, NPS	Foundations, Private Sources, PA DCNR, MD DNR	**Medium**
4. Identify important riparian habitats for protecting tiger beetles and work to implement targeted strategies for controlling invasive Japanese knotweed in these areas.	Conservation Groups, PA DCNR, MD DNR	Foundations, Private Sources, PA DCNR, MD DNR	**Medium**
5. Ensure that forest management practices take into account, and are consistent with, the ecological and geographic requirements of Allegheny woodrat populations.	Conservation Groups, PA DCNR, MD DNR, NPS	Foundations, Private Sources, PA DCNR, MD DNR	**Medium**
6. Ensure that forest management practices take into account, and are consistent with, the ecological and geographic requirements of Camby's mountain lover populations.	Conservation Groups, PA DCNR, MD DNR	Foundations, Private Sources, PA DCNR, MD DNR	**Low**

Goal 4-3. Utilize and improve County Natural Heritage Inventories.

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
1. Conduct additional studies to monitor biodiversity, including surveys for historical species of concern for which the current status is unknown, in conjunction with the Pennsylvania and Maryland Natural Heritage Programs.	WPC, TNC, PA DCNR, MD DNR, PFBC, PGC, Conservation Groups	PA DCNR, MD DNR, Foundations, Private Sources	**Medium**
2. Incorporate Natural Heritage Inventories into municipal plans.	Municipal and County Officials, Conservation Groups	Foundations, Private Sources, Local Government	**Medium**
3. Study and expand areas to be included in County Natural Heritage Inventories as Biological Diversity Areas.	PA DCNR, MD DNR, WPC, Conservation Groups	PA DCNR, MD DNR, Foundations, Private Sources	**Low**
4. Update the Bedford County Natural Heritage Inventory, organizing it by watersheds and making it user friendly.	Bedford County Planning Commission, Bedford County Commissioners, Bedford Conservation District, WPC	PA DCNR, Foundations, Private Sources, Local Government	**Low**

Goal 4-4. Protect and improve wildlife habitats.

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
1. Increase habitat by planting riparian buffers or allowing them to grow back, through streambank fencing programs.	NRCS, PGC, WPC, PA DEP, MDE, MD DNR, Citizens, Conservation Districts	PA DEP, MDE, Foundations, Private Sources, Conservation Groups	**High**
2. Encourage streamside-property owners to leave a buffer from the edge of the stream when mowing their lawn.	NRCS, PGC, WPC, PA DEP, MDE, MD DNR, Citizens, Conservation Districts	PA DEP, MDE, Foundations, Private Sources, Conservation Groups	**Medium**
3. Improve aquatic life for fish, mussels, and other organisms by implementing best management practices and other restoration activities.	PA DEP, MDE, PFBC, MD DNR, Conservation Groups	PA DEP, PFBC, MD DNR, Foundations, Private Sources	**Medium**
4. Promote the preservation of riparian areas through education about their benefits for wildlife, flood prevention, and groundwater supplies.	NRCS, PGC, WPC, PA DEP, MDE, MD DNR, Citizens, PGC, Conservation Districts	PA DEP, MDE, Foundations, Private Sources, Conservation Groups	**Medium**

Goal 4-4. Protect and improve wildlife habitats (continued).

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
5. Work with utility companies to limit herbicide use and to utilize management techniques in rights-of-way, which may harbor at-risk butterfly and moth species.	Utility Companies, Transportation Departments, PABS, Conservation Groups, PA DCNR, MD DNR	Foundations, Private Sources	**Low**

Goal 4-5. Minimize the spread of exotic and invasive species and increase use of native plantings.

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
1. Develop an eradication or control strategy for removing invasive species, especially from high-quality areas or areas where an invasive species is expanding its territory.	Conservation Districts, MD DNR, Conservation Groups, PA DEP, PA DCNR, PABS, MBSS, MDE	PA DEP, MDE, PA DCNR, MD DNR, U.S. EPA, Foundations, Private Sources	**High**
2. Encourage the use of native plants in landscaping and wildlife habitat plantings.	PA DCNR, MD DNR, Landscapers, Sportsmen's Groups	Foundations, Private Sources, PA DCNR, MD DNR	**High**
3. Promote native tree plantings in streambank fencing projects.	Sportsmen's Groups, Conservation Groups, PA DCNR, MD DNR, PA DEP, MDE	Foundations, Private Sources, PA DCNR, MD DNR, PA DEP, MDE	**High**
4. Conduct a watershed-wide invasive species plant survey by subwatershed to develop a list of areas where invasive species pose the greatest threats to biodiversity.	Conservation Districts, Conservation Groups, PA DEP, PA DCNR, PABS, MBSS, MDE, MD DNR	PA DEP, MDE, PA DCNR, MD DNR, U.S. EPA, Foundations, Private Sources	**Medium**
5. Increase funding to control the hemlock wooly adelgid on ecologically important hemlock stands on private lands.	Conservation Groups, PA DCNR, MD DNR,	U.S. EPA, PA DCNR, MD DNR	**Medium**
6. Develop monitoring plans for invasive species on private properties by working with landowners, especially those whose properties contain high-quality natural communities.	Conservation Districts, Conservation Groups, PA DEP, PA DCNR, PABS, MBSS, MDE, MD DNR	PA DEP, MDE, PA DCNR, MD DNR, U.S. EPA, Foundations, Private Sources	**Medium**
7. Compile an Internet database of exotic and invasive species sightings that can be accessed and added to by the public.	Conservation Districts, MD DNR, MDE, Conservation Groups, PA DEP, PA DCNR, PABS, MBSS	PA DEP, MDE, PA DCNR, MD DNR, U.S. EPA, Foundations, Private Sources	**Low**

Goal 4-6. Promote and utilize deer management strategies that protect the watershed's natural resources.

Methods to achieve goal:	***Potential Partners:***	***Potential Funding:***	***Priority:***
1. Sponsor outreach programs about deer-management strategies and practices for private landowners.	PGC, MD DNR, Sportsmen's Groups, Conservation Groups, Landowners	PGC, MD DNR, Foundations, Private Sources	**High**

Methods to achieve goal:	***Potential Partners:***	***Potential Funding:***	***Priority:***
2. Promote and support deer-management strategies, such as special hunting tags and deer exclosures in natural areas.	PGC, MD DNR, Sportsmen's Groups, Conservation Groups	PGC, MD DNR, Foundations, Private Sources	**Medium**

Cultural Resources

Goal 5-1. Increase awareness of local environmental issues.

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
1. Educate residents and officials to understand the economic benefits and importance of watershed protection.	Conservation Groups, MDE, PA DEP, PA DCNR, MD DNR, Municipal and County Officials	PA DEP, MDE, PA DCNR, MD DNR, Foundations, Private Sources, U.S. EPA	**High**
2. Encourage school districts to work with conservation groups and agencies to educate students about watersheds.	Conservation Groups, MDE, PA DEP, PA DCNR, MD DNR, School Districts	PA DEP, MDE, PA DCNR, MD DNR, Foundations, Private Sources, U.S. EPA	**Medium**
3. Educate local students, beginning in elementary school, about environmental issues affecting the watershed.	Conservation Groups, MDE, PA DEP, PA DCNR, MD DNR, School Districts	PA DEP, MDE, PA DCNR, MD DNR, Foundations, Private Sources, U.S. EPA	**Medium**
4. Increase awareness of watershed-related issues through the distribution of materials and educational programs.	Conservation Groups, MDE, PA DEP, PA DCNR, MD DNR, Municipal and County Officials, RVS	PA DEP, MDE, PA DCNR, MD DNR, Foundations, Private Sources, U.S. EPA, WREN	**Medium**
5. Increase funding for environmental education programs targeting landowners and school districts.	Conservation Groups, School Districts, MDE, PA DEP, PA DCNR, MD DNR	PA DEP, MDE, PA DCNR, MD DNR, Foundations, Private Sources, U.S. EPA	**Low**

Goal 5-2. Encourage a better appreciation of the local history.

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
1. Establish an auto tour highlighting historical sites and events.	School Districts, Historical Societies, Citizens, Civic Groups	Private Foundations, Private Sources, PHMC, MD Trust	**Medium**
2. Host community events or festivals commemorating local historical events and places.	Citizens, Businesses, Municipalities, Community Groups	Private Foundations, Private Sources	**Medium**
3. Incorporate local history into history classes taught in local school districts.	School Districts, Historical Societies, Citizens, Civic Groups	Private Foundations, Private Sources, Departments of Education	**Medium**

Goal 5-2. Encourage a better appreciation of the local history (continued).

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
4. Install interpretive signage at historical locations.	Historical Societies, Municipalities, Community Groups	Private Foundations, Private Sources	**Medium**
5. Establish a local historical society to preserve historical sites and relics.	Citizens, County Historical Societies	Private Foundations, Private Sources	**Medium**
6. Work with elected officials to offer incentives or tax breaks for the restoration of historic buildings.	Citizens, Municipal, County, State, Federal Officials, Historical Societies	Private Foundations, Private Sources, PHMC, MD Trust	**Low**

Goal 5-3. Enhance recreational opportunities.

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
1. Increase funding to maintain and enhance existing recreational facilities.	Municipalities and Counties, Community Groups	PA DCNR, MD DNR, Foundations, Private Sources	**High**
2. Develop low-impact recreational facilities, such as campsites and trails.	Community Groups, Conservation Groups, MD DNR, PA DCNR	PA DCNR, MD DNR, Private Foundations, Private Sources	**High**
3. Establish additional access points and boat launches at strategic places.	Conservation Groups, MD DNR, PFBC, PA DCNR, NPS	PFBC, MD DNR, PA DCNR, Private Sources	**Medium**
4. Provide amenities at trail heads and municipal parks, such as parking, composting toilets, and hand pumps.	Community Groups, Businesses, Counties and Municipalities, PA DCNR, MD DNR, Conservation Groups	PA DCNR, MD DNR, Foundations, Private Sources	**Medium**
5. Improve facilities, such as parking areas and signage along the Mid State Trail to prepare for the additional usage that will come from the establishment of the Great Eastern Trail that will travel from Florida to New York.	PA DCNR, MD DNR, Conservation Groups, Mid State Trail Association, Counties and Municipalities, Businesses, Community Groups	PA DCNR, PA DEP, MD DNR, PA DCED, Private Sources, Foundations	**Medium**
6. Link recreational facilities through the extension of trails and the establishment of more trailheads providing additional access to existing and new recreational sites.	Community Groups, Businesses, Counties and Municipalities, PA DCNR, MD DNR, Conservation Groups	PA DCNR, MD DNR, Foundations, Private Sources	**Medium**

Goal 5-3. Enhance recreational opportunities (continued).

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
7. Enhance the area around Pond View Loop Road at southern Tussey Mountain to be applicable for outdoor recreation, to provide a habitat education opportunity, and to encourage formal establishment of the area as the Pond View Loop Recreation Area.	Southern Alleghenies Regional Development Commission, Mid State Trail Association	PA DCNR, PA DEP, MD DNR, PA DCED	**Medium**
8. Establish additional municipal parks.	Community Groups, Businesses, Municipalities and Counties	PA DCNR, Municipalities, Foundations, Private Sources	**Medium**

Goal 5-4. Encourage recreational activities on public property and minimize the infringements on private landowners.

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
1. Encourage and educate visitors to utilize recreational resources available to the public and to respect property owner rights by not trespassing on private property.	PA DCNR, MD DNR, MDE, PGC, WPC, TNC, NPS, Community Groups, Conservation Groups	Private Sources	**High**
2. Encourage property owners concerned with trespassing to mark the boundaries of their property with posted signs.	Municipal and County Officials, PA DCNR, MD DNR, Citizens	Private Sources, MD DNR	**Medium**
3. Encourage agricultural landowners to participate in the Cooperative Farmland Program opening additional land to public hunting.	PGC, Sportsmen's Groups	Private Sources	**Medium**

Goal 5-5. Encourage environmentally sound practices when operating recreational vehicles.

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
1. Monitor the use of recreational vehicles to ensure their impacts to the environment are minimal.	PA DCNR, MD DNR, Conservation Groups, Municipal and County Officials	PA DCNR, MD DNR, Foundations, Private Sources	**Medium**
2. Prohibit the use of recreational vehicles in areas at risk of being affected by their use. Steep slopes, streambanks, stream crossings, and habitat for rare, threatened, or endangered species are examples of areas at risk.	PA DCNR, MD DNR, Conservation Groups, Municipal and County Officials, State Police, PGC	PA DCNR, MD DNR, Foundations, Private Sources	**Medium**

Goal 5-5. Encourage environmental sound practices when operating recreational vehicles (continued).

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
3. Educate riders of recreational vehicles to recreate in a way that causes the least disturbance to the environment.	PA DCNR, MD DNR, Conservation Groups, Municipal and County Officials, Recreational Vehicle Riding Clubs, State Police	PA DCNR, MD DNR, Foundations, Private Sources	**Medium**
4. Establish additional trails and parks for the use of recreational vehicles to reduce the damage occurring to private property.	PA DCNR, MD DNR, Conservation Groups, Municipal and County Officials, Recreational Vehicle Riding Clubs	PA DCNR, MD DNR, Foundations, Private Sources	**Low**

Goal 5-6. Establish additional recreational programs.

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
1. Increase funding to support recreational programs.	Community Groups, School Districts	Private Sources	**High**
2. Organize community sport leagues, such as baseball, basketball, and football.	Community Groups, School Districts	Private Sources	**Medium**
3. Establish community or school programs to teach children how to swim.	Community Groups, School Districts	Private Foundations, Private Sources	**Medium**
4. Establish community or school programs to teach children about outdoor recreational opportunities, such as hiking, camping, fishing, hunting, etc.	Community Groups, School Districts, PGC, PFBC, Scouts	Private Foundations, Private Sources	**Medium**
5. Organize a community group encouraging area youth to utilize outdoor recreational opportunities, including camping, fishing, swimming, hiking, hunting, etc.	BOW, Sportsmen's Clubs, PFBC, MD DNR, PGC, Local Businesses, Scouts	Private Sources	**Medium**

Goal 5-7. Increase awareness of recreational resources available through marketing and outreach.

Methods to achieve goal:	*Potential Partners:*	*Potential Funding:*	*Priority:*
1. Develop and distribute public land maps, identifying recreational facilities and public lands open to the public.	PA DCNR, MD DNR, MDE, PGC, WPC, TNC, NPS, Tourist Bureaus, Chambers of Commerce, Southern Allegheny Planning and Development Commission	Foundations, Private Sources, Tourist Bureaus, Chambers of Commerce	**High**

Goal 5-7. Increase awareness of recreational resources available through marketing and outreach (continued).

Methods to achieve goal:	***Potential Partners:***	***Potential Funding:***	***Priority:***
2. Establish a visitors or welcome center and accompanying website where visitors can obtain information about recreational opportunities.	Municipalities and Counties, Businesses, PA DCNR, MD DNR, PFBC, PGC, NPS, Community Groups, Churches, Historical Societies, Sportsmen's Groups	Foundations, Private Sources, Local Government	**Medium**
3. Enhance the Buchanan State Forest website to provide more information about recreational opportunities.	PA DCNR	PA DCNR	**Medium**
4. Conduct an economic impact study of recreational activities to determine the impact that recreation has on the local economy.	Municipalities and Counties, PA DCNR, MD DNR, Businesses, Conservation Groups	PA DCNR, MD DNR, PA DCED, MEDA	**Medium**

CHAPTER 8. REFERENCES

303(d) list. (2004). Retrieved November 22, 2005 from Maryland Department of the Environment Website: http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/index.asp.

Advanced Land and Water, Inc., (2006). *Terrapin Run Expert Testimony*. Retrieved March 3, 2006 from Advance Land and Water, Inc. Website: http://www.alwi.com/news.php?itemid=cumbtimes080405.

Allegany County Maryland Planning Department, (2002a). *Allegany County Comprehensive Plan*. Retrieved September 23, 2004 from Allegany County Maryland Planning Department Website: http://www.gov.allconet.org/plan/cpi.htm.

Allegany County Maryland Planning Department, (2002b). *Water and Sewerage Plan*. Retrieved September 23, 2004 from Allegany County Maryland Planning Department Website: http://www/ gov.allconet.org/plan/cpi.htm.

American Farmland Trust, (1998). *Agricultural Conservation Easements Fact Sheet*. Retrieved January 29, 2003 from American Farmland Trust Website: http://www.farmlandinfo.org/fic/tas/tafs-ace.html.

Audubon Society of Western Pennsylvania, (2002). *Environmental Education*. Retrieved January 21, 2003 from Audubon Society of Western Pennsylvania Website: http://www.aswp.org/education.html.

Barnes, J. and W. Sevon, (2002). *The Geological Story of Pennsylvania* (3rd ed.). Pennsylvania Geological Survey, 4th series, Education Series 4.

Bilton, K., (n.d.). *Pawpaws: A Paw for You and a Paw for Me.* Retrieved August 30, 2006 from website: http://www.fred.net/kathy/pawpaws.html.

Blankenship, K., (1999). "Septic systems offer promise, perils for bay." *Alliance for the Chesapeake Bay Journal*.

Bourodimos, E.L., (1974). Thermopollution in the Aquatic Environment in *Against Pollution and Hunger*. New York: John Wiley and Sons.

Brezinski, D., (1994). *Geology of the Sideling Hill Road Cut*. Retrieved August 31, 2004 from Maryland Geological Survey Website: http://www.mgs.md.gov/esic/brochures/sideling.html.

British Wind Energy Association, (2006). *Frequently Asked Questions*. Retrieved June 7, 2006 from British Wind Energy Association Website: http://www.bwea.com/ref/faq.html.

Buchanan State Forest, (n.d.). Retrieved October 31, 2005 from Wildernet Website: http://www.wildernet.com/pages/area.cfm?areaname=Buchanan%20State%20Forest.

Bureau of Forestry (n.d.). *Private Forest Landowners*. Retrieved August 14, 2004 from Pennsylvania Department of Conservation and Natural Resources Website: http://www.dcnr.state.pa.us/forestry/privatelands.aspx.

Canaan Valley Institute, (2004). *Mid-Atlantic Highlands Geographic Profiler*. Retrieved February 5, 2004 from Canaan Valley Institute Website: http://canaanvi.org/profiler/.

Carnegie Museum of Natural History, Section of Mammals, (n.d.). T*he On-line Mammals of Pennsylvania Resource*. Retrieved May 9, 2005 from Carnegie Museum of Natural History Website: http://carnegiemnh.org/mammals/collections/Pamama.htm.

Changes in Acid Deposition and the Projected Impacts on Maryland Streams, (n.d). Retrieved October 3, 2005 from Maryland Department of Natural Resources Website: http://www.dnr.state.md.us/streams/acid/page3.html.

Chesapeake Bay Foundation, (2004). *A Citizen's Guide to Stormwater Management in Maryland*. Retrieved March 9, 2005 from Chesapeake Bay Foundation Website: http://www.savethebay.cbf.org.

Chunko, S. E. and W.E. Wolf, Jr., (2001). Best Management Practices for Pennsylvania Forests: Penn State College of Agricultural Sciences. 52 pp.

Churchill, N., (1969). *Soil Survey of Fulton County, Pennsylvania*. Washington, D.C.: U.S. Government Printing Office.

Code of Maryland Regulations, (2004). *Designated Uses.* Retrieved October 22, 2005 from Code of Maryland Regulations Chapter 26.08.02.03 Website: http://www.dsd.state.md.us/comar/.

Cooperative State Research, Education, and Extension Service, (2004). *New Federal Concentrated Animal Feeding Operation Rules: Applying State Concentrated Animal Feeding Operation Rules to Meet New Requirement*. Retrieved October 24, 2005 from United States Department of Agriculture Website: http://www.mawaterquality.org.

Delano H., and J. Wilshusen, (2001). *Landslides in Pennsylvania*. Pennsylvania Geological Survey, 4th series, Education Series 9.

Driscoll, C.T., G.B. Lawrence, A.J. Bulger, T.J. Butler, C.S. Cronan, C. Eagar, K.F. Lambert, G.E. Likens, J.L. Stoddard, and K.C. Weathers, (2001). *Acid Rain Revisited: Advances in Scientific Understanding Since the Passage of the 1970 and 1990 Clean Air Act Amendment*. Hubbard Brook Research Foundation: Science Links Publication Vol.1, No.1.

Economic Research Service, (2004). *County Level Unemployment and Median Household Income*. Retrieved September 20, 2004 from United States Department of Agriculture Website: http://www.ers.usda.gov/data/unemployment/RDList2.asp?ST=PA+SF=2A.

Edwards, Jr., J., (2002). *A Brief Description of the Geology of Maryland*. Retrieved October 28, 2005 from State of Maryland Department of Natural Resources Website: http://www.mgs.md.gov.

Elder, D., G. Killam, and P. Koberstein, 1999. *The Clean Water Act: An Owner's Manual*. River Network, Portland, Oregon.

Erosion and Sediment Control in Maryland, (n.d.). Retrieved October 25, 2005 from Maryland Department of the Environment Website: http://www.mde.state.md.us/Programs/WaterPrograms/SedimentandStormwater.

Fall Foliage and Hawk Watching Lookout, (n.d.). Retrieved December 27, 2005 from Adventure Marine Ltd. Canoe and Kayak Website: http://www.bedford.net/canoe/fallhawk.htm.

Farmland Preservation, (n.d.). Retrieved January 29, 2002 from Bureau of Farmland Preservation Website: http://sites.state.pa.us/PA_Exec/Agrriculture/bureaus/farmland_protection/index.htm.

Farmland Protection Policy Act Annual Report FY 2000, (2001). Retrieved November 14, 2005 from United States Department of Agricultural Natural Resources Conservation Service Website: http://www.nrcs.usda.gov/programs/fppa/pdf_files/FPPA-FY00Report.pdf.

Federal Insurance Administration, (2005). *The National Flood Insurance Program Community Status Book*. Retrieved December 13, 2005 from Federal Emergency Management Agency Website: http://www.fema.gov/fema/csb.shtm.

Fergus, C., (2005). *Wildlife Notes (black bear, bobcat, spotted skunk, shrews)*. Retrieved May 9, 2005 from Pennsylvania Game Commission Website http://www.pgc.state.pa.us/pgc/cwp.

Freshwater Mussels of Sideling Hill Creek, (2001). Pittsburgh, PA: Western Pennsylvania Conservancy.

Fulton County Pennsylvania, (n.d.). Retrieved August 10, 2005 from Pennsylvania Visitors Network Website: http://pavisnet.com/fulton/are.html.

Green Ridge State Forest, (2000). *Green Ridge State Forest History*. Retrieved December 6, 2005 from Maryland Department of Natural Resources Website: http://www.dnr.state.md.us/publiclands/greenridgehistory.html.

Harris Infosource, (2005). *Selectory Database*. Retrieved October 31, 2005 from Harris Source Website: http://www.harrisinfo.com.

Hulse, A.C., C.J. McCoy, and E.J. Censky, (2001). *Amphibians and Reptiles of Pennsylvania*. Cornell University.

Ingerson, A., (2002). *Agriculture and Forestry in the Sideling Hill Creek Watershed Statistical Information:* Wilderness Society.

Introduction to Sustainability, (n.d.). Retrieved June 7, 2006 from Sustainable Table Website: http://www.sustainabletable.org/intro/dictionary/.

Jacobson, M., and C. Seyler, (2004). *Economic Contribution of Forestry to Pennsylvania*. Retrieved September 8, 2005 from Penn State Natural Resources Extension Website: http://rnrext.cas.psu.edu/counties/ExtMap.htm.

Klapproth, J. and J. Johnson, (2000). *Understanding the Science Behind Riparian Forest Buffers: Effects on Water Quality*. Virginia Cooperative Extension.

Kling, G., and D. Wuebbles, (2003). Impacts on Pennsylvania Communities and Ecosystems. F*indings from Confronting Climate Change in the Great Lakes Region*.

Knight, W., (1996). *Soil Survey of Bedford County Pennsylvania*. Washington, D.C.: U.S. Government Printing Office.

Kochanov, W., (1999). Sinkholes in Pennsylvania. Pennsylvania Geological Survey, 4th series, Education Series 11.

Koehn, S., (2005). *Incentives for Non Industrial Private Forest Landowners*. Retrieved August 30, 2005 from Maryland Department of Natural Resources Website: http://www.dnr.state.md.us/forests/041505message.asp.

Kraft, J., (2001). *Washington County, Maryland Soil Survey*. Retrieved October 18, 2004 from United States Department of Agriculture Natural Resources Conservation Service Website: http://www.sawgal.umd.edu/nrcsweb/Maryland/Washington/index.htm.

Latham, R.E., J. Beyea, M. Benner, C.A. Dunn, M. Fajvan, R.R. Freed, M. Grund, S.B. Horsley, A.F. Rhoads, and B.P. Schissler, (2005). *Managing White-tailed Deer in Forest Habitat from an ecosystem Perspective: a Pennsylvania Case Study*. Pennsylvania: Harrisburg.

Mann Township Comprehensive Plan, (2004). Retrieved November 22, 2005 from Mann Township Website: http://bedford.sapdc.org/mann/site/default.asp.

Marinette County, (2005). *Agricultural Best Management Practices*. Retrieved December 6, 2005 from Marinette County Website: http://www.marinettecounty.com/lw_ps_bmp_ag.htm.

Maryland Agricultural Land Preservation Foundation, (2003). *Agricultural Preservation Districts.* Retrieved November 12, 2004 from Maryland Department of Agriculture Website: http://www.malpf.info/fact1.html.

Maryland Cooperative Extension, (n.d.). *About the Nutrient Management Program*. Retrieved November 30, 2005 from the Maryland Cooperative Extension Website: http://www.agnr.umd.edu/users/agron/nutrient/.

Maryland Department of the Environment, (2002). *Consumption Advisories for Fish Caught from the Potomac River Watershed*. Retrieved from Maryland Department of the Environment Website: http://www.mde.state.md.us.

Maryland Department of the Environment, (2005). *Maryland Department of Environment Recommended Maximum Meals Each Year for Maryland Waters*. Retrieved November 21, 2005 from Maryland Department of the Environment Website: http://www.mde.state.md.us.

Maryland Department of the Environment[1], (n.d.). *2004 List of Impaired Surface Waters and Integrated Assessment of Water Quality*. Retrieved October 19, 2005 from Maryland Department of the Environment Website: http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/Maryland%20303%20dlist/final_2004_303dlist.asp.

Maryland Department of the Environment[2], (n.d.). *Erosion and Sediment Control in Maryland*. Retrieved October 25, 2005 from Maryland Department of Environment Website: http://www.mde.state.md.us/Programs/WaterPrograms/SedimentandStormwater.

Maryland Department of the Environment[3], (n.d.). *Water Quality Standards*. Retrieved March 29, 2006 from Maryland Department of the Environment Website: http://www.mde.state.md.us/ResearchCenter/Data/WaterQualityStandards.

Maryland Department of Legislative Services, (2005). *Fiscal and Policy Note House Bill 1240 Environmental Matters*. Retrieved December 27, 2005 from Maryland General Assembly Website: http://mlis.state.md.us/2005rs/fnotes/bil_0000/hb1240.pdf.

Maryland Department of Natural Resources[1], (2003). "Chesapeake 2000: The Renewed Bay Agreement." Retrieved March 29, 2005 from Maryland Department of Natural Resources Website: http://dnrweb.dnr.state.md.us/bay/res_protect/c2k.

Maryland Department of Natural Resources[2], (2003). *Green Ridge State Forest: Ten Year Resource Management Plan.* Volume 1 and Volume 2.

Maryland Department of Natural Resources, (2004a). *Belle Grove Wildlife Management Area*. Retrieved May 5, 2005 from Maryland Department of Natural Resources Website: http://www.dnr.state.md.us/publiclands/western/bellegrove.asp.

Maryland Department of Natural Resources, (2004b). *Billmeyer Wildlife Management Area*. Retrieved May 5, 2005 from Maryland Department of Natural Resources Website: http://www.dnr.state.md.us/publiclands/western/billmeyer.asp.

Maryland Department of Natural Resources, (2004c). *Sideling Hill Wildlife Management Area*. Retrieved May 5, 2005 from Maryland Department of Natural Resources Website: http://www.dnr.state.md.us/publiclands/western/sidelinghill.asp.

Maryland Department of Natural Resources, (2004d). *Warrior Mountain Wildlife Management Area*. Retrieved May 5, 2005 from Maryland Department of Natural Resources Website: http://www.dnr.state.md.us/publiclands/western/warriormountain.asp

Maryland Department of Natural Resources, (2005a). *Green Ridge State Forest*. Retrieved December 27, 2005 from Maryland Department of Natural Resources Website: http://www.dnr.state.md.us/publiclands/western/greenridge.html.

Maryland Department of Natural Resources, (2005b). *Maryland Biological Stream Survey*. Retrieved October 24, 2005 from Maryland Department of Natural Resources Website: http://www.dnr.state.md.us/streams/mbss/.

Maryland Department of Natural Resources[1], (n.d.). *Changes in Acid Deposition and the Projected Impacts on Maryland Streams*. Retrieved October 3, 2005 from Maryland Department of Natural Resources Website: http://www.dnr.state.md.us/streams/acid/page3.html.

Maryland Department of Natural Resources[2], (n.d.). *The Maryland Wildland Preservation System*. Retrieved October 3, 2005 from Maryland Department of Natural Resources Website: http://www.dnr.state.md.us/resourceplanning/wildland.html.

Maryland Department of Planning, (n.d.). *Comprehensive Planning and Land Use Maps*. Retrieved November 22, 2005 from Maryland Department of Planning Website: http://www.mdp.state.md.us/compmaps.htm.

Maryland Forest Service, (2005a). *Forestry Stewardship*. Retrieved December 5, 2005 from Maryland Department of Natural Resources Website: http://www.dnr.state.md.us/forests/programapps/`stewcon.asp

Maryland Forest Service, (2005b). *Maryland's Forest Conservancy District Boards.* Retrieved December 7, 2005 from Maryland Department of Natural Resources Website: http://www.dnr.state.md.us/forests/programapps/fboards.html.

Maryland Historic Trust, (2005). *About the Trust*. Retrieved March 24, 2006 from Maryland Historic Trust Website: http://www.marylandhistoricaltrust.net/.

Mash, J., (1996). *The Land of the Living*. Commercial Press, Maryland: Cumberland

McNab, H., and P. Avers, (1994). *Ecological Subregions of the United States*. Retrieved October 7, 2005 from United States Department of Agriculture, U.S. Forest Service Website: http://www.fs.fed.us/land/pubs/ecoregions/ch16.htm/#221E.

Mitsch, W. and J.G. Gosselink, (2000). *Wetlands*. 3rd Edition: John Wiley and Sons, Inc.

Monroe Township Comprehensive Plan, (2004). Retrieved November 22, 2005 from Monroe Township Website: http://bedford.sapdc.org/monroe/site/default.asp.

Mosier, R., (2002). Air Pollution Affects Land and Water. In *Clean Air News*. Baltimore: Maryland Department of the Environment.

National Association of State Departments of Agriculture, (n.d.). *State Environmental Laws Affecting Maryland Agriculture*. Retrieved November 30, 2005 from National Association of State Departments of Agriculture Website: http://www.nasda-hq.org/nasda/nasda/Foundation/state/Maryland.pdf.

National Environmental Education Advisory Council, (1996). *Report Assessing Environmental Education in the U.S. and the Implementation of the National Environmental Education Act of 1990*. Retrieved January 24, 2005 from United States Environmental Protection Agency Website: http://www.epa.gov/enviroed/neeac.html.

National Flood Insurance Program, (2005). *Flood Insurance.* Retrieved October 24, 2005 from Federal Emergency Management Agency Website: http://www.fema.gov/nfip/.

National Park Service, (2001). *Listing a Property in the National Register of Historic Places*. Retrieved August 22, 2002 from National Park Service Website: http://www.cr.nps.gov/pr/listings.htm.

National Park Service, (2005). *The National Road*. Retrieved December 27, 2005 from Fort Necessity National Battlefield Website: http://www.nps.gov/fone/natlroad.htm.

National Park Service, (n.d.). *Chesapeake and Ohio Canal: History of the Canal*. Retrieved October 31, 2005 from National Park Service Website: http://www.nps.gov/choh/History/index.html.

Natural Lands Trust, (2001). *Growing Greener Conservation by Design.* Media, PA.

Pennsylvania Association of Conservation Districts, (2003). *Pennsylvania Handbook of Best Management Practices for Developing Areas.* Retrieved October 26, 2005 from Pennsylvania Association of Conservation Districts Website: http://www.pacd.org/products/bmp/bmp_toc.htm.

Pennsylvania Audubon, (n.d.). *Audubon Pennsylvania Birds Conservation*. Retrieved September 7, 2005 from Pennsylvania Audubon Website: http://pa.audubon.org/iba/.

Pennsylvania Center for Local Government Services, (2005). *E-Library*. Retrieved October 27, 2005 from Pennsylvania Center for Local Government Services Website: http://www.elibrary.state.pa.us/disclaimer.asp.

Pennsylvania Code, (1997a). *Pennsylvania Code Title 25 Environmental Protection – Chapter 93.7s Specific Water Quality Criteria.* Retrieved October 26, 2005 from Pennsylvania Code Website: http://www.pacode.com/secure/data/025/chapter93/s93.7.html.

Pennsylvania Code, (1997b). *Pennsylvania Code Title 25 Environmental Protection – Chapter 93.9s Designated Water Uses*. Retrieved October 26, 2005 from Pennsylvania Code Website: http://www.pacode.com/secure/data/025/chapter93/chap93toc.html.

Pennsylvania Code, (1997c). *Pennsylvania Code Title 25 Environmental Protection – Chapter 102.4s Erosion and Sediment Control.* Retrieved March 31, 2006 from Pennsylvania Code Website: http://www.pacode.com/secure/data/025/chapter102/chap102toc.html.

Pennsylvania Department of Conservation and Natural Resources, (2002). *Summary of Pennsylvania's All-Terrain Vehicle Law*. Harrisburg, PA: Pennsylvania Bureau of Forestry.

Pennsylvania Department of Conservation and Natural Resources, (2004). *The State of the Forest: A Snapshot of Pennsylvania's Updated Forest Inventory*.

Pennsylvania Department of Conservation and Natural Resources[1], (n.d.). *Forest Wildlife Trends*. Retrieved August 22, 2005 from Pennsylvania Department of Conservation and Natural Resources Website: http://www.dcnr.state.pa.us/wlhabitat/forest/forest-type.html..

Pennsylvania Department of Conservation and Natural Resources[2], (n.d.). *Invasive Plants in Pennsylvania*. Retrieved September 6, 2005 from Pennsylvania Department of Conservation and Natural Resources Website: http://www.dnr.state.pa.us/forestry/wildplant/invasive.aspx..

Pennsylvania Department of Conservation and Natural Resources[3], (n.d.). *Martin Hill All-Terrain Vehicle Trail*. Harrisburg, PA: Pennsylvania Bureau of Forestry.

Pennsylvania Department of Conservation and Natural Resources[4], (n.d.). *Natural and Wild Areas Near Buchanan State Forest*. Retrieved December 27, 2005 from Pennsylvania Department of Conservation and Natural Resources Website: http://www.dcnr.state.pa.us/forestry/stateforests/buchananwild.aspx.

Pennsylvania Department of Education, (2002). *Academic Standards for Environment and Ecology*. Retrieved December 27, 2005 from Pennsylvania Department of Education Website: http://www.pde.state.pa.us/k12/lib/k12/envec.pdf.

Pennsylvania Department of Education[1], (n.d.). *List of Schools by District and County*. Retrieved October 1, 2005 from Pennsylvania Department of Education Website: http://www.paprofiles.org/pa0001/distlist.htm.

Pennsylvania Department of Education[2], (n.d.). *Sustaining Penn's Woods*. Retrieved October 5, 2005 from H.L.M.A., Inc. Website: http://www.hlma.org/pennswoods/overview/.

Pennsylvania Department of Environmental Protection, (2003a). *Air Pollution in Pennsylvania*. Retrieved March 28, 2005 from Pennsylvania Department of Environmental Protection Website: http://www.dep.state.pa.us/dep/deputate/airwaste/aq/factsheets/factsheets.htm

Pennsylvania Department of Environmental Protection, (2003b). *Municipal Waste Yearly Report Results 2003*. Retrieved October 18, 2004 from Pennsylvania Department of Environmental Protection Website: http://www.dep.state.pa.us/wm_apps/municipalwaste03/.

Pennsylvania Department of Environmental Protection, (2004a). *Environmental Facility Application Compliance Tracking System*. Retrieved October 14, 2004 from Pennsylvania Department of Environmental Protection Website: http://www.dep.state.pa.us.

Pennsylvania Department of Environmental Protection, (2004b). *Pennsylvania's State-wide Surface Waters Assessment Program: 2004 Update.* Retrieved October 24, 2005 from Pennsylvania Department of Environmental Protection Website: http://www.dep.state.pa.us/dep/deputate/watermgt/Wqp/WQStandards/UnassesWater.htm..

Pennsylvania Department of Environmental Protection, (2006). *Public Health Advisory – Fish Consumption*. Retrieved May 3, 2006 from Pennsylvania Department of Environmental Protection Website: http://www.depweb.state.pa.us/watersupply/cwp/view.asp?a=1261&q=450642&watersupplyNav=|30184|.

Pennsylvania Department of Environmental Protection[1], (n.d.). *Pennsylvania Integrated Water Quality Monitoring and Assessment Report*. Retrieved October 18, 2005 from Pennsylvania Department of Environmental Protection Website: http://www.dep.state.pa.us/dep/deputate/watermgt/Wqp/WQStandards/303d-Report.htm.

Pennsylvania Department of Environmental Protection[2], (n.d.). *The Principal Pollutants*. Retrieved March 28, 2005 from Pennsylvania Department of Environmental Protection Website: http://www.dep.state.pa.us/dep/deputate/airwaste/aq/aqm/pollutants.htm.

Pennsylvania Department of Environmental Protection[3], (n.d.). *Underground Storage Tank Program*. Retrieved January 26, 2006 from Pennsylvania Department of Environmental Protection Website: http://www.depweb.state.pa.us/landrecwaste/cwp/view.asp?a=1240&Q=453792&landrecwasteNav=|31016|.

Pennsylvania Department of Environmental Protection[4], (n.d.). *Understanding Concentrated Animal Feeding Operations*. Retrieved August 3, 2004 from Pennsylvania Department of Environmental Protection Website: http://www.dep.state.us.

Pennsylvania Department of Environmental Protection[5], (n.d.). *Executive Summary: Water Resources Planning Act*. Retrieved March 31, 2006 from Pennsylvania Department of Environmental Protection Website: http://www.dep.state.pa.us/dep/deputate/watermgt/wc/act220.

Pennsylvania Department of Environmental Resources, (1994). *Sideling Hill Creek Special Protection Evaluation Report: Water Quality Standards Review*.

Pennsylvania Department of Environmental Resources, (n.d.). *The Buchanan State Forest Public Use Map*. Harrisburg, PA: Pennsylvania Bureau of Forestry.

Pennsylvania Farmland Preservation Association, (2004). *Agricultural Conservation Easements*. Retrieved September 7, 2005 from Pennsylvania Farmland Preservation Association Website: http://www.pafarmland.org/easements.htm.

Pennsylvania Geological Survey[1], (n.d.). *Areas of Pennsylvania Susceptible to Landslides*. Retrieved February 27, 2002 from Pennsylvania Department of Conservation and Natural Resources Website: http://www.dcnr.state.pa.us/topogeo/hazards/landslide.htm.

Pennsylvania Geological Survey[2], (n.d.). *Geological Hazards in Pennsylvania*. Retrieved December 18, 2002 from Pennsylvania Department of Conservation and Natural Resources Website: http://www.dcnr.state.pa.us/topogeo/hazards/hazards.htm.

Pennsylvania Natural Heritage Program, (n.d). *Pennsylvania Natural Heritage Program Version 1.0.6.2*. Retrieved September 7, 2005 from Pennsylvania Natural Heritage Program Website: http://www.naturalheritage.state.pa.us.

Pennsylvania Nutrient Management Program, (n.d.). *Pennsylvania Nutrient Management Program*. Retrieved November 30, 2005 from Pennsylvania Nutrient Management Program Website: http://panutrientmgmt.cas.psu.edu/cert_application_info.htm.

Penn State Center for Dirt and Gravel Road Studies, (2004). *Program Background*. Retrieved November 11, 2005 from Penn State University Website: http://www.mri.psu/centeres/cdgrs/Program_history/history.html.

Ridge and Valley Streamkeepers, (2001a). *Water Quality Assessment of the Sideling Hill Creek Watershed in Pennsylvania and Maryland: 2001 Technical Status Report*.

Ridge and Valley Streamkeepers, (2001b). *Water Quality Assessment of the Town Creek Watershed in Pennsylvania and Maryland: 2001 Technical Status Report*.

Rodeward, A.D., and M.C. Brittingham, (2001). Incorporating Wildlife Needs into Forest Management Plans. *Ohio State University Extension Fact Sheet*.

Scenic Maryland Inc., (2006). *Maryland's 2006 Last Chance Scenic Places*. Maryland: Baltimore.

Sevon, W.D., (2000). *Physiographic Provinces of Pennsylvania*. Retrieved December 4, 2003 from Pennsylvania Department of Conservation and Natural Resources Website: http://www.dcnr.state.pa.us/topogeo/places.aspx.

Smart Growth Network, (1996). *Smart Growth Principles*. Retrieved June 8, 2006 from Smart Growth Partnership of Westmoreland County Website: http://www.smartgrowthpa.org/principles.asp.

Southampton Comprehensive Plan, (2005). Retrieved November 22, 2005 from Southampton Township Website: http://bedford.sapdc.org/southampton/site/default.asp.

Southeast Michigan Resource Conservation and Development Council, (2005). *Lake and Stream Corridor Owners' Guide for Riparian Buffer Establishment*. Retrieved from Southeast Michigan Resource Conservation and Development Council Website: http://semircd.org/buffers/guide/intro.php.

Stone, K., and E. Matthews, (1977). *Allegany County Maryland Soil Survey*. Retrieved October 18, 2004 from United States Department of Agriculture Natural Resources Conservation Service Website: http://www.sawgal.umd.edu/nrcsweb/allegconvert/index.htm.

Stormwater Authority, (n.d.). *Stormwater in Maryland*. Retrieved October 22, 2005 from Stormwater Authority Website: http://www.stormwaterauthority.org/regulatory_data/state.aspx?id=141.

Sustainable Table, (n.d.). Retrieved November 14, 2005 from Grace Factory Farm Project Website: http://www.factoryfarm.org.

The Nature Conservancy, (2004a). *Allegany Forests Site Conservation Plan*.

The Nature Conservancy, (2004b). *Conservation by Design: A Framework for Mission Success*.

The Nature Conservancy, (2005). *Potts Creek Shale Barren*. Retrieved October 31, 2005 from The Nature Conservancy Website: http://www.nature.org/wherewework/northamerica/states/virginia/preserves/art1241.html.

The Nature Conservancy, (n.d.). *An Introduction to the 5-S Framework for Site Conservation*.

United States Department of Agriculture Forest Service, and Pennsylvania Department of Conservation and Natural Resources, *(2004). The State of the Forest: A Snapshot of Pennsylvania's Updated Forest Inventory*. Retrieved June 12, 2006 from Pennsylvania Department of Conservation and Natural Resources Website: http://www.dcnr.state.pa.us/forestry/sfmanagement.aspx.

The Weather Channel, (2006). Monthly Climatology. Retrieved March 24, 2006 from The Weather Channel Website: http://www.weather.com/weather/wxclimatology/monthly/graph/USPA0291?from=36hr_bottomnav_undeclared.

Tiner, R.W. and D.G. Burke, (1995). *Wetlands of Maryland*. Maryland Department of Natural Resources, Water Resources Administration, in cooperation with U.S. Fish and Wildlife Service, National Wetland Inventory.

Trapp, Jr., H. and M. Horn, M.A., (1997). *Groundwater Atlas of the United States: Delaware, Maryland, New Jersey, North Carolina, Pennsylvania, Virginia*. Retrieved October 22, 2005 from United States Geological Survey Website: http://capp.water.usgs.gov/gwa/ch_l/index.html. HA 730-L.

Treiman, T., J. Dwyer, and D. Larsen, (2005). Long-term Economic Simulation: Even-Aged and Uneven-Aged Examples from the Missouri Ozark Forest Ecosystem Project. *Northern Journal of Applied Forestry*. 22, 42-47.

United States Army Corps of Engineers, (2002). Recognizing Wetlands. Retrieved May 5, 2002 from United States Army Corps of Engineers Website: http://www.usacoe.army.mil/inet/functions/CW/cecwo/reg/rw-bro.htm.

United States Bureau of the Census, (1990). *Total Population by Census Block Groups*. Retrieved September 1, 2004 from American Fact Finder Website: http://americanfactfinder.uscensus.gov.

United States Bureau of the Census, (2000). *Total Population by Census Block Groups*. Retrieved September 1, 2004 from American Fact Finder Website: http://americanfactfinder.uscensus.gov.

United States Bureau of the Census, (n.d). *Demographic Profiles*. Retrieved September 1, 2004 from United States Bureau of the Census Website: http://censtats.census.gov/cgi-bin/pct/pctProfile.pl.

United States Department of Labor – Bureau of Labor Statistics, (2004). *Local Area Unemployment Statistics (LAUS) data*. Retrieved September 20, 2004 from United States Bureau of Labor Statistics Website: http://www.bls.gov.

United States Environmental Protection Agency, (2002). *Resource Conservation Recovery Act Orientation Manual Executive Summary*. Retrieved November 15, 2005 from United States Environmental Protection Agency Website: http://www.epa.gov/epaoswer/general/orientat/.

United States Environmental Protection Agency, (2003a). *Atmospheric Deposition and Water Quality*. Retrieved March 29, 2005 from United States Environmental Protection Agency Website: http://www.epa.gov/OWOW/oceans/airdep/air1.html.

United States Environmental Protection Agency, (2003b). *Superfund Amendments Reauthorization Act Overview*. Retrieved March 29, 2004 from United States Environmental Protection Agency Website: http://www.epa.gov/superfund/action/law/sara.htm.

United States Environmental Protection Agency, (2004a). *Comprehensive Environmental Response, Compensation, and Liability Act Overview*. Retrieved March 29, 2004 from United States Environmental Protection Agency Website: http://www.epa.gov/superfund/action/law/cercla.htm.

United States Environmental Protection Agency, (2004b). *Envirofacts*. Retrieved October 18, 2004 from United States Environmental Protection Agency Website: http://www.epa.gov/enviro/.

United States Environmental Protection Agency, (2004c.). *List of Municipal Solid WasteLandfills*. Retrieved November 15, 2005 from University of Tennessee Website: http://www.cis.utk.edu/EPAMACT/landfill/US%20EPA%20landfill%20list.pdf.

United States Environmental Protection Agency, (2005). *Mercury*. Retrieved April 6, 2005 from United States Environmental Protection Agency Website: http://www.epa.gov/mercury/about.htm.

United States Environmental Protection Agency[1], (n.d.). *Acid Rain*. Retrieved October 4, 2005 from United States Environmental Protection Agency Website: http://www.epa.gov/acidrain/.

United States Environmental Protection Agency[2], (n.d.). *Managing Nonpoint Pollution from Agriculture.* Retrieved October 26, 2005 from United States Environmental Protection Agency Website: http://www.epa.gov/OWOW/NPS/facts/.

United States Postal Service, (n.d.). *History of the United States Postal Service.* Retrieved October 31, 2005 from United States Postal Service Website: http://www.usps.com/history/history/his1.htm#contents.

Virginia Department of Forest, (2001). *Forest Management Practices*. Retrieved July 5, 2006 from Conserve Online Website: http://conserveonline.org/Co/docs/2001/11/management practices.pdf.

Wagner, J., (1998). *Bedford County Natural Heritage Inventory*. Pittsburgh, PA: Western Pennsylvania Conservancy.

Watershed Natural History[1], (n.d.). Retrieved November 16, 2005 from Sideling Hill Creek Watershed Website: http://www.sidelinghillwatershed.org/nhistory.html.

Watershed Natural History[2], (n.d.). Retrieved November 16, 2005 from Town Creek Watershed Website: http://www.towncreekwatershed.org/nhistory.html.

Weiss, M., (n.d.). *Economic Development History of Interstate 68 in Maryland*. Retrieved December 27, 2005 from the United States Department of Transportation Website: http://www.fhwa.dot/planning/econdev/i68md.html.

Western Pennsylvania Conservancy, (2001). *Freshwater Mussels of Sideling Hill Creek*.

APPENDIX A. GLOSSARY

Acidity	The capacity of water to neutralize a basic solution.
Agricultural Preservation Areas	Lands enrolled in a statewide program that has been established to promote the conservation and preservation of agricultural lands and the agricultural community.
Air Pollutant	Any substance in the air that causes damage to life, ecosystems, or property.
Airsheds	Geographic areas responsible for emitting 75 percent of the air pollution reaching a body of water.
All Terrain Vehicle	A small, open motor vehicle having one seat and three or more wheels fitted with large tires. It is designed chiefly for recreational use over roadless, rugged terrain.
Atmospheric Deposition	The process of airborne pollutants falling to the ground.
Basicity	The extent to which a substance is a base, which is defined as having a pH over seven.
Bedrock	The solid rock that underlies the soil and other unconsolidated material, or that is exposed at the surface.
Best Management Practices	Refer to the most environmentally appropriate techniques for agriculture, forestry, mining, development, urban stormwater management, and other practices that are potential threats to natural resources.
Biological Diversity	The number and variety of organisms found within a specific geographic region, or a particular habitat; the variability among living organisms on the earth, including the variability within and between species and within and between ecosystems.
Biological Diversity Area	An area of land recognized as supporting populations of state, nationally, or globally significant species or natural communities, high-quality examples of natural communities or ecosystems, or natural exceptional native diversity.
Canal	A manmade waterway that is usually used to connect existing bodies of water.
Carbon Monoxide	A colorless, odorless, poisonous gas that results from the incomplete burning of carbon fuels.
Comprehensive Plans	A general policy guide for the physical development of a municipality, taking into account many factors, including locations, character, and timing of future development.

Concentrated Animal Feeding Operation	A farm where large quantities of livestock or poultry are housed inside buildings or a confined area and all units of production, including feed, wastes, and dead animals are concentrated in one area.
Conservation	The maintenance of environmental quality and physical, biological, and/or cultural resources. Ecosystem management within given social and economic constraints; producing goods and services for humans without depleting natural ecosystem diversity, and acknowledging the natural character of biological systems.
Conservation Lands	Public or private lands with management plans that include the protection of natural areas as a primary objective.
Dedicated Area	An area of land recognized because of an owner's specific intention to protect it, which could result in the improving to become either a biological diversity area in the future or an even better high-quality area within an already designated biological diversity area.
Degradation	A degeneration to a poorer quality, condition, or state.
Direct Deposition	Occurs when pollutants enter a waterway by falling directly into it.
Drainage Pattern	The arrangement of streams in a landscape in response to local topography and subsurface geology.
Easement	A deed restriction that landowners may voluntarily place on their property to protect its future uses.
Ecoregion	A geographical unit based on associations of those biotic and environmental factors that directly affect or indirectly express energy, moisture, and nutrients regulating the structure and function of ecosystems.
Ecosystems	An area and its living and non-living components.
Environmental Education	A learning process that increases knowledge and awareness of the environment and associated challenges, develops skills and expertise to address these challenges, and fosters attitudes, motivation, and commitment to make informed decisions and take responsible actions.
Erosion	The processes by which solids are displaced from the earth's surface, including weathering, dissolution, abrasion, corrosion, and transportation.
Factory Farms	Larger, corporate-based farms that emphasize high volume and profit.
Family Farms	Smaller farms that have been in operation for several generations.
Floodplain	The level land along the course of a river or stream formed by the deposition of sediment during periodic floods.

Forest Management	The art and science of treating a forest to promote a desired outcome.
Geology	Geology is the science that deals with the study of the earth and its history, and is the name of the natural features of our plant.
Ground-Level Ozone	A harmful secondary pollutant formed in the atmosphere when nitrogen oxide (NOx) combines and reacts with volatile organic compounds in the presence of sunlight and warm temperatures.
Groundwater	Water beneath the earth's surface; found in pore spaces in rock material. Supplies wells and springs as a source of drinking water for many; also contributes to surface water.
High-Grading	Involves cutting only the biggest, most profitable trees in a stand; considered a non-sustainable practice.
Hydric Soils	Soils that are adequately moist in the upper section to cultivate anaerobic conditions during the growing season.
Hydrologic Unit Code	A system for organizing the watersheds of the United States that divides and subdivides the watershed into successively smaller hydrologic units and is then assigned an identifying number.
Hydrology	The study of movement of water on the earth; includes surface water and groundwater.
Indirect Deposition	Occurs when a pollutant enters a waterway by falling onto land and being washed into waterbodies as runoff.
Industrial Agriculture	Larger, corporate-based farms that emphasize high volume and profit.
Invasive species	Environmentally noxious weeds that grow aggressively, spread easily, and displace other plants.
Karst	An area of limestone marked by irregularities such as sinkholes, fissures, caves, and underground streams, which are created by erosion.
Landscape Conservation Area	A larger area of land that contains minimal human disturbance and allows ecosystems to function on a landscape level.
Lichens	A symbiosis between a fungal and algal life form that usually grows on trees or rocks.
Major Employers	Companies having a minimum of 200 employees.
Management Recommendations	Non-regulatory suggestions to improve the quality of life.

Methylmercury	A neurotoxin formed by the transformation of mercury by certain microorganisms; it is highly toxic and easily accumulates in fish, shellfish and animals that eat fish.
Natural Heritage Inventories	A method of assessing areas of important plants, animals, and ecological communities.
Natural Resources	A naturally-occurring material with economic value.
Non-Point Source	Pollutants that have no readily visible source and often require detailed analysis and research to discern the source.
Ozone	A colorless, odorless gas that forms in the atmosphere.
Ozone Layer	A colorless, odorless gas located in the upper atmospheric layer that filters the sun's harmful ultraviolet rays.
Particular Matter	Tiny drops of liquid or small particles of dust, metal, or other materials that float in the air.
Physiographic Provinces	A region with a particular type of landscape and geology.
Point Source	Pollutants that can be easily traced to their source.
Precipitation	Any form of water that falls from the sky, including, rain, snow, sleet, fog, and hail.
Preservation	The act or process of keeping something safe from harm or injury; the act of maintaining or reserving.
Prime Agricultural Soils	Soils that are extremely well suited for agricultural uses and meet certain physical, chemical, and slope characteristics.
Rain Shadow	An area behind a mountain that is dry due to the effect of clouds losing moisture.
Restoration	Returning to its original state or condition.
Riparian Areas	Areas of protective vegetation next to a body of water that serve as a barrier against polluted runoff and provide habitat corridors for wildlife.
Runoff	Rainfall or snowmelt not absorbed by soil that flows over the surface of the ground to a receiving waterway.
Secondary Pollutant	A new air pollutant formed when primary pollutants react in the atmosphere.
Sedimentary Rock	Rocks formed by the deposition of sediment.
Sedimentation	The deposit of particles moved by erosion.

Shale Barren	A community with unique characteristics, including exposed south-facing terraces of Devonian shale and dry, sunny conditions throughout most of the year.
Silviculture	The art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands.
Smart Growth Practices	A current movement that focuses on redevelopment of established urban areas and other ways to reduce sprawl pressures on undeveloped countrysides.
Soil Associations	A classification of soil types that comprise two to three major soil types and a few minor soil types.
Stormwater	Water that runs off the land into surface waters during and immediately following periods of precipitation.
Stormwater Management Plan	Planning for surface runoff into streams and river systems during rain and/or snowmelt events.
Streambed	The channel base of a stream or river or creek; it serves as an interchange between groundwater and surface water.
Subsidence	The downward movement of surface material involving little or no horizontal movement.
Sustainable	The ability to provide for the needs of the world's current population without damaging the ability of future generations to provide for themselves. When a process is sustainable, it can be carried out repeatedly without negative environmental effects or impossibly high costs to anyone involved.
Symbiosis	An alliance between two or more species that benefits each member.
Synthetic Processes	Human-controlled processes, such as burning fossil fuels.
Temperate Continental Climate	A climate without extremes of temperatures or precipitation.
Topography	Describes landscape features of an area.
Total Maximum Daily Load	A limit for pollutant load placed on a waterway by PA DEP. TMDLs are determined for a waterway based on how much pollutant it is determined that the waterway can assimilate and still meet its designated use criteria. TMDLs will be used to regulate the percentage of total pollutant load that each source in a watershed can contribute.
Trellis Drainage Pattern	A pattern of drainage where water runs off ridges and meets the valleys at right angles.

Unemployment Rate	The percentage of people of the total labor force that are actively seeking a job but cannot find employment.
Value Added	The additional value added to a product at a stage of production.
Water Gap	An opening or notch which occurs when a section of a ridge has a weaker geological structure and a stream essentially cuts through a ridge to end up on the other side.
Water Quality Trading	A program which allows facilities with higher pollution control costs to purchase the right to pollute from facilities that have reduced their pollution output below their required limits.
Watershed	The area of land that drains to a particular point along a stream. Each stream has its own watershed. Topography is the key element affecting this area of land. The boundary of a watershed is defined by the highest elevations surrounding the stream. A drop of water falling outside of the boundary will drain to another watershed.
Wetland	An area that is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances support, a prevalence of vegetation typically adapted for life in saturated soil conditions.
Wildland Areas	Limited areas of land or water which have retained their wilderness character, although not necessarily completely undisturbed, or have rare or vanishing species of plant or animal life or similar features of interest worthy of preservation for use of present and future residents.
Wildlife Management Areas	Areas dedicated to wildlife management activities and low-intensity, wildlife-related recreation, including hunting and wildlife observation.
Zoning	A legal mechanism by which government bodies, for the sake of protecting public health, safety, morals, and general welfare, can limit a landowner's right to use privately owned land by dividing land into districts and creating land-use regulations.

APPENDIX B. PLANNING COMMITTEES

Three Sisters Watershed Conservation Plan Steering Committee

Scott Alexander	Fulton County Conservation District
Mark Beals	Green Ridge State Forest
Dan Hedderick	Town Creek Ecosystem Management Project Maryland Department of Natural Resources Department of Forestry
Tolif Hunt	Western Pennsylvania Conservancy, Sideling Hill Creek Center
Donnelle Keech	The Nature Conservancy
Jeff Kloss	Bedford County Planning Commission
Michael Knoop	Western Pennsylvania Conservancy, Sideling Hill Creek Center
Georgene McLaughlin	Town Creek Landowners Association
Dave Scamardella	Pennsylvania Department of Conservation and Natural Resources Bureau of Forestry, Buchanan Forest District
Dave Schreffler	Woodland Owners of Southern Alleghenies Ridge and Valley Streamkeepers, Inc.
Mary Stanley	Joint Comprehensive Plan Steering Committee Mann Township Planning Commission
Guy Stottlemyer	Bedford County Conservation District
Dave Trail	Local Landowner and Farmer
Francis Zumbrun	Green Ridge State Forest

Three Sisters Watershed Conservation Plan Advisory Committees

Project Area Characteristics	
Annabelle Barkman	Joint Comprehensive Plan Steering Committee
David Cotton	Maryland Department of Planning
Bill Plank	Bedford Conservation District Board Member
Steve Saari	Interstate Commission on the Potomac River Basin

Land Resources	
David Cotton	Maryland Department of Planning
Bill Plank	Bedford Conservation District Board Member
Ken Roberts	New Page, Inc.
Steve Saari	Interstate Commission on the Potomac River Basin
Ron Stanley	Watershed Resident

Water Resources	
Larry Glass	Potomac Conservancy
Ted Kane	Pennsylvania Fish and Boat Commission
Bill Plank	Bedford Conservation District Board Member
Steve Saari	Interstate Commission on the Potomac River Basin
Ron Stanley	Watershed Resident
Dave Steele	Southern Alleghenies RC&D

Biological Resources	
Jim Cumming	Interstate Commission on the Potomac River Basin
Larry Glass	Potomac Conservancy
Rick Latshaw	Maryland Department of Natural Resources Wildlife Services
Bill Plank	Bedford Conservation District Board Member
Ron Stanley	Watershed Resident
Ed Thompson	Maryland Department of Natural Resources Heritage Service

Cultural Resources	
Bill Plank	Bedford Conservation District Board Member
Ron Stanley	Watershed Resident

APPENDIX C. EMPLOYERS

Acts Community Fellowship
Akers Excavation
All Kinds of Good Stuff
Allegany Aggregates, Inc.
Allegany Concrete
Alleghany Heating Specialist
Alpine Pantry
Arther De Yong
Ashley Stewart, Ltd.
Asylum Cycles, LLC
Aungst, Dale S. House Movers
Backhoe Services
Barry Shatzer
Beegle Saw Mill
Bethel Christian Church
Bishops Roofing
Black Valley Farm
Brian E. Miller Building
Buck Ridge Crafts
Carpenter Co. of MD T
Cessna Brothers Lumber
Chamberlain Cabinetry
Chaneysville Auto
Chaneysville Volunteer Fire Company
Charles Mallow
Charlie's Porcelain Repair
Cherry Lane Farms
Clark Penton
Chesapeake and Ohio Canal NHP
Clark's Beef Farm
Clark's Plumbing Heating and Air
Cliff Cregger
Clingerman Builders
Clingerman Wood Products
Cornerstone Paints and Quarter
Creative Solutions
Cris Brocky
Custom Analytical Engineering
Dans Law Service
Dave Mallow Home Improvement
Dave S Cleaning Svc.
Dave Trail
DB Propst Trucking
Dennis Clark Farm
Dolly's Auto Sales
Donald Eby
Donny L. Jay Construction
Eby's Saw Mill
Eckhart Apts.
El Bethel Assembly of God
Eldon Mallow
Emerick's Locksmith
Eric Barkman
Eshelman's Auto Service
Ever Breeze Auto Sales
Everett Lions Club
Evergreen Furniture Shop
Fairview Chamberlains Farm
Faith Resourcing Connections
Five Forks Farm
Flintstone Sharpening Service
Flintstone Auto, Inc.
Flintstone Lumber Processing
Flintstone Pta
Flintstone United Methodist Church
Flintstone Volunteer Fire Co.
Four Quarters Interfaith
Frank Heavner
George F. Harris Foundation
George Stickley Farm
Graham Trucking
Greenridge Horse Ranch
Greenwalts
Grousland Tours
Haltman Produce
Helen and Martin Lichty
Helmick's Grocery
Hidden Springs Campground
Hunting, Bedford, Fulton Senior Center
James Levy
James Tatgis Janitorial
Jay Tarlton
Jays Rolling Hill Farm
Jeff's One Stop, Inc.
Jl Farm
JMS Trucking Company
John Kull Contracting
JT Enterprise Trucking
Juvenile Services, Maryland
Klahre's Pulpwood, Logs, and Lumber
Knot Hole Craft Shop
Knot Whole
Laurel Sand and Gravel, Inc.
Lester Resau
Lewis Rudolph
Mallow Auction Service
Mann Township
Martin, Mary Louise
Maryland DNR
McCuster Siding
Medco
Metro Metal Service
MGM Sales
Monroe Township
Morral's Dairy Farm
OK Towing
Overhead Doors by Ronald
Pepple Co.
Prosperity United Methodist
Queen City Tours
R&J Transit
Ray L. and Janet M. Eby
Reed Clingerman
Richard T. Talbert
Rick Mallow
Robert Shoemaker
Robosson Contracting
Rocky Gap Veteran Cemetary
Roland Excavating
Robbie Leach Builder
Ruby Excavation
Ruby S. Drywall
Sam Yokum Trucking
Scissors Etc.
Shawn Morthvraft
Shipway Construction
Simplicity Farm
Simpson Fire Protection
Smith Logging
Snider's Grocery (Road Kill Café)
Solid Wood, Floors, and Molding
Stickley Painting and Decorating
Tax and Booking Svc.
Tel A Story
Teter Landscaping, Inc.
Teter's Sod Farm
Twiggtown Things
UPS Clearville
UPS Flintstone
Valley Electronics
William Heaverner
William K. Mearkle Masonry
Wood Ruffles and Lace
Western Pennsylvania Conservancy
Yvonne Mallow T.W.

APPENDIX D. AGRICULTURAL SOILS

Prime Agricultural Soils

Allegany County

	Map Symbol	Soil Name	Slope Character (% slope)
	AhA	Allegheny fine sandy loam	0 to 3
	AhB2	Allegheny fine sandy loam, moderately eroded	3 to 8
	AlA	Allegheny silt loam	0 to 3
	AlB2	Allegheny silt loam, moderately eroded	3 to 8
	CsA	Chavies loam	0 to 3
	CsB	Chavies loam	3 to 8
	Hn	Huntington silt loam	
	HxA	Huntington silt loam, local alluvium	0 to 3
	HxB	Huntington silt loam, local alluvium	3 to 8
	LaB2	Laidig gravelly loam, moderately eroded	3 to 8
*	Ln	Lindside silt loam	
	McB2	Meckesville silt loam, moderately eroded	3 to 8
	Ph	Philo silt loam	
	Pn	Pope fine sandy loam	
	Ps	Pope silt loam	
	ShB2	Shelocta shaly silt loam, moderately eroded	3 to 8

Bedford County

Map Symbol	Soil Name	Slope Character (% slope)
AbB	Albrights silt loam	3 to 8
AeB	Allegheny loam	3 to 8
Ba	Basher silt loam	
BbB	Basher-Birdsboro complex	0 to 8

Bedford County (continued)

Map Symbol	Soil Name	Slope Character (% slope)
Bm	Birdsboro silt loam, rarely flooded	
BuB	Buchanan cobbly loam	3 to 8
CkB	Clarksburg silt loam	3 to 8
EdB	Edom silty clay loam	3 to 8
ElB	Elliber very channery loam	3 to 8
ErB	Ernest silt loam	0 to 8
HeB	Hagerstown silt loam	3 to 8
LdB	Laidig cobbly loam	3 to 8
LkB	Leck Kill-Calvin complex	3 to 8
Lx	Lobdell loam	
McB	Meckesville gravelly loam	3 to 8
MoA	Monongahela silt loam	0 to 3
MrB	Morrison channery sandy loam	3 to 8
MuB	Murrill channery loam	3 to 8
Nd	Nolin silt loam	
Ph	Philo silt loam	
Pp	Pope fine sand loam	
WsB	Westmoreland channery silt loam	3 to 8

Fulton County

Map Symbol	Soil Name	Slope Character (% slope)
AbB2	Albright silt loam, moderately eroded	3 to 8
AgB2	Allegheny gravelly loam, moderately eroded	3 to 8

Prime Agricultural Soils

	Map Symbol	Soil Name	Slope Character (% slope)
Fulton County (continued)			
	Ba	Barbour fine sandy loam	
	Bc	Basher silt loam	
	BdB2	Bedington-Edom shaly silt loam, moderately eroded	3 to 8
	BuB2	Buchanan gravelly loam	
	CkB2	Calvin-Leck Kill shaly silt loam	3 to 8
	EbB2	Elliber very chert loam	3 to 8
	FrB2	Frankstown cherty silty loam	3 to 8
	HeB2	Hagerstown silt loam	3 to 8
	LaB2	Laidig gravelly loam	3 to 8
	Ls	Lindside silt loam	
	MuB2	Murrill gravelly loam	3 to 8
	Ph	Philo silt loam	
	Pm	Pope fine sandy loam, neutral variant	
	Po	Pope loam	
	WgB2	Wiltshire gravelly loam, moderately eroded	3 to 8
Washington County			
*	Bc	Basher fine sandy loam	
*	Bp	Bigpool silt loam	
	BrB	Braddock-Thurmont gravelly loam	3 to 8
*	Cm	Codorus silt loam	
*	Cn	Codorus gravelly sandy loam	
*	Co	Combs fine sandy loam	
*	Cp	Comb silt loam	
	DoA	Downsville gravelly loam	0 to 3
	DoB	Downsville gravelly loam	3 to 8
	DrA	Dryrun gravelly loam	0 to 3
Washington County (continued)			
	DrB	Dryrun gravelly loam	3 to 8
	DsA	Duffield silt loam	0 to 3
	DsB	Duffield silt loam	3 to 8
*	Ft	Funkstown silt loam	
	HaA	Hagerstown silt loam	0 to 3
	HaB	Hagerstown silt loam	3 to 8
*	Ln	Lindside silt loam	
	MkB	Mt. Zion gravelly silt loam	3 to 8
	MmA	Mt. Zion-Rohrersville silt loams	0 to 3
	MoB	Murrill silt loam	3 to 8
	MsB	Murrill gravelly loam	3 to 8
	MvB	Myersville silt loam	3 to 8
	MwB	Myersville gravelly loam	3 to 8
	NoB	Nollville channery silt loam	3 to 8
	PaB	Pecktonville gravelly silt loam	3 to 8
*	Pg	Philo silt loam	
*	Ph	Pope fine sandy loam	
*	Po	Pope gravelly loam	
	SpA	Swanpond silt loam	0 to 3
*	SpB	Swanpond silt loam	3 to 8
	SsA	Swanpond-Funkstown silt loams	0 to 3
	ThB	Thurmont gravelly loam	3 to 8
	WaA	Walkersville silt loam	0 to 3
	WaB	Walkersville silt loam	3 to 8
	WcA	Walkersville gravelly loam	0 to 3
	WcB	Walkersville gravelly loam	3 to 8

* Prime farmland if protected from flooding or not frequently flooded during the growing season

Farmland of Statewide Importance

Allegany County

Map Symbol	Soil Name	Slope Character (% slope)
AbB	Albrights silt loam	0 to 8
AbC2	Albrights silt loam, moderately eroded	8 to 15
AhC2	Allegheny fine sandy loam, moderately eroded	8 to 15
AlC2	Allegheny silt loam, moderately eroded	8 to 15
BuB2	Buchanan gravelly loam, moderately eroded	0 to 8
BuC2	Buchanan gravelly loam, moderately eroded	8 to 15
CaB	Calvin channery silt loam	0 to 10
ClB2	Calvin shaly silt loam, moderately eroded	0 to 10
CoB2	Cavode silt loam, moderately eroded	0 to 10
CtB2	Cookport silt loam, moderately eroded	0 to 10
DeB2	Dekalb channery sandy loam, moderately eroded	0 to 12
EdB2	Edom silt loam, moderately eroded	3 to 8
EdC2	Edom silt loam, moderately eroded	8 to 15
ElA	Elliber cherty silt loam	0 to 5
ErA	Ernest silt loam	0 to 3
ErB2	Ernest silt loam, moderately eroded	3 to 8
ErC2	Ernest silt loam, moderately eroded	8 to 15

Allegany County (continued)

Map Symbol	Soil Name	Slope Character (% slope)
GlB2	Gilpin silt loam, moderately eroded	0 to 10
GnB2	Gilpin channery silt loam, moderately eroded	0 to 10
HeC2	Hagerstown silt loam, moderately eroded	8 to 20
HxC	Huntington silt loam, local alluvium	8 to 15
LaC2	Laidig gravelly loam, moderately eroded	8 to 15
LdA	Landisburg cherty silt loam	0 to 3
LdB2	Landisburg cherty silt loam, moderately eroded	3 to 8
LdC2	Landisburg cherty silt loam, moderately eroded	8 to 15
LhB2	Lehew channery loam, moderately eroded	3 to 10
LsB2	Litz shaly silt loam, moderately eroded	3 to 10
LyB	Loysville cherty silt loam	0 to 8
McC2	Meckesville silt loam, moderately eroded	8 to 15
Me	Melvin silt loam	
MhA	Monongahela silt loam	0 to 3
MhB2	Monongahela silt loam, moderately eroded	3 to 8
MhC2	Monongahela silt loam, moderately eroded	8 to 15
OpB2	Opequon flaggy clay loam, moderately eroded	3 to 8

Farmland of Statewide Importance

Map Symbol	Soil Name	Slope Character (% slope)
Bedford County (continued)		
AbC	Albrights silt loam	8 to 15
AeC	Allegheny loam	8 to 15
Aw	Atkins silt loam	
Ax	Atkins-Ernest complex	0 to 8
BcC	Bedington-Berks complex	8 to 15
BkB	Berks channery silt loam	3 to 8
BrB	Blairton channery silt loam	3 to 8
BrC	Blairton channery silt loam	8 to 15
BuC	Buchanan cobbly loam	8 to 15
CaB	Calvin channery silt loam	3 to 8
CaC	Calvin channery silt loam	8 to 15
CoB	Cookport loam	3 to 8
EdC	Edom silty clam loam	8 to 15
ElC	Elliber very channery loam	8 to 15
ErC	Ernest silt loam	8 to 15
HeC	Hagerstown silt loam	8 to 15
HgC	Hagerstown silty clay loam	8 to 15
HwB	Hustontown silt loam	3 to 8
LdC	Laidig cobbly loam	8 to 15
LeC	Leck kill channery silt loam	8 to 15
LkC	Leck kill-Calvin complex	8 to 15
McC	Meckesville gravelly loam	8 to 15
Bedford County (continued)		
MoB	Monongahela silt loam	3 to 8
MrC	Morrison channery sandy loam	8 to 15
MuC	Murrill channery loam	8 to 15
PeB	Penlaw silt loam	0 to 8
RgC	Rayne-Gilpin channery silt loam	8 to 15
BkC	Berks channery silt loam	8 to 15
TgA	Tyler silt loam	0 to 3
TgB	Tyler silt loam	3 to 8
WsC	Westmoreland channery silt loam	8 to 15
Fulton County		
At	Atkins silt loam	
BdC2	Bedington-Edom shaly silt loam, moderately eroded	8 to 15
BeB2	Berks channery silt loam, moderately eroded	3 to 8
BeC2	Berks channery silt loam, moderately eroded	8 to 15
BuC2	Buchanan gravelly loam, moderately eroded	8 to 15
CaC2	Calvin shaly silt loam, moderately eroded	8 to 15
CbB2	Calvin-Berks channery silt loam, moderately eroded	3 to 8
CbC2	Calvin-Berks channery silt loam, moderately eroded	8 to 15
ErB2	Ernest silt loam, moderately eroded	3 to 8
HeC2	Hagerstown silt loam, moderately eroded	8 to 15
HgB3	Hagerstown silty clay loam, severely eroded	3 to 8
KaB2	Klinesville shaly silt loam, moderately eroded	3 to 8

Farmland of Statewide Importance

Map Symbol	Soil Name	Slope Character (% slope)
Fulton County (continued)		
KwB2	Klinesville-Weikert channery silt loams, moderately eroded	3 to 8
Ln	Lawrence gravelly silt loam, coarse substrate variant	
Me	Melvin silt loam	
MoB2	Monongahela silt loam, moderately eroded	3 to 8
MuC2	Murrill gravelly loam, moderately eroded	8 to 15
Ty	Tygart silt loam	
WcB2	Weikert channery silt loam, moderately eroded	3 to 8
Washington County		
BeB	Berks channery silt loam	3 to 8
BeC	Berks channery silt loam	8 to 15
BfB	Berks-Weikert channery silt loams	3 to 8
BfC	Berks-Weikert channery silt loams	8 to 15
BkB	Berks-Weikert-Urban land complex	0 to 8
BrC	Braddock-Thurmont gravelly loams	8 to 15
BuB	Buchanan gravelly loam, moderately eroded	3 to 8
BuC	Buchanan gravelly loam, moderately eroded	8 to 15
CaB	Calvin channery silt loam	3 to 8
CaC	Calvin channery silt loam	8 to 15
CcB	Catoctin-Myersville channery loams	3 to 8
CcC	Catoctin-Myersville channery loams	8 to 15
CkB	Clearbrook channery silt loam	0 to 8
Washington County (continued)		
Dk	Deposit gravelly loam	
DoC	Downsville gravelly loam	8 to 15
HaC	Hagerstown silt loam	8 to 15
DsC	Duffield silt loam	8 to 15
DuB	Duffield silt loam, very rocky	3 to 8
HbB	Hagerstown silty clay loam, very rocky	3 to 8
HnB	Hazel channery silt loam	3 to 8
HnC	Hazel channery silt loam	8 to 15
MoC	Murrill silt loam	8 to 15
MsC	Murrill gravelly loam	8 to 15
MvC	Myersville silt loam	8 to 15
NoC	Nollville channery silt loam	8 to 15
OpA	Opequon silty clay loam	0 to 3
OpB	Opequon silty clay loam	3 to 8
PaC	Pecktonville gravelly silt loam	8 to 15
PcB	Pecktonville cobbly loam	3 to 8
PcC	Pecktonville cobbly loam	8 to 15
RmB	Ryder-Duffield channery silt loams	3 to 8
RmC	Ryder-Duffield channery silt loams	8 to 15
RnB	Ryder-Nolville channery silt loams	3 to 8
RnC	Ryder-Nolville channery silt loams	8 to 15

Farmland of Statewide Importance

Map Symbol	Soil Name	Slope Character (% slope)
Washington County (continued)		
RvC	Ryder-Nolville channery silt loams, very rocky	8 to 15
SdB	Sideling gravelly loam	3 to 8
TaB	Talladega channery silt loam	3 to 8
TaC	Talladega channery silt loam	8 to 15
ThC	Thurmont gravelly loam	8 to 15
TrA	Trego gravelly loam	0 to 3
TrB	Trego gravelly loam	3 to 8
TrC	Trego gravelly loam	8 to 15
TyA	Tyler silt loam	0 to 3
TyB	Tyler silt loam	3 to 8
WaC	Walkersville gravelly loam	8 to 15
KcB	Klinesville-Calvin channery loams	3 to 8

Map Symbol	Soil Name	Slope Character (% slope)
Washington County (continued)		
MgA	Monongahela silt loam	0 to 3
MgB	Monongahela silt loam	3 to 8
MgC	Monongahela silt loam	8 to 15
MhA	Monongahela gravelly loam	0 to 3
MhB	Monongahela gravelly loam	3 to 8
MhC	Monongahela gravelly loam	8 to 15
MkC	Mt. Zion gravelly silt loam	8 to 15
WcC	Walkersville gravelly loam	8 to 15
WeB	Weikert very channery silt loam	3 to 8
WkB	Weikert-Berks channery silt loams	3 to 8
WuB	Wurno-Nolville channery silt loams	3 to 8
WuC	Wurno-Nolville channery silt loams	8 to 15

APPENDIX E. NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM PERMITS

Name	Permit Number	Date	Description	Discharge Waters	Watershed	Latitude	Longitude
Allegany Aggregates Quarry	MDG499846	3/14/2001 to 10/16/05	construction, sand and gravel	unknown	unknown	unknown	unknown
Allegany Aggregates Quarry	MDR3098461	3/25/98 to 7/31/2000	minerals and earths, grounds, or otherwise treated materials	unknown	unknown	unknown	unknown
Ballantine Residence	PAG043555	8/19/96 to 8/19/01	small flow treatment system	UNT Johnson Branch, Piney Creek	Sideling Hill	39.763889	-78.420278
Bolyard Residence	PAG043551	3/14/97 to 4/1/02	small flow treatment system	Flintstone Creek	Town	39.799444	-78.575556
Breezewood Proving Grounds Rec. Park	PAI2030503001		stormwater construction	unknown	unknown	unknown	unknown
Capricii Residence	PAG043561		small flow treatment system	Clear Creek	Town	unknown	unknown
Carrigan Residence	PA0083992	10/3/05 to 10/3/00	non municipal sewage-minor; small flow treatment facility	UNT Sweet Root Creek	Town	39.824167	-78.509167
Clark Residence	PAG043557	2/12/97 to 3/1/02	small flow treatment system	Milk and Water Creek	Town	39.914167	-78.431944
Collier Residence	PA0086819		non municipal sewage-minor; small flow treatment facility	Wilson Run	Fifteenmile	unknown	unknown
Flintstone WWTP	MD0055620	4/1/03 to 3/31/08	sewerage	unknown	unknown	39.7025	-78.565556
Gibson Residence	PA0088421		non municipal sewage-minor	Town Creek	Town Creek	unknown	unknown
Green Ridge Youth Camp WWTP	MD0024988	12/1/04 to 11/30/06	sewerage	unknown	unknown	39.672222	-78.456389

Name	Permit Number	Date	Description	Discharge Waters	Watershed	Latitude	Longitude
Keating Farm CAFO	PA0088927	11/1/2001 to 11/1/2006	groundwater drain discharge	n/a	unknown	39.766667	-78.608333
Little Orleans Campground WWTP	MDG062375	4/1/2000 to 3/31/2005	sewerage	unknown	unknown	39.626944	-78.389167
Martin Bros. Concrete	MDG499897	1/11/2001 to 10/16/2005	construction, sand, and gravel	unknown	unknown	unknown	unknown
Rock Gap Water Treatment	MD0067750	12/1/2004 to 11/30/09	water supply	unknown	unknown	39.058333	-76.855556
Stup Residence	PA0247405		non municipal sewage-minor; small flow treatment facility	UNT West Branch Sideling Hill Creek	Sideling Hill	38.81467	-78.373056
Wide Awake Farm Swine CAFO	PA008595	9/6/01 to 10/1/06	concentrated animal feed operation/stormwater construction	Sideling Hill Creek	Sideling Hill	38.814167	-78.373056

APPENDIX F. WILDLIFE LISTING

Bird Species

(developed from U.S. Breeding Bird Survey and Pennsylvania Breeding Bird Atlas)

Common Name	Scientific Name
blackbird, red-winged	*Agelaius phoeniceus*
bluebird, eastern	*Sialia sialis*
bobolink	*Dolichonyx oryzivorus*
bobwhite, northern	*Colinus virginianus*
bunting, indigo	*Passerina cyanea*
cardinal, northern	*cardinalis cardinalis*
chat, yellow-breasted	*Icteria virens*
catbird, gray	*Dumetella carolinensis*
chickadee, black-capped	*Poecile atricapillus*
chickadee, Carolina	*Poecile carolinensis*
cowbird, brown-headed	*Molothrus ater*
creeper, brown	*Certhia americana*
crow, American	*Corvus brachyrhynchos*
crow, fish	*Corvus ossifragus*
cuckoo, black-billed	*Coccyzuz erythrophthalmus*
cuckoo, yellow-billed	*Coccyzuz americanus*
dove, mourning	*Zenaida macroura*
dove, rock	*Columba livia*
duck, hooded merganser	*Lophodytes cucullatus*
duck, wood	*Aix sponsa*
finch, house	*Carpodacus mexicanus*
finch, purple	*Carpodacus purpureus*
flicker, northern	*Colaptes auratus*
flicker, yellow-shafted	*Colaptes auratus*
flycatcher, Acadian	*Empidonax virescens*
flycatcher, Alder	*Empidonax traillii*
flycatcher, great-crested	*Myiarchus crinitus*
flycatcher, least	*Empidonax minimus*
flycatcher, willow	*Empidonax trailli*
gnatcatcher, blue-gray	*Polioptila coerulea*
goldfinch, American	*Carduelis tristis*
grackle, common	*Quiscalus quiscula*
grosbeak, blue	*Guiraca caerulea*
grosbeak, rose-breasted	*Pheucticus ludovicianus*
grouse, ruffed	*Bonasa umbellus*
harrier, northern	*Circus cyaneus*
hawk, broad-winged	*Buteo platypterus*
hawk, Cooper's	*Accipiter cooperii*

Bird Species (continued)

Common Name	**Scientific Name**
hawk, red-shouldered	*Buteo lineatus*
hawk, red-tailed	*Buteo jamaicensis*
hawk, sharp-shinned	*Accipiter striatus*
heron, great blue	*Ardea herodias*
heron, green	*Butorides virescens*
hummingbird, ruby-throated	*Archilochus colubris*
jay, blue	*Cyanocitta cristata*
kestrel, American	*Falco sparverius*
kildeer	*Charadrius vociferus*
kingbird, eastern	*Tyrannus tyrannus*
kingfisher, belted	*Ceryle alcyon*
lark, horned	*Eremophila alpestris*
mallard	*Anas platyrhynchos*
martin, purple	*Progne subis*
meadowlark, eastern	*Sturnella magna*
mockingbird, northern	*Mimus polyglottos*
nighthawk, common	*Chordeiles minor*
nuthatch, white-breased	*Sitta Carolinensis*
oriole, Baltimore	*Icterus galbula*
oriole, orchard	*Icterus spurius*
ovenbird	*Seiurus aurocapillus*
owl, barred	*Strix varia*
owl, eastern screech	*Otus asio*
owl, great horned	*Bubo virinianus*
owl, barn	*Tyto alba*
parula, northern	*Parula americana*
pewee, eastern wood	*Contopus virens*
pheasant, rink-necked	*Phasianus colchicus*
phoebe, eastern	*Sayornis phoebe*
raven, common	*Corvus corax*
redstart, American	*Setophaga ruticilla*
robin, American	*Turdus migratorius*
siskin, pine	*Carduelis pinus*
sparrow, chipping	*Spizella passerina*
sparrow, field	*Spizella pusilla*
sparrow, grasshopper	*Ammodramus savannarum*
sparrow, Henslow's	*Ammodramus henslowii*
sparrow, house	*Passer domesticus*
sparrow, lark	*Chondestes grammacus*
sparrow, Savannah	*Passerculus sandwichensis*
sparrow, song	*Melospiza melodia*
sparrow, swamp	*Melospiza georgiana*

Bird Species (continued)

Common Name	Scientific Name
sparrow, vesper	*Pooecetes gramineus*
starling, European	*Sturnus vulgaris*
swallow, bank	*Riparia riparia*
swallow, barn	*Hirundo rustica*
swallow, cliff	*Petrochelidon pyrrhonota*
swallow, northern rough-winged	*Stelgidopteryx ruficollis*
swallow, tree	*Spizella arborea*
swift, chimney	*Chaetura pelagica*
tanager, scarlet	*Piranga olivacea*
thrasher, brown	*Toxostoma rufum*
thrush, hermit	*Catharus guttatus*
thrush, wood	*Hyocichla mustelina*
titmouse, tufted	*Baeolophus bicolor*
towhee, eastern	*Pipilo erythrophthalmus*
turkey, wild	*Meleagris gallopavo*
vireo, blue-headed	*Vireo solitarius*
vireo, red-eyed	*Vireo olivaceus*
vireo, yellow-throated	*Vireo flavifrons*
vireo, white-eyed	*Vireo griseus*
vulture, black	*Coragyps atratus*
vulture, turkey	*Cathartes aura*
warbler, black-and-white	*Mniotilta varia*
warbler, Blackburnian	*Dendroica fusca*
warbler, Blackpoll	*Dendroica striata*
warbler, black-throated green	*Dendroica virens*
warbler, blue-winged	*Vermivora pinus*
warbler, Canada	*Wilsonia canadensis*
warbler, cerulean	*Dendroica cerulea*
warbler, chestnut-sided	*Dendroica pennsylvanica*
warbler, golden-winged	*Vermivora chrysoptera*
warbler, hooded	*Wilsonia citrina*
warbler, pine	*Dendroica pinus*
warbler, prairie	*Dendroica discolor*
warbler, worm-eating	*Helmitheros vermivorus*
warbler, yellow	*Dendroica petechia*
waterthrush, Louisiana	*Seiurus motacilla*
waterthrush, northern	*Seiurus noveboracensis*
waxwing, cedar	*Bonbycilla cedrorum*
whippoorwill	*Caprimulgus vociferus*
woodcock, American	*Scolopax minor*
woodpecker, downy	*Picoides pubescens*
woodpecker, hairy	*Picoides villosus*

Bird Species (continued)

Common Name	Scientific Name
woodpecker, pileated	*Dryocopus pileatus*
woodpecker, red-bellied	*Melanerpes carolinus*
woodpecker, red-headed	*Melanerpes erythrochephalus*
wood-pewee, eastern	*Contopus virens*
wren, Bewick	*Thryomanes bewickii*
wren, Carolina	*Thryothours lodocicianus*
wren, house	*Troglodytes aedon*
yellowthroat, common	*Geothlypis trichas*

Mammal Species

(developed from Carnegie Museum of Natural History records and published distributions)

Common Name	Scientific Name
Allegheny woodrat*	*Neotoma floridana*
Appalachian cottontail*	*Sylvilagus obscurus*
badger	*Taxidea taxus*
beaver*	*Castor canadensis*
big brown bat	*Eptesicus fuscus*
black bear	*Ursus americanus*
bobcat*	*Lynx rufus*
coyote*	*Canis latrans*
deer mouse	*Peromyscus maniculatus*
eastern chipmunk	*Tamias striatus*
eastern cottontail	*Sylvilagus obscurus*
eastern mole	*Scalopus aquaticus**
eastern pipistrelle*	*Pipistrellus subflavus*
ermine/short-tailed weasel	*Mustela frenata*
fox squirrel*	*Sciurus niger*
gray fox*	*Urocyon cinereoargenteus*
gray squirrel	*Sciurus carolinensis*
groundhog	*Marmota monax*
hairy-tailed mole	*Parascalops breweri*
hoary bat*	*Lasiurus cinerus*
house mouse	*mus musculus*
Indiana bat*	*Myotis sodalis*
least shrew*	*Cryptotis parva*
least weasel*	*Mustela nivalis*
little brown bat*	*Myotis lucifugus*
long-tailed shrew	*Sorex dispar*
long-tailed weasel*	*Mustela frenata*
masked shrew	*Sorex cinereus*
meadow jumping mouse*	*Zapus hudsonius*

Mammal Species (continued)

Common Name	**Scientific Name**
meadow vole	*Microtus pennsylvanicus*
mink	*Mustela vision*
muskrat*	*Ondatra zibethicus*
northern flying squirrel	*Glaucomys sabrinus*
northern long-eared bat*	*Myotis septentrionalis*
Norway rat	*Rattus norvegicus*
opossum	*Didelphus virginiana*
pine vole*	*Microtus pinetorum*
porcupine	*Erethizon dorsatum*
pygmy shrew*	*Sorex hoyi*
raccoon*	*Procyon lotor*
red bat	*Lasiurus borealis*
red fox*	*Vulpes vulpes*
red squirrel	*Tamiasciurus hudsonicus*
red-backed vole	*Clethrionomys gapperi*
short-tailed shrew	*Blarina brevicauda*
silver-haired bat*	*Lasionycteris noctivagans*
small-footed bat*	*Myotis leibii*
smoky shrew	*Sorex fumeus*
snowshoe hare	*Lupus americanus*
southern bog lemming	*Synatomys cooperi*
southern flying squirrel	*Glaucomys volans*
spotted skunk	*Spilogale putorius*
star-nosed mole	*Condylura cristata*
striped skunk	*Mephitis mephitis*
white-footed mouse	*Peromyscus leucopus*
whitetail deer	*Odocoileus virginianus*
woodland jumping mouse	*Napaezapus insignis*

* most probably in watershed, though no record

Amphibians and Reptiles

(*Developed from "Amphibians and Reptiles of Pennsylvania and the Northeast "*)

Common Name	**Scientific Name**
black rat snake	*Elaphe obsoleta obsoleta*
bullfrog	*Rana catesbeiana*
common musk turtle	*Sternotherus odoratus*
common snapping turtle	*Chelydra serpentina serpentina*
eastern American toad	*Bufo americanus americanus*
eastern box turtle	*Terrapene carolina carolina*

Amphibians and Reptiles (continued)

Common Name	**Scientific Name**
eastern garter snake	*Thamnophis sirtalis*
eastern hellbender salamander*	*Cryptobranchus alleganiensis alleganiensis*
eastern hognose snake	*Heterodon platyrhinos*
eastern milk snake	*Lampropeltis triangulum triangulum*
eastern ribbon snake*	*Thamnophis sauritus*
eastern worm snake	*Carphophis amoenus*
five-lined skink*	*Eumeces fasciatus*
four-toed salamander*	*Hemidactylium scutatum*
Fowler's toad	*Bufo woodhoussii fowleri*
gray tree frog*	*Hyla chrysoscelis*
green frog	*Rana clamitans*
Jefferson salamander*	*Ambystoma jeffersonianum*
longtail salamander	*Eurycea longicauda longicauda*
marbled salamander*	*Ambystoma opacum*
mountain dusky salamander	*Desmognathus ochrophaeus*
northern black racer snake	*Coluber constrictor constrictor*
northern brown snake	*Storeria dekayi dekayi*
northern copperhead*	*Agkistrodon contortrix mokasen*
northern dusky salamander	*Desmognathus fuscus fuscus*
northern fence lizard	*Scelopurus undulatus hyacinthinus*
northern leopard frog*	*Rana pipiens*
northern red salamander	*Pseudotriton ruber ruber*
northern redbelly snake	*Storeria occipitomaculata occipitomaculata*
northern ringneck snake	*Diadophis punctatus edwardsii*
northern slimy salamander	*Plethodon glutinosus*
northern spring peeper frog	*Pseudacris crucifer crucifer*
northern spring salamander*	*Gyrinophilus porpyriticus porphyriticus*
northern two-lined salamander	*Eurycea bislineata*
northern water snake	*Nerodia sipedon sipedon*
painted turtle*	*Chrysemys picta*
pickerel frog	*Rana palustris*
redback salamander	*Plethodon cinerius*
red-spotted newt	*Notophthalmus viridescens viridescens*
smooth green snake*	*Opheodrys vernalis*
spotted salamander*	*Ambystoma maculatum*
spotted turtle*	*Clemmys guttata*
timber rattlesnake	*Crotalus horridus*
upland chorus frog*	*Pseudacris triseriata feriarum*
valley and ridge salamander	*Plethodon hoffmani*
wood frog*	*Rana sylvatica*
wood turtle	*Clemmys insculpta*

*Most probably in watershed, though no record

APPENDIX G. RARE, THREATENED, AND ENDANGERED SPECIES (PNDI)

Scientific Name	Common Name	State	State Rank	Global Rank	State Status	Subwatershed
Amphibians						
Heterodon platirhinos	eastern hognose snake	PA	S3S4	G5	Not Ranked	Sideling Hill
Birds						
Accipiter gentilis	northern goshawk	MD	S1B,SZN	G5	Endangered	Town
Accipiter striatus	sharp-shinned hawk	MD	S1S2B,S4N	G5	Not Ranked	Fifteenmile
Aimophila aestivalis	Bachman's sparrow	MD	SHB	G3	Extirpated	Town
Ammodramus henslowii	Henslow's sparrow	MD	S1S2B	G4	Threatened	Fifteenmile
Dendroica fusca	blackburnian warbler	MD	S1S2B	G5	Threatened	Sideling Hill, Town
Thryomanes bewickii altus	Bewick's wren	MD	S1B	G5T2Q	Endangered	Fifteenmile, Potomac Bends
Communities						
Central appalachian shale barren	Central Appalachian Shale Barren	PA	S1	GNR	Not Ranked	Fifteenmile,Sideling Hill,Town
Pinus strobus-tsuga canadensis (mesic)	White Pine-Hemlock Forest (Moist)	PA	SNR	GNR	Not Ranked	Town
Quercus alba-quercus velutina-carya sp	White Oak-Black Oak-Hickory Forest	PA	SNR	GNR	Not Ranked	Town
Invertebrates						
Amblyscirtes hegon	pepper and salt skipper	MD	S2	G5	In Need of Conservation	Fifteenmile
Calephelis borealis	northern metalmark	MD	S2	G3G4	Threatened	Fifteenmile, Potomac Bends, Sideling Hill, Town
		PA	S1S2		Not Ranked	
Caripeta aretaria	southern pine looper moth	PA	S1	G4	Not Ranked	Town
Cicindela ancocisconensis	a tiger beetle	MD	S1	G3	Endangered	Fifteenmile, Sideling Hill
Cisthene packardii	Packard's lichen moth	PA	S1S3	G5	Not Ranked	Sideling Hill
Cisthene plumbea	lead-colored lichen moth	PA	S1	G5	Not Ranked	Sideling Hill
Crambidia cephalica	lichen moth	PA	S1S2	G5	Not Ranked	Sideling Hill
Erynnis martialis	mottled duskywing	MD	S1	G3G4	Endangered	Sideling Hill

Scientific Name	Common Name	State	State Rank	Global Rank	State Status	Subwatershed
Invertebrates (continued)						
Erynnis persius persius	Persius duskywing	MD	SH	G5T2T3	Not Ranked	Sideling Hill
Euchloe olympia	Olympia marble	MD	S2	G4G5	In Need of Conservation	Fifteenmile, Potomac Bends,Sideling Hill, Town
		PA	S1		Not Ranked	
Fixsenia ontario	northern hairstreak	MD	S1S2	G4T4	Endangered	Potomac Bends, Sideling Hill
Fontigens bottimeri	Appalachian spring snail	MD	S2	G2	Not Ranked	Fifteenmile, Town
Papilio cresphontes	giant swallowtail	MD	S2	G5	In Need of Conservation	Fifteenmile, Potomac Bends, Town
Porhomma cavernicola	Appalachian cave spider	MD	S2	G4G5	Not Ranked	Town
Properigea sp. 1	a noctuid moth	PA	S1	G2G3Q	Not Ranked	Sideling Hill
Pyrgus wyandot	southern grizzled skipper	MD	S1	G2/G1G2Q	Endangered/Not Ranked	Fifteenmile, Sideling Hill, Town
Satyrium caryaevorum	hickory hairstreak	MD	S1	G4	Endangered	Fifteenmile
Satyrium edwardsii	Edwards' hairstreak	MD	S1	G4	Endangered	Sideling Hill
Spongilla lacustris	a freshwater sponge	PA	S1?	GNR	Not Ranked	Sideling Hill
Stygobromus franzi	Franz's cave amphipod	MD	S2S3	G2G3	In Need of Conservation	Town
		PA	?			
Zale metata	a zale moth	PA	SNR	G5	Not Ranked	Town
Mammals						
Neotoma magister	Allegheny woodrat	MD	S1	G3G4	Threatened/ Endangered	Potomac Bends, Sideling Hill, Town
Spilogale putorius	eastern spotted skunk	MD	S1	G5	Not Ranked	Fifteenmile
		PA	SH		Endangered	
Erethizon dorsatum	porcupine	MD	S1S2	G5	In Need of Conservation	Sideling Hill
Mustela nivalis	least weasel	MD	S2S3	G5	In Need of Conservation	Town
Myotis leibii	eastern small-footed bat	MD	S1B,S2N	G3	In Need of Conservation	Town
Myotis septentrionalis	northern myotis	PA	S3B,S3N	G4	Not Ranked	Town
Alasmidonta undulata	triangle floater	MD	S1	G4	Endangered	Sideling Hill
Alasmidonta varicosa	brook floater	MD	S1	G3	Endangered	Potomac Bends, Town
Lasmigona subviridis	green floater	MD	S1	G3	Endangered	Sideling Hill

Scientific Name	Common Name	State	State Rank	Global Rank	State Status	Subwatershed
Plants						
Adlumia fungosa	climbing fumitory	MD	S2	G4	Threatened	Sideling Hill, Town
Agrimonia striata	woodland agrimony	MD	S1	G5	Endangered	Town
Alnus viridis	mountain alder	PA	S1	G5	Endangered	Town
Amelanchier humilis	a serviceberry	PA	S1	G5	Tentatively Undetermined	Fifteenmile, Sideling Hill
Amelanchier sanguinea	roundleaf serviceberry	MD	S1	G5	Not Ranked	Sideling Hill, Town
		PA	S1		Tentatively Undetermined	
Amelanchier stolonifera	running juneberry	MD	S2	G5	Threatened	Sideling Hill
Antennaria virginica	shale barren pussytoes	PA	S3	G4	Not Ranked	Fifteenmile, Sideling Hill,Town
Apocynum sibiricum	clasping-leaved dogbane	MD	SH	G5?	Extirpated	Potomac Bends
Arctostaphylos uva-ursi	bearberry	MD	S1	G5	Extirpated	Sideling Hill
Aristida dichotoma var. curtissii	three-awned grass	PA	SH	G5T5	Tentatively Undetermined	Fifteenmile, Sideling Hill, Town
Aster praealtus	willow aster	MD	S1	G5	Unranked	Sideling Hill
Aster radula	rough-leaved aster	PA	S2	G5	Unranked	Town
Astragalus canadensis	Canada milkvetch	MD	S1/S2	G5	Endangered/Not Ranked	Sideling Hill
Astragalus distortus	bent milkvetch	MD	S2	G5	Threatened	Fifteenmile, Potomac Bends
Azolla caroliniana	mosquito fern	MD	SU	G5	Not Ranked	Potomac Bends
Bouteloua curtipendula	side-oats grama	MD	S2	G5	Not Ranked	Fifteenmile, Potomac Bends, Town
Bromus kalmii	brome grass	PA	S3	G5	Not Ranked	Town
Bromus latiglumis	broad-glumed brome	MD	S1	G5	Endangered	Potomac Bends, Town
Calamagrostis porteri	Porter's reedgrass	MD	S1	G4	Endangered	Sideling Hill
Calystegia spithamaea	low bindweed	MD	S2	G4G5	Not Ranked	Fifteenmile, Sideling Hill
Campanula divaricata	southern harebell	MD	SU	G4	Extirpated	Fifteenmile
Campanula rotundifolia	harebell	MD	S2	G5	Not Ranked	Fifteenmile, Potomac Bends, Town
Carex emoryi	Emory's sedge	MD	S1S2	G5	Not Ranked	Potomac Bends
Carex pedunculata	long-stalked sedge	MD	S1	G5	Endangered	Fifteenmile
Carex schweinitzii	Schweinitz's sedge	PA	S1	G3G4	Threatened	Town
Carex shortiana	sedge	PA	S3	G5	Not Ranked	Town
Carya laciniosa	big shellbark hickory	MD	S1	G5	Endangered	Sideling Hill

Scientific Name	Common Name	State	State Rank	Global Rank	State Status	Subwatershed
Plants (continued)						
Chionanthus virginicus	fringe-tree	PA	S3	G5	Not Ranked	Town
Cinna latifolia	slender wood reedgrass	MD	S2	G5	Threatened	Potomac Bends
Cyperus houghtonii	Houghton's umbrella-sedge	MD	S1	G4?	Not Ranked	Sideling Hill
Delphinium exaltatum	tall larkspur	PA	S1	G3	Endangered	Town
Diarrhena americana	twin oats	MD	S1	G4?	Endangered	Potomac Bends
Dicentra eximia	wild bleeding heart	MD	S2	G4	Threatened	Fifteenmile, Town
		PA	S1		Endangered	
Diplazium pycnocarpon	glade fern	MD	S2	G5	Threatened	Sideling Hill
Dryopteris campyloptera	mountain wood-fern	MD	S1	G5	Endangered	Fifteenmile
Elliptio producta	Atlantic spike	MD	S2S3	G4Q	Not Ranked	Potomac Bends, Sideling Hill
Eupatorium rotundifolium	a *Eupatorium sp.*	PA	S3	G5	Tentatively Undetermined	Town
Euphorbia obtusata	blunt-leaved spurge	MD	S1	G5	Endangered	Fifteenmile, Potomac Hills, Sideling Hill
Galium latifolium	purple bedstraw	PA	S3	G5	Not Ranked	Town
Gentiana andrewsii	fringe-tip closed gentian	MD	S2	G5?	Threatened	Town
Glaucopsyche lygdamus	silvery blue	MD	S2	G5	In Need of Conservation	Fifteenmile, Potomac Bends, Town
Hasteola suaveolens	sweet-scented Indian plantain	MD	S1	G3	Endangered	Sideling Hill
Helianthus hirsutus	a sunflower	PA	S2	G5	Not Ranked	Sideling Hill, Town
Hieracium traillii	Maryland hawkweed	PA	S1	G4	Endangered	Fifteenmile
Hypericum stragulum	St. Andrew's cross	PA	S2	G5	Not Ranked	Sideling Hill
Iris cristata	crested iris	MD/PA	S1	G5	Endangered	Sideling Hill
Juglans cinerea	butternut	MD	S2S3	G3G4	Not Ranked	Fifteenmile
Juncus biflorus	grass-leaved rush	PA	S2	G5	Tentatively Undetermined	Town
Juncus debilis	weak rush	PA	S3	G5	Not Ranked	Sideling Hill, Town
Juniperus communis	common juniper	PA	S2	G5	Not Ranked	Town
Lactuca hirsuta	downy lettuce	PA	S3	G5?	Not Ranked	Town
Lathyrus venosus	veiny pea	PA	S2	G5	Not Ranked	Fifteenmile, Town
Liatris scariosa	round-head gayfeather	PA	S2	G5?	Not Ranked	Fifteenmile,Sideling Hill,Town
Liatris turgida	robust blazing-star	MD	SH	G3	Extirpated	Sideling Hill

Scientific Name	Common Name	State	State Rank	Global Rank	State Status	Subwatershed
Plants (continued)						
Ligusticum canadense	nondo lovage	PA	SH	G4	Endangered	Town
Lithospermum canescens	hoary puccoon	PA	S2	G5	Ranked	Fifteenmile, Town
Lithospermum latifolium	American gromwell	PA	S3	G4	Endangered	Fifteenmile, Town
Lonicera canadensis	Canada honeysuckle	MD	S1	G5	Endangered	Fifteenmile
Lupinus perennis	wild lupine	MD	S2	G5	Threatened	Fifteenmile
Lysimachia hybrida	lowland loosestrife	MD	S2	G5	Threatened	Sideling Hill
Malaxis bayardii	Bayard's malaxis	PA	S1	G2	Rare	Fifteenmile, Sideling Hill, Town
Matelea obliqua	climbing milkweed	MD	S1	G4?	Endangered	Fifteenmile, Potomac Bends
Melanthium virginicum	Virginia bunchflower	PA	SU	G5	Not Ranked	Sideling Hill
Melica nitens	three-flowered melic	MD	S2	G5	Threatened	Fifteenmile, Potomac Bends,
		PA	S2		Threatened	Sideling Hill, Town
Menziesia pilosa	minniebush	PA	S3	G4G5	Rare	Town
Minuartia michauxii	rock sandwort	MD	S2	G5	Threatened	Fifteenmile, Potomac Bends, Sideling Hill, Town
Oenothera argillicola	shale-barren evening primrose	PA	S2	G3G4	Threatened	Town
Opuntia humifusa	prickly-pear cactus	PA	S3	G5	Rare	Town
Oryzopsis asperifolia	white-fruited mountainrice	MD	S2	G5	Threatened	Fifteenmile
Panicum boreale	panic-grass	PA	SU	G5	Tentatively Undetermined	Sideling Hill
Paronychia fastigiata var. nuttallii	forked-chickweed	PA	S1S2	G5T3T5	Tentatively Undetermined	Sideling Hill
Paronychia virginica var virginica	yellow nailwort	MD	S1	G4T1Q	Endangered	Potomac Bends
Parthenium integrifolium	American feverfew	MD	S1	G5	Endangered	Fifteenmile, Town
Paxistima canbyi	Canby's mountain lover	MD	S1	G2	Endangered	Town
Penstemon canescens	a beard-tongue	PA	S3	G4	Not Ranked	Fifteenmile, Sideling Hill, Town
Phaseolus polystachios	wild kidney bean	PA	S1S2	G4	Not Ranked	Sideling Hill
Phlox subulata ssp. brittonii	moss pink	PA	S1	G5T4?	Endangered	Sideling Hill
Pinus echinata	short-leaf pine	PA	S1S2	G5	Not Ranked	Sideling Hill

	Scientific Name	Common Name	State	State Rank	Global Rank	State Status	Subwatershed
Plants (continued)							
	Platanthera ciliaris	yellow-fringed orchid	PA	S2	G5	Tentatively Undetermined	Town
	Platanthera flava	pale green orchid	MD	S2	G4	Not Ranked	Fifteenmile, Sideling Hill
	Poa alsodes	grove meadow-grass	MD	S2	G4G5	Not Ranked	Sideling Hill
	Poa languida	drooping bluegrass	PA	S2	G3G4Q	Tentatively Undetermined	Fifteenmile, Town
	Polygala polygama	racemed milkwort	MD	S1/S1S2	G5	Threatened/ Tentatively Undetermined	Fifteenmile, Sideling Hill, Town
	Polygala senega	Seneca snakeroot	MD	S2	G4G5	Threatened	Fifteenmile, Sideling Hill
	Potamogeton illinoensis	Illinois pondweed	MD	S1	G5	Not Ranked	Town
	Potamogeton tennesseensis	Tennessee pondweed	PA	S1	G2	Endangered	Sideling Hill
	Prenanthes serpentaria	lion's-foot	PA	S3	G5	Not Ranked	Sideling Hill
	Prunus alleghaniensis	Allegheny plum	MD	S2	G4	Threatened	Fifteenmile
			PA	S2S3		Not Ranked	
*	*Ptilimnium nodosum*	harperella	MD	S1	G2	Endangered	Fifteenmile, Sideling Hill
	Pycnanthemum virginianum	Virginia mountain-mint	MD	S2	G5	Not Ranked	Potomac Bends, Sideling Hill
	Ruellia strepens	rustling wild-petunia	MD	S1	G4G5	Endangered	Town
	Salix caroliniana	Carolina willow	PA	S1	G5	Not Ranked	Sideling Hill
	Scirpus ancistrochaetus	northeastern bulrush	PA	S3	G3	Endangered	Town
	Scleria triglomerata	whip nutrush	PA	SH	G5	Tentatively Undetermined	Town
	Scutellaria leonardii	Leonard's skullcap	MD	S2	G4T4	Threatened	Fifteenmile, Potomac Bends, Town
	Sedum telephioides	Allegheny stonecrop	PA	S3	G4	Rare	Sideling Hill, Town
	Senecio antennariifolius	cat's-paw ragwort	PA	S1	G4	Endangered	Sideling Hill
	Senecio plattensis	prairie ragwort	PA	SH	G5	Tentatively Undetermined	Town
	Smilacina stellata	star-flowered false Solomon's seal	MD	S1	G5	Endangered	Fifteenmile
	Solidago arguta var. harrisii	Harris' goldenrod	PA	S1	G5T4	Endangered	Fifteenmile, Sideling Hill, Town
	Solidago hispida	hairy goldenrod	MD	SH	G5	Extirpated	Fifteenmile, Sideling Hill
	Spiraea betulifolia	dwarf spiraea	PA	S1	G5	Threatened	Sideling Hill, Town
	Spiranthes ochroleuca	yellow nodding lady's tresses	MD	S1	G4	Endangered	Town
	Stellaria alsine	trailing stitchwort	MD	S1	G5	Endangered	Sideling Hill

Scientific Name	Common Name	State	State Rank	Global Rank	State Status	Subwatershed
Plants (continued)						
Strophitus undulatus	squawfoot	MD	S2	G5	In Need of Conservation	Fifteenmile, Sideling Hill
Symphoricarpos albus	snowberry	MD	S1	G5	Endangered	Fifteenmile, Potomac Bends, Town
Taenidia montana	mountain pimpernel	MD	S1	G3?	Threatened	Fifteenmile,Potomac Bends, Sideling Hill, Town
		PA	S2		Endangered	
Thalictrum coriaceum	thick-leaved meadow-rue	PA	S2	G4	Endangered	Town
Trifolium virginicum	Kate's Mountain clover	MD	S2S3	G3	Threatened/ Endangered	Fifteenmile, Potomac Bends, Sideling Hill, Town
		PA	S1		Endangered	
Triosteum angustifolium	narrow-leaved horse-gentian	MD	S1	G5	Endangered	Potomac Bends
Valerianella chenopodiifolia	goose-foot cornsalad	MD	S1	G5	Endangered	Fifteenmile
Veronica scutellata	marsh speedwell	MD	S1	G5	Endangered	Sideling Hill
Woodsia ilvensis	rusty woodsia	MD	S1	G5	Threatened	Sideling Hill, Town
Zanthoxylum americanum	northern prickly-ash	MD	S1	G5	Endangered	Fifteenmile, Sideling Hill

** federally endangered species*

Basic Global Rank Codes and Definitions

Rank Code	Description	Definition
GX	Presumed Extinct	Believed to be extinct throughout its range. Not located despite intensive searches of historic sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.
GH	Possibly Extinct	Known from only historical occurrences. Still some hope of rediscovery.
G1	Critically Imperiled	Critically imperiled globally because of extreme rarity or because of some factor(s) making it especially vulnerable to extinction. Typically 5 or fewer occurrences or very few remaining individuals (<1,000) or acres (<2,000) or stream miles (<10).
G2	Imperiled	Imperiled globally because of rarity or because of some factor(s) making it very vulnerable to extinction. Typically 6 to 20 occurrences or few remaining individuals (1,000 to 3,000) or acres (2,000 to 10,000) or stream miles (10 to 50).
G3	Vulnerable	Vulnerable globally either because very rare and local throughout its range, found only in a restricted range (even if abundant at some locations), or because of other factors making it vulnerable to extinction. Typically 21 to 100 occurrences or between 3,000 and 10,000 individuals.
G4	Apparently Secure	Uncommon but not rare, and usually widespread. Possibly cause for long-term concern. Typically more than 100 occurrences and more than 10,000 individuals.
G5	Secure	Common, typically widespread and abundant. Typically with considerably more than 100 occurrences and more than 10,000 individuals.
G#G#	Range Rank	A numeric range rank (e.g., G2G3) is used to indicate uncertainty about the exact status of a taxon.
T	Infraspecific Taxon (trinomial)	The status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank. Rules for assigning T ranks follow the same principles outlined above. For example, the global rank of a critically imperiled subspecies of an otherwise widespread and common species would be G5T1. A T subrank cannot imply the subspecies or variety is more abundant than the species= basic rank (e.g.., a G1T2 subrank should not occur). A population (e.g., listed under the U.S. Endangered Species Act or assigned candidate status) may be tracked as an infraspecific taxon and given a T rank; in such cases a Q is used after the T rank to denote the taxon's questionable taxonomic status.

Global Rank Qualifiers

Qualifier	Description	Definition
?	Inexact Numeric Rank	Denotes inexact numeric rank.
Q	Questionable Taxonomy	Taxonomic status is questionable; numeric rank may change with taxonomy.
C	Captive or Cultivated Only	Taxon at present is extant only in captivity or cultivation, or as a reintroduced population not yet established.

State Rank Codes and Definitions

Rank Code	Description	Definition
SX	Extirpated	Element is believed to be extirpated from the "state" (or province or other subnational unit).
SH	Historical	Element occurred historically in the state (with expectation that it may be rediscovered), perhaps
S1	Critically Imperiled	Critically imperiled in the state because of extreme rarity or because of some factor(s) making it especially vulnerable to extirpation from the state. Typically 5 or fewer occurrences or very few remaining individuals or acres.
S2	Imperiled	Imperiled in the state because of rarity or because of some factor(s) making it very vulnerable to extirpation from the state. Typically 6 to 20 occurrences or few remaining individuals or acres.
S3	Vulnerable	Vulnerable in the state either because rare and uncommon, or found only in a restricted range (even if abundant at some locations), or because of other factors making it vulnerable to extirpation. Typically 21 to 100 occurrences.
S4	Apparently Secure	Uncommon but not rare, and usually widespread in the state. Usually more than 100 occurrences.
S5	Secure	Demonstrably widespread, abundant, and secure in the state, and essentially ineradicable under present conditions.
S?	Unranked	State rank is not yet assessed.
SU	Unrankable	Currently unrankable due to lack of information or due to substantially conflicting information about status or trends. NOTE: Whenever possible, the most likely rank is assigned and a question mark added (e.g.., S2?) to express uncertainty, or a range rank (e.g.., S2S3) is used to delineate the limits (range) of uncertainty.

State Rank Codes and Definitions (continued)

Rank Code	Description	Definition
S#S#	Range Rank	A numeric range rank (e.g., S2S3) is used to indicate the range of uncertainty about the exact status of the element. Ranges cannot skip more than one rank (e.g.., SU should be used rather than S1S4).
HYB	Hybrid	Element represents an interspecific hybrid.
SE	Exotic	An exotic established in the state; may be native in nearby regions (e.g., house finch or catalpa in eastern U.S.).
SE#	Exotic Numeric	An exotic established in the state that has been assigned a numeric rank to indicate its status, as with S1 through S5.
SA	Accidental	Accidental or casual in the state (i.e., infrequent and outside usual range). Includes species (usually birds or butterflies) recorded once or only a few times. A few of these species may have bred on the one or two occasions they were recorded. Examples include European strays or western birds on the east coast and vice-versa.
SZ	Zero Occurrences	Not of practical conservation concern in the state because there are no definable occurrences, although the taxon is native and appears regularly in the state. An SZ rank will generally be used for long-distance migrants whose occurrences during their migrations have little or no conservation value for the migrant as they are typically too irregular (in terms of repeated visitation to the same locations), transitory, and dispersed to be reliably identified, mapped, and protected. In other words, the migrant regularly passes through the subnation, but enduring, mappable Element Occurrences cannot be defined. Typically, the SZ rank applies to a non-breeding population in the subnation -- for example, birds on migration. An SZ rank may in a few instances also apply to a breeding population, for example certain Lepidoptera which regularly die out every year with no significant return migration. Although the SZ rank typically applies to migrants, it should not be used indiscriminately. Just because a species is on migration does not mean it receives an SZ rank. SZ only applies when the migrants occur in an irregular, transitory, a
SP	Potential	Potential that Element occurs in the state but no extant or historic occurrences reported.
SR	Reported	Element reported in the state but without a basis for either accepting or rejecting the report. Some of these are very recent discoveries for which the program hasn't yet received first-hand information; others are old, obscure reports.

State Rank Codes and Definitions (continued)

Rank Code	Description	Definition
SRF	Reported Falsely	Element erroneously reported in the state (e.g., misidentified specimen) and the error has persisted in the literature.
SSYN	Synonym	Element reported as occurring in the state, but state does not recognize the taxon; therefore, the Element is not ranked by the state.
*		S rank has been assigned and is under review. Contact the individual state Natural Heritage Program for assigned rank.
Not Provided		Species is known to occur in this state. Contact the individual state Natural Heritage program for assigned rank.

State Rank Qualifiers

Qualifier	Description	Definition
B	Breeding	Basic rank refers to the breeding population of the Element in the state.
N	Non-breeding	Basic rank refers to the non-breeding population of the Element in the state.
?	Inexact or Uncertain	Denotes inexact or uncertain numeric rank. For SE denotes uncertainty of exotic status. (The ? qualifies the character immediately preceding it in the SRANK.)
C	Captive or Cultivated	Element is presently extant in the state only in captivity or cultivation, or as a reintroduced population not yet established.
NOTE - A breeding status subrank is only used for species that have distinct breeding and/or non-breeding populations in the state. A breeding-status SRANK can be coupled with its complementary non-breeding-status SRANK. The two are separated by a comma, with the higher-priority rank listed first in their pair (e.g.., AS2B,S3N@ or ASHN,S4S5B@).		

Pennsylvania Status Definitions - Plants

Status	Description	Definition
PE	Pennsylvania Endangered	Plant species which are in danger of extinction throughout most of their natural range within this commonwealth, if critical habitat is not maintained or if the species is greatly exploited by man. This classification shall also include any populations of plant species that have been classified as Pennsylvania Extirpated, but which subsequently are found to exist in this commonwealth.
PT	Pennsylvania Threatened	Plant species which may become endangered throughout most or all of their natural range within this commonwealth, if critical habitat is not maintained to prevent their future decline, or if the species is greatly exploited by man.
PR	Pennsylvania Rare	Plant species, which are uncommon within this commonwealth. All species of the native wild plants classified as Disjunct, Endemic, Limit of Range, and Restricted are included within the Pennsylvania Rare classification.
	Disjunct	Significantly separated from their main area of distribution.
	Endemic	Confined to a specialized habitat.
	Limit of Range	At or near the periphery of their natural distribution.
	Restricted	Found in specialized habitats or habitats infrequent in Pennsylvania.
PX	Pennsylvania Extirpated	Plant species believed by the department to be extinct within this commonwealth. These plants may or may not be in existence outside the commonwealth.
PV	Pennsylvania Vulnerable	Plant species which are in danger of population decline within the commonwealth because of their beauty, economic value, use as a cultivar, or other factors which indicate that persons may seek to remove these species from their native habitats.
TU	Tentatively Undetermined	A classification of plant species which are believed to be in danger of population decline, but which cannot presently be included within another classification due to taxanomic uncertainties, limited evidence within historical records, or insufficient data.
N		No current legal status exists, but is under review for future listing.

Pennsylvania State Status - Wild Birds and Mammals

Status	Description	Definition
PE	Pennsylvania Endangered	Species in imminent danger of extinction or extirpation throughout their range in Pennsylvania if the deleterious factors affecting them continue to operate. These are: 1) species whose numbers have already been reduced to a critically low level or whose habitat has been so drastically reduced or degraded that immediate action is required to prevent their extirpation from the commonwealth; or 2) species whose extreme rarity or peripherality places them in potential danger of precipitous declines or sudden extirpation throughout their range in Pennsylvania; or 3) species that have been classified as "Pennsylvania Extirpated," but which are subsequently found to exist in Pennsylvania as long as the above conditions 1 or 2 are met; or 4) species determined to be "Endangered" pursuant to the Endangered Species Act of 1973, Public Law 93 205 (87 Stat. 884), as amended.
PT	Pennsylvania Threatened	Species that may become endangered within the foreseeable future throughout their range in Pennsylvania unless the casual factors affecting the organism are abated. These are: 1) species whose populations within the commonwealth are decreasing or have been heavily depleted by adverse factors and while not actually endangered, are still in critical condition; 2) species whose populations may be relatively abundant in the commonwealth but are under severe threat from serious adverse factors that have been identified and documented; or 3) species whose populations are rare or peripheral and in possible danger of severe decline throughout their range in Pennsylvania; or 4) species determined to be "Threatened" pursuant to the Endangered Species Act of 1973, Public Law 93205 (87 Stat. 884), as amended, that are not listed as "Pennsylvania Endangered."
N		No current legal status but is under review for future listing.

Pennsylvania State Status - Invertebrates

Status	Description	Definition
N		No current legal status but is under review for future listing.

Pennsylvania State Status - Fish, Amphibians, Reptiles, and Aquatic Organisms

Status	Description	Definition
PE	Pennsylvania Endangered	All species declared by: 1) the Secretary of the United States Department of the Interior to be threatened with extinction and appear on the Endangered Species List or the Native Endangered Species List published in the Federal Register; or 2) have been declared by the Pennsylvania Fish Commission, Executive Director to be threatened with extinction and appear on the Pennsylvania Endangered Species List published by the Pennsylvania Bulletin.
PT	Pennsylvania Threatened	All species declared by: 1) the Secretary of the United States Department of the Interior to be in such small numbers throughout their range that they may become endangered if their environment worsens, and appear on a Threatened Species List published in the Federal Register; or 2) have been declared by the Pennsylvania Fish Commission Executive Director to be in such small numbers throughout their range that they may become endangered if their environment worsens and appear on the Pennsylvania Threatened Species List published in the Pennsylvania Bulletin.
PC		Animals that could become endangered or threatened in the future. All of these are uncommon, have restricted distribution or are at risk because of certain aspects of their biology.
N		No current legal status, but is under review for future listing.

Federal Status Codes and Definitions

Status	Description	Definition
LE	Listed Endangered	A species which is in danger of extinction throughout all or a significant portion of its range.
LT	Listed Threatened	Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
LELT	Listed Endangered in part of range; listed Threatened in the remaining part.	
PE	Proposed Endangered	Taxa proposed to be listed as endangered.
PT	Proposed Threatened	Taxa proposed to be listed as threatened
PEPT		Proposed Endangered in part of range; proposed Threatened in the remaining part.
C	Candidate for listing.	
E(S/A)		Treat as Endangered because of similarity of appearance.
T(S/A)		Treat as Threatened because of similarity of appearance.
XE	Essential Experimental population.	
XN	Nonessential Experimental population.	
"xy" (mixed status)		Status varies for different populations or parts of range.
"x" NL		Status varies for different populations or parts of range with at least one part not listed.

APPENDIX H. ALLEGANY FORESTS PROJECT CAP SUMMARY

Step 1: Project Team

The project team is made up of staff from The Nature Conservancy (TNC, both the Maryland and Pennsylvania chapters), Western Pennsylvania Conservancy (WPC), PA Natural Heritage Program, and MD Natural Heritage Program. All of the team members participated in the planning process.

WPC and PA Heritage Staff

Michael Knoop*, Special Projects Coordinator, Sideling Hill Creek Center; Charles Bier, Senior Director, Conservation Science; Tolif Hunt, Director, Agriculture Conservation Services (former Special Projects Coordinator, Sideling Hill Creek Center); Jeremy Deeds, Aquatic Ecologist; Jeff Wagner, Director Pennsylvania Natural Heritage Program; Jason Heinze, Allegheny Forestlands Program Director; Greg Socha, Senior Director, Forest Conservation; Jacqui Bonomo, Vice President, Conservation

TNC (MD and PA) and MD Heritage Staff

Donnelle Keech*, Allegany Forests Project Director (MD); Mark Bryer, Chesapeake Bay Initiative; Doug Samson, Senior Scientist (MD); Deborah Landau, Conservation Ecologist (MD); Charles DeCurtis, Director Conservation Science (PA); Stephanie Orndorff, Conservation Planner (PA); Margo Burnham, Director Conservation Operations (MD); Ed Thompson, Western Region Ecologist, MD DNR Natural Heritage Program; Harry Kahler, Natural Resource Biologist, MD DNR Natural Heritage Program; Dylan Jenkins, Director of Forest Conservation and PA Northcentral Highlands Project; Keith Eshleman, Associate Professor, Appalachian Lab; Phil Townsend, Associate Professor, Department of Forest Ecology and Management

* Denotes Team Leader

Step 2: Vision, Scope, and Focal Targets

Vision

The vision of the Allegany Forests Project is to protect the full range of native biodiversity within the project area.

Scope

The geographic scope of the Allegany Forests Project includes:

- Watersheds of Town Creek, Sideling Hill Creek, and Fifteenmile Creek.
- The Green Ridge Matrix Forest Block and the Buchanan Matrix Forest Block, which were identified in TNC's plan for the **Central Appalachian Forests Ecoregion**.

Focal Targets

Stream Systems (including Riparian Zones)

This target is defined as the main stems of Sideling Hill Creek, Fifteenmile Creek, and Town Creek, ***and*** riparian zone habitat throughout the three watersheds. More specifically, it is the portion of these stream systems that have watersheds 30 – 200 square miles in extent (named "size 2" waterbodies in TNC's freshwater portfolio analysis); and the land adjacent to all perennial streams within the three watersheds a certain distance above stream level (as determined by Digital Elevation Model analysis).

Note that this target does not include all small tributaries – the biodiversity health or protection of these small perennial or ephemeral tributaries is not a goal in and of itself, but obviously it is important to maintaining, improving, or even assessing the health of the target as defined.

These three watersheds drain into the upper Potomac River and are within the Chesapeake Bay watershed. They capture two different aquatic system types and all three of these size 2 streams are targets identified in the ***Chesapeake Bay Freshwater Ecoregional*** portfolio, outlining species and habitats in need of protection for the entire Chesapeake Bay.

Nested targets within the stream systems are:

- Harperella (*Ptilimnium nodosum*)
- White Mountain tiger beetle (*Cicindela ancocisconensis*) (G3, S1 in MD)
- Odonate assemblage
- Fish assemblage
- Wood turtle habitat

Harperella is found only in Sideling Hill and Fifteenmile creeks, with by far the larger population in the former. This species is globally rare, with a rank of G2. It is a target in TNC's Central Appalachians Ecoregional plan. This plan encompasses the area including the Blue Ridge Mountains, Great Valley, Ridge and Valley, and Allegheny Mountains and includes plants, animals, and natural communities that represent TNC's most urgent conservation priorities, including the protection of 467 sites. Of these, 122 are immediate priorities.

Native Mussel Assemblage

This target is defined as all native mussel populations (rare and common species, listed below) in Sideling Hill Creek. There are nine species of mussels currently known from Sideling Hill Creek, including four globally rare species, and two that are targets in the Central Appalachians Ecoregional plan.

Common Name	**Scientific Name**	**Global Rank**	**State Rank (MD/PA)**
green floater*	*Lasmigona subviridis**	G3	S1/S1
brook floater*	*Alasmidonta varicose**	G3	S1/S1
Atlantic spike	*Elliptio producta*	G3Q	N/S2
triangle floater	*Alasmidonta undulata*	G5	S2/S3S4
northern lance	*Elliptio producta*	G4	S1/S2
eastern elliptio	*Elliptio complanata*	G5	S5/S5
yellow lampmussel	*Lampsilis cariosa*	G3-G4	S1/S3-S4
creeper	*Strophitus undulates*	G5	S4/S4

*Ecoregional target species, Sideling Hill Creek occurrence is "tagged" element occurrence

Plain pocketbook (*Lampsilis cardium*) is also present in Sideling Hill Creek, but is not considered part of this target, because it is an Ohio River basin species that was introduced to the Potomac drainage back in the early 1900s. It is not invasive, just not native. The bass host fish species is also not native (source: Charles Bier).

It is unknown at this time how important restoration of mussels in Town Creek might be to range-wide status of rare or uncommon species. There are also unanswered questions about how suitable current conditions in Town Creek might be to mussel re-establishment, although there was general optimism

expressed among the project team and from Dan Feller of MD DNR about the state of knowledge for mussel reintroduction.

The mussels are designated as a target separate from the stream system target because they may likely have lower viability than the stream system.

Mixed Oak Forests

This target is defined as the mosaic of native forest types that occupy the landscape across the project area.

Forest type maps from remotely sensed data and forest monitoring plots in Green Ridge State Forest show current forest types for a portion of the project area. Likely or potential component community types are enumerated and described in the Allegany Forests Project Site Conservation Plan, first iteration dated September 2003.

Both the Green Ridge Matrix Forest Block and the Buchanan Matrix Forest Block outlined in TNC's Central Appalachian Forest Ecoregional Plan have been selected for conservation action under this plan. Forest blocks are areas of connected intact forest, usually of higher quality, that serve as important habitat and corridors for wildlife. The boundary of the Green Ridge Block is slightly modified from the boundary identified in the 2001 Central Appalachian Forest Ecoregional Plan, and the core area boundary was created by TNC MD staff through analysis. The Buchanan Boundary is shown as identified in the Ecoregional plan. Work currently underway by WPC and PA TNC is re-evaluating forest blocks in Pennsylvania, and may result in modification of the Buchanan block.

Nested targets:

- northern metalmark
- southern grizzled skipper

Shale Barrens

This target is defined as occurrences of shale barrens throughout the project area. Shale barrens have been mapped in both MD and PA, with MD data being more complete and PA data reflecting many of the very best known shale barrens examples.

Shale barrens are designated as a target separate from forests, because of their importance as an element of diversity in the area, because they are subject to different threats than forest targets, and because their viability may be different than forests.

Single Species Targets

Paxistima canbii (Canby's Mountain Lover)

This is a single species target. This G2 ecoregional target species occurs at one site in the Maryland portion of the Town Creek watershed, and this occurrence is a tagged EO in the ecoregional plan. It is designated as a separate target because it is a G2 species with only one occurrence that could be threatened/lost even if forest matrix is protected.

*Neotoma magister (*Allegheny Woodrat*)*

This is a single species target. It is designated as a separate target because it is has threats and viability that do not necessarily track with the Mixed Oak Forest target.

Step 3: Assess Viability of Focal Targets

Through December 2005 and April 2006 workshops, the project team identified at least one Key Ecological Attribute (KEA) for each of the project's six Focal Targets. These are characteristics of the targets that can be used to gauge the health of the targets, such as macroinvertebrate assemblage to assess the health of perennial streams (see spreadsheet at the end of this Appendix). Most of these KEAs are in very rough draft form, and very few have well-defined indicators and indicator rankings. We do not intend to implement all of these draft KEAs in our monitoring plan at this time. Over the next year, the Core Implementation team will work with other project team members to "operationalize" the KEAs selected for inclusion in current monitoring. We will improve other draft KEAs as/if they are incorporated into a revised or expanded monitoring plan in future versions of the Allegany Forests CAP plan.

Step 4: Identify Critical Threats

At December 2005 and April 2006 workshops, the project team identified and ranked direct threats to focal targets. Diagrams were created to visually model the relationships of these threats to the focal targets. A description of these threats is given under Step 5 and a diagram illustrating these relationships can be found at the end of this Appendix.

Step 5: Conduct Situational Analysis

Situation diagrams were created that articulate and visually model a shared understanding of the relationships among direct threats, focal targets, and the factors that drive or influence the direct threats.

A pilot version of a new software tool, e-Adaptive Management (or eAM), was used to record threat rankings. Overall degree of threat was based on a score of "very high," "high," "medium," or "low" for each of the three categories—scope, severity, and irreversibility.

Scope – Most commonly defined spatially as the geographic scope of impact on the conservation target at the site that can reasonably be expected within 10 years under current circumstances (i.e., given the continuation of the existing situation).

- **4 - Very High:** The threat is likely to be very widespread or pervasive in its scope, and affect the conservation target throughout the target's occurrences at the site.
- **3 - High:** The threat is likely to be widespread in its scope, and affect the conservation target at many of its locations at the site.
- **2 - Medium:** The threat is likely to be localized in its scope, and affect the conservation target at some of the target's locations at the site.
- **1 - Low:** The threat is likely to be very localized in its scope, and affect the conservation target at a limited portion of the target's location at the site.

Severity – The level of damage to the conservation target that can reasonably be expected within 10 years under current circumstances (i.e., given the continuation of the existing situation).

- **4 - Very High:** The threat is likely to destroy or eliminate the conservation target over some portion of the target's occurrence at the site.

3 - High: The threat is likely to seriously degrade the conservation target over some portion of the target's occurrence at the site.

2 - Medium: The threat is likely to moderately degrade the conservation target over some portion of the target's occurrence at the site.

1 - Low: The threat is likely to only slightly impair the conservation target over some portion of the target's occurrence at the site.

Irreversibility – The degree to which the effects of a source of threat can be restored.

4 - Very High: The effects of the threat are not reversible (e.g., wetlands converted to a shopping center).

3 - High: The effects of the threat are reversible, but not practically affordable (e.g., wetland converted to agriculture).

2 - Medium: The effects of the threat are reversible with a reasonable commitment of resources (e.g., ditching and draining of wetland).

1 - Low: The effects of the threat are easily reversible at relatively low cost (e.g., off-road vehicles trespassing in wetland).

Overall, the threat ranking for the Allegany Forests Project is "High." The highest ranked threats are:

- Residential Development (high)
- New Large Developments (high)
- Road Maintenance (medium)
- Pest and Pathogens (medium)
- Invasive Plants (medium)
- Poor Forestry Practices (medium)
- Water Withdrawals (medium)

Step 6: Develop Conservation Strategies

Team members worked at both the December 2005 and April 2006 workshops to develop conservation strategies to address all of the highest-ranked threats and/or key factors that are driving these threats. Team members assigned each prospective strategy a rank of 1 – 4 for each of these criteria:

- Importance – how important is this strategy for achieving conservation success?
- Urgency – how urgent is it that we undertake these actions?
- Gap – are there others involved in this strategy, or will it not happen without our involvement?
- Cost – how expensive, in terms of time and money, is this strategy?
- Like/Ability – do we like to do this stuff? are we good at it (i.e., is it a strength of our organization and/or our current staff)?

The top strategies and the associated objectives that were selected for action by one or both of our organizations are listed below. These strategies are in various states of development.

Strategy: Work with local jurisdictions responsible for managing and maintaining local public roads.

Objective 2: Elimination of sedimentation problem spots on dirt and gravel roads in the Conservation Area.

Strategy: Implement strategies to improve our understanding of relative contribution of these sources to sediment pollution in stream systems, so we can adjust/confirm threat rankings and invest adequately/appropriately in threat abatement strategies.

Objective 3: Within three years, determine through strategic actions the approximate proportions of sediment pollution contributed by roads, agriculture, forestry activities, and development.

Strategy: Implement strategies to become more involved in local land-use decision-making, supporting programs, plans, and ordinances that coincide with conservation objectives.

Objective 4: Work with local communities to ensure that land-use/zoning ordinances that identify and protect critical sites for riparian habitat and water quality/quantity protection are adopted, and institutions are in place to enforce them in relevant PA townships (Mann, Monroe, Southampton) and MD counties (Allegany, Washington).

Strategy: Implement strategies to directly protect riparian and matrix forestland.

Objective 5a: By 2010, identify and legally protect target acreage of riparian forestland vulnerable to conversion/development.

Objective 5b: By 2010, identify and legally protect target acreage of matrix forestland vulnerable to conversion/development.

Strategy: Provide free forest planning and management services to private forest landowners within our targeted areas.

Objective: Ensure that a target number of acres of private forest lands are under management plans done through our program within three years.

Strategy: Get involved in public land management.

Objective: Within three years, work with state land managers to develop, adopt, and begin to implement management plans that achieve conservation goals to protect identified core forest blocks and buffers.

Step 7: Measures

At an April 2006 workshop, a short list of measures of strategy effectiveness were developed, and ranked using these three criteria:

- return – how much would this information contribute to our work?
- feasibility – can we do it?
- cost – how much does it cost, in terms of time and money?

The selection of 13 measures were identified to be implemented in the next one to three years. They are:

1. % change natural flow – IHA
2. Benthic Index of Biological Integrity (using MD Biological Stream Survey data)
3. % forested buffer (Riparian Zone)
4. % impervious surface in subwatersheds
5. % natural cover within 10 km buffer of forest core, matrix block
6. % forest cover in block in various seral stages
7. % forest cover in block
8. Disturbance of Canby's Mountain Lover sites

9. Presence of Canby's Mountain Lover at previous known sites
10. % of protected land in core forest matrix areas and in each watershed
11. Protection status known *Paxistima*, Allegheny woodrat sites
12. Degree of support from local governments for natural resources protection
13. Road quality scoring system for identifying priority roads – critical sites over 50

Assessment of Target Viability: Allegany Forests Project

Conservation Target Enter # of Target		Category	Key Attribute	Indicator	Poor	Fair	Good	Very Good
1	Mixed Oak Forests	Landscape Context	Landscape pattern & structure (buffering forested landscape)	Percent natural cover within 10k buffer width	0-50%	*50-70%*	70-90%	>90%
1	Mixed Oak Forests	Condition	Landscape successional dynamics	Proportion of forested block in various seral stages	<15% acreage of matrix block in LSOG stage	15-25% acreage of matrix block in LSOG stage	*25-40% acreage of matrix block in LSOG stage*	>40% acreage of matrix block in LSOG stage
1	Mixed Oak Forests	Condition	Population structure & recruitment	Adequate understory regeneration of appropriate LSOG tree species for stands in late-MS and LSOG successional stages (live tree density(BA) - #trees(BA)>=4"dbh/acre)	<80 (6)	80-160 (6-12)	*160-370 (12-17)*	>370 (17+)
1	Mixed Oak Forests	Condition	Successional dynamics (stand level)	Number of cohorts and/or presence of uneven-aged vertical structure within late-MS and LSOG stands	1	2	*3*	4+
1	Mixed Oak Forests	Condition	Woody Debris	BA of standing snags within late-MS and LSOG stands				
1	Mixed Oak Forests	Condition	Woody Debris	Volume of downed woody debris, > 3 inches in diameter within late-MS and LSOG stands				

Assessment of Target Viability: Allegany Forests Project (continued)

Conservation Target Enter # of Target		Category	Key Attribute	Indicator	Poor	Fair	Good	Very Good
1	Mixed Oak Forests	Size	Forest Matrix Area	Acres composing block	< 30,000 acres	30,000-45,000 acres	45,000 - 65,000 acres	*> 65,000 acres*
2	Perennial Streams (incl Riparian Zone)	Landscape Context	Forest cover in the riparian zone	% of riparian zone in "natural" forest riparian cover for watershed	70%		*> 80%*	90-100%
2	Perennial Streams (incl Riparian Zone)	Landscape Context	Hydrological flow regime at USGS stations and other areas at low?	% of change of natural flow (flashiness)	TBD	TBD	TBD	TBD
2	Perennial Streams (incl Riparian Zone)	Landscape Context	Linear connectivity	Percentage of total connected miles in mainstem of stream and lower major tributaries during wet periods		< 80%	*> 80% ?*	> 95%
2	Perennial Streams (incl Riparian Zone)	Landscape Context	Macroinvertebrate assemblage	BIBI (Benthic Index of Biotic Integrity)	1.0 - 1.9	2.0 - 2.9	3.0 - 3.9	4.0 - 5.0
2	Perennial Streams (incl Riparian Zone)	Landscape Context	Sedimentation	Embeddness (%) based on EPA standards				
2	Perennial Streams (incl Riparian Zone)	Landscape Context	Water physical chemistry regime	Nitrate; Total P under spring baseflow conditions			N at <.5 mg/l, P < .05 mg/l	
2	Perennial Streams (incl Riparian Zone)	Condition	Fish assemblage	FIBI (Fish Index of Biotic Integrity)	1.0 - 1.9	2.0 - 2.9	3.0 - 3.9	4.0 - 5.0
2	Perennial Streams (incl Riparian Zone)	Condition	Invasive plants in herb and shrub layer	% of riparian zone impaired by invasive plants; Plant indicators	lots	some	few	none

Assessment of Target Viability: Allegany Forests Project (continued)

Conservation Target Enter # of Target		Category	Key Attribute	Indicator	Poor	Fair	Good	Very Good
2	Perennial Streams (incl Riparian Zone)	Condition	Normal Stream Processes	Woody debris	0 - 5%	5-10%	10-20%	20%+
2	Perennial Streams (incl Riparian Zone)	Condition	Percent forest cover	Percent impervious surface			<5%	
2	Perennial Streams (incl Riparian Zone)	Condition	Size and distribution of tiger beetle population	Number of beetles and distribution (number of patches)			Sideling Hill Creek 2003 level "A Rank" (according to Heritage data)	
2	Perennial Streams (incl Riparian Zone)	Condition	Structure of forest community	Age Class; Seedling recruitment; woody debris				
3	Native Mussel Assemblage	Condition	Presence of host fish	Presence of x, y, z species	fish absent		fish present	co-occur throughout
3	Native Mussel Assemblage	Size	Population size, distribution, and structure	Number of beds with rare species, density in beds of rare species			=baseline	
3	Native Mussel Assemblage	Size	Population size, distribution, and structure	Recruitment rare species			juveniles present	
4	Shale Barrens	Landscape Context	Connectivity among communities & ecosystems	GIS metric of connectivity and fragmentation				

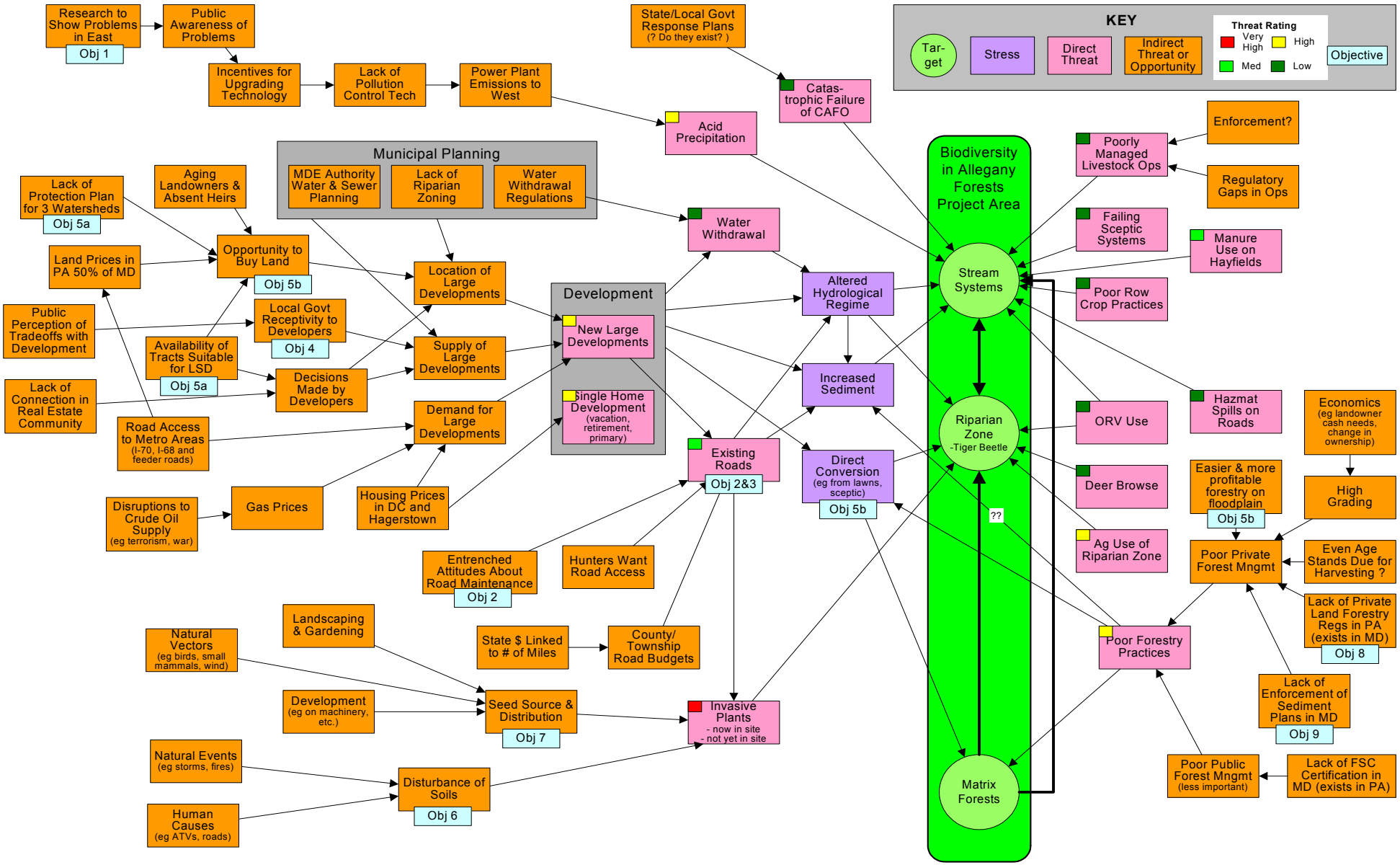
Assessment of Target Viability: Allegany Forests Project (continued)

Conservation Target Enter # of Target		Category	Key Attribute	Indicator	Poor	Fair	Good	Very Good
4	Shale Barrens	Landscape Context	Forest buffer	Depth of the forest buffer	< 50 meters	50 - 100 meters	100 meters	> 100 meters or to the top of the watershed (whichever is greatest)
4	Shale Barrens	Landscape Context	Linkage to the stream	Degree of disturbance	Heavy disturbance	Moderate disturbance	Little disturbance	No disturbance
4	Shale Barrens	Condition	Presence of select invasive species	Percent cover of selected invasive species	increasing	not changing	decreasing	
4	Shale Barrens	Size	Individual patch size of shale barrens/woodlands	GIS metric of connectivity and fragmentation				
4	Shale Barrens	Size	Overall size of the shale barrens and woodlands complex	Area of complex		Loss	No net loss	Increase in area
7	Paxistima canbii (Canby's Mountain Lover)	Size	Population presence, size	Disturbance to site			no new disturbance to site	
7	Paxistima canbii (Canby's Mountain Lover)	Size	Population presence, size	Species present at previously known locations			present, approximately same extent and numbers (order of magnitude estimate) as in previous years	

Assessment of Target Viability: Allegany Forests Project (continued)

Conservation Target Enter # of Target		Category	Key Attribute	Indicator	Poor	Fair	Good	Very Good
8	Neotoma magister (Allegheny woodrat)	Size	Population size & dynamics	Number of individuals				

Full Situation Analysis Model With Objectives



APPENDIX I. PUBLIC COMMENTS

Public Meeting Comments

Expand potential partner listings for management recommendations.

As mentioned in the plan, the potential partners and funding sources are suggestions and should not be limited to those provided.

Categories were developed in order to reduce the space required to identify an exhausted list of every potential group in the region and to allow for new groups that may be developed. Individual groups, such as Ridge and Valley Streamkeepers, Woodland Owners of Southern Alleghenies, Western Pennsylvania Conservancy, and The Nature Conservancy have been categorized as conservation organizations. Other categorizations include private sources (local business or grassroots funding), community groups (scouts, Kiwanis, etc.), and sportsmen's groups.

Be careful about the term Smart Growth, or define term clearly.

There is a section in the Land Resources chapter that talks about smart growth principles, to which the plan is referring when the term Smart Growth is utilized. Smart Growth is also defined in the glossary.

Dirt and gravel roads should be increased to a high priority.

The original prioritizations have been reviewed and the recommendations have been increased.

Add definition of industrial agriculture.

A definition of industrial agriculture is located in the Land Resources chapter. It has also been added to the glossary.

Define PA CleanWays.

PA CleanWays is discussed in the Land Resources chapter.

Discuss differences between Maryland and Pennsylvania conservation districts

This has been added as a section of Appendix L.

Encourage farmland/forestland tax-matching programs to provide incentives to keep land in agriculture/forest and not convert it to residential.

This is similar to the Clean and Green program in Pennsylvania; however, the area is not enrolled in the program because of a required property reassessment. A recommendation has been added.

Compare forestry and agriculture protection programs in Pennsylvania and Maryland.

Descriptions of the programs for each state are identified in the Land Resources chapter; however, a section in Appendix L has been added that directly compares the two states.

Goal 3-8 method number six makes reference to Clearville, but it is not in the watershed.

The recommendation reads, "Establish sewage systems in populated areas like the village of Clearville." Although Clearville is not located in the watershed it is just used as a reference of a populated area in the region.

Local government is identified as a funding source for many of the recommendations in the project area characteristics section. Local governments are strapped for money; other sources need to be identified.

It is the job of the local government to fulfill many of these recommendations, so therefore it should not be an added expense. In other locations, additional funding sources are included or have been added.

How are potential funding sources obtained?

It depends on the funding source. Most agencies and foundations provide funding through competitive grant programs that typically require an application through an open grant period. Some provide funding year-round. Private sources could include local business donations or grassroots community fundraising.

Trash Free Potomac.

The Trash Free Potomac is an initiative of the Alice Ferguson Foundation to eliminate trash along the Potomac River by 2013. It is a comprehensive regional strategy that involves collaboration between all watershed jurisdictions, education campaigns, enforcement and legislation, new technologies, best management practices, and economic impacts. A recommendation has been added to encourage conservation groups and watershed residents to participate in cleaning up Sideling Hill Creek, Fifteenmile Creek, and Town Creek watersheds.

In response to a hog operation being established just outside the watershed in Monroe Township, citizens should monitor the level of water in their wells to track groundwater levels.

A management recommendation has been added to encourage residents to monitor groundwater levels.

Rare, threatened, and endangered species are a resource for tourism and advantages of having them as opposed to individuals removing them for fear of government control.

Many citizens within the watershed feel that the identification of rare, threatened, or endangered species within the area limits their property rights and future economic opportunities. Local residents need to be educated that the rare, threatened, and endangered species are a resource for tourism and that there are advantages to having them. A recommendation has been added to increase educational outreach about the benefits or rare, threatened, or endangered species.

Wildlife management plans for individual landowners.

Local residents in Pennsylvania can contact the Pennsylvania Game Commission biologist to develop a wildlife management plan for their property. A recommendation will be added to encourage residents to develop wildlife management plans for their property.

Potomac Conservancy – Growing Native

A volunteer effort by the Potomac Conservancy collects seeds from native hardwood species. The seeds are then donated to state nurseries that grow the seeds. Each spring, volunteers plant saplings that have grown from previous years' collections along streambanks in their communities. A recommendation has been added to encourage watershed residents to participate in the seed collection and tree plantings.

Provide economic incentives (include recreational opportunities, such as hunting, fishing, golfing, etc.) and economic values. Make table so information is easily obtained.

This could be an additional study to be conducted. A recommendation has been added to conduct an economic impact study of recreational activities within the watershed. General information about the value of recreation will be included in the appendix. However, this data will not be specific to the project area.

People making decisions have no link to the land.

County or municipal officials who make decision about land-use regulations and zoning are elected representatives. Local citizens vote for who they want to represent them and make these important decisions for the area. In order to change, local citizens need to elect individuals who have a link to the land or who will properly represent people who have a link to the land.

Do we know "cottage industries?" Educate residents about these businesses and provide a directory/listing. Establish a cooperation or network of industries that can share the word. Farm Market/Crafter's market.

A recommendation in the plan encourages the support of local businesses. Additional recommendations have been added to educate residents about these local businesses and to develop a directory or listing that can be distributed to local business and residents. Another recommendation has been added encouraging local business owners to establish a cooperation or network of industries to spread the word about each other's businesses within the watershed.

Petition for Fifteenmile Creek for EV status.

A recommendation has been added encouraging interested organizations and individuals to work together in determining if a petition to change Fifteenmile Creek to EV status is feasible.

Written Comments Received

Francis Zumbrun Green Ridge State Forest

Page	***Comments***	***Actions Taken***
ES-6	Fifteenmile Creek flows "*under*" bridge "*built in 1930s by WPA."*	Corrected
1-1	Length of stream miles needed for Sideling Hill Creek (?) and Fifteenmile Creek (19.2 miles).	Added
1-8	"Piclic Run" spelled incorrectly in first paragraph. Add "Pine Lick" as a Fifteenmile Creek tributary.	Corrected and added
2-1	Mention "Vernal Ponds" as a unique feature.	Added
3-20	Water gauges are also located on Terrapin Run and Deep Run with the Fifteenmile Creek watershed.	Added
4-12	Green Ridge State Forest is now 46,000 acres.	Corrected
4-33	Add sentence: *Maryland is losing an average of 8,600 acres a year of agricultural fields, wildlife habitat to development - equivalent to losing green open space the size of Green Ridge State Forest every seven years.*	Added

5-4	Add sentences: *Scenic Route 40 in Allegany County from Belle Grove to Fifteenmile Creek has been recently designated a "last chance scenic place" due to on-going development pressures. "This seven-mile segment of Scenic Route 40 and its surrounding viewshed in eastern Allegany County make up one of the most visually enjoyable and well preserved portions of the Maryland Historic National Road Scenic Byway."*	Added
5-4	Bold the words **"Chesapeake and Ohio Canal"** like the "National Road" bold designation.	Corrected
5-5	Important People: Add Charles Carroll of Carrollton – signer of the Declaration of Independence – Owned most of Green Ridge Forest in early 1800s, his primary business interests being iron ore and timber.	Added
5-5	Historical Structures: The Carroll Chimney off of Carroll Road at Green Ridge State Forest was built in 1836 and served as steam-powered sawmill.	Added
5-10	Add: In 2005, the Green Ridge State Forest Hiking Trail was designated a National Recreation Trail. Two of the three national trails are within the Three Sisters watershed, the also include the C&O Canal National Historical Park. Both trails are part of the Potomac Heritage National Scenic Trail system. In 2006, the Green Ridge State Forest Hiking Trail and the Mid State Trail became part of the Great Eastern Trail, a network of trails that connect and extend from Florida to the Great Lakes.	Added
5-11	Trails: Add to the C&O Canal Towpath the Paw Paw Tunnel, completed in 1850. The brick-lined tunnel, over 3,118 feet in length, was promoted as one of the "wonders of the world" in 1850.	Added, but in a different location
5-12	Green Ridge ORV Trail is the most heavily used ORV/ATV trail on state public lands in Maryland. In 2005, over 2,000 of the 4,000 ATV permits purchased in Maryland were issued at Green Ridge State Forest headquarters.	Added
6-13	Scenic Vistas: These vistas should be called "endangered viewscapes" where the scenery may be degraded if development and growth is not controlled or managed.	Revised, to include information explaining that scenic vistas are in danger and could become degraded if development is not managed properly.
6-14	For the plan to be successful is to develop a 100-year vision of what the Three Sisters Watershed will look like as the plan guides development and economic growth.	Added
7-17	Biological Resources: State forest managers should offer field tours to elected officials to emphasize values of natural resources within the watershed. Natural resource managers should also be actively involved in county land planning meetings, county commissioner meetings, and most importantly, involved in the development of county comprehensive plans.	Added

8-5	Add reference: Maryland Department of Natural Resources (1993): Green Ridge State Forest: Ten Year Resource Management Plan. Vols. 1& 2.	Added
8-6	Add reference: Mash, J. *The Land of the Living* (Commercial Press, Cumberland, MD) 1996.	Added
8-10	Add Reference: Scenic Maryland Inc.: *Maryland's 2006 Last Chance Scenic Places* (PO Box 39095, Baltimore, MD 21212).	Added
	Add to Appendices: Develop a table for **economic values and contributions** for natural resources and nature tourism (i.e., hiking, camping, mountain biking, heritage tourism…)	Developing a table specific for the economic values and contributions for the watershed is so encompassing that it could be its own entire study. A recommendation has been added to conduct an economic impact study of recreational activities for the Three Sisters region.

Ron Stanley for Ridge and Valley Streamkeepers

The Ridge and Valley Streamkeepers Board of Directors has reviewed the draft Three Sisters Watershed Conservation Plan and would like to commend Western Pennsylvania Conservancy for an excellent job of preparing a comprehensive document to guide the future of conservation in this watershed.

Our only comment as an organization is to request that Ridge and Valley Streamkeepers be specifically named as potential partner for several of the action items in the plan. In particular, we would like to be added as potential partners to:

Goal 2-5, methods 3 & 4 related to illegal dump cleanups,
3-2, method 2 on education about non-point and point source pollution,
3-3, method 4 on acceptable pH of streams,
3-5, method 3 on encouraging riparian buffers,
3-6, methods 2 thru 6 on volunteers, training and assessments,
4-1, method 3 on biologically diversity and habitat,
4-4, methods 2 & 4 on encouraging riparian buffers, and
5-1, method 4 on increasing watershed awareness.

The Board considers these items, as well as those for which RVS is already mentioned, to be important to our mission.

Thank you for your efforts on behalf of this watershed.

Ridge and Valley Streamkeepers have been added to the listed recommendations. They also would qualify under the general category of a conservation organization for any remaining recommendations.

APPENDIX J. SURVEY AND INTERVIEW QUESTIONS

Three Sisters Watershed Conservation Plan: A Plan for Sideling Hill Creek, Fifteen Mile Creek, and Town Creek Watersheds

Welcome and thank you for taking the time to complete this very important survey. The Three Sisters Watershed Conservation Plan Steering Committee and Western Pennsylvania Conservancy are conducting this survey.

The purpose of this study is to help us understand what residents of the communities within these watersheds think of current conditions and how they would like to see the watershed resources and characteristics progress in the future. This will give the steering committee a basis for making recommendations for the watershed in the plan. Should you have any questions about the survey, or if you would like to find out more information or become involved in the planning process, please do not hesitate to contact either Jessica Coil or Carla Ruddock of the Western Pennsylvania Conservancy at 724-459-0953.

Thanks again for your time to complete this survey. We truly value your input.

Public Survey

1.) In what county and municipality do you reside?

County _____ Municipality _____

2.) In what watershed do you reside?

☐ Sideling Hill Creek
☐ Fifteen Mile Creek
☐ Other _____
☐ Town Creek
☐ Don't Know

3.) What do you think are the two most common land uses in your area?

☐ Residential
☐ Commercial
☐ Industrial
☐ Other_____
☐ Forested
☐ Agricultural
☐ Recreation

4.) Number the following list in order of importance in regards to your future visions of the watershed. One being the most important.

_____ Attractive Natural Settings
_____ Recreation Opportunities
_____ New Business/Jobs
_____ Residential Development
_____ Other _____
_____ Preserving Historic Sites
_____ Water Quality Improvement
_____ Community Activities
_____ Educational Opportunities

5.) Number the following list of outdoor recreational opportunities in order of your interest. One being the most important.

_____ Boating	_____ Hiking	_____ Fishing
_____ Canoeing/Kayaking	_____ Horseback Riding	_____ Swimming
_____ Hunting	_____ Bird Watching	_____ Picnicking
_____ Visiting Scenic Vistas	_____ Organized Sports	_____ Photography
_____ Visiting Public Parks	_____ ATV Riding	_____ Biking

_____ Other _____

6.) List three things you like about the area in which you live.

1. _____
2. _____
3. _____

7.) List three things you don't like about the area in which you live.

1. _____
2. _____
3. _____

8.) List three suggestions to improve conditions in the watersheds.

1. _____
2. _____
3. _____

9.) Other comments or concerns.

_____
_____
_____
_____
_____
_____
_____

If you would like to be informed of public meetings regarding this project, please complete the information below.

Name _____ E-mail _____
Address _____ Home Phone _____
_____ Work Phone _____

Completed Surveys can be sent to
Three Sisters Watershed Conservation Plan, 1131 Big Creek Road, Clearville, PA 15535

Three Sisters Watershed Conservation Plan: A Plan for Sideling Hill Creek, Fifteen Mile Creek, and Town Creek Watersheds

Thank you for taking the time to complete this very important survey. The survey is being conducted by the Three Sisters Watershed Conservation Plan Steering Committee and Western Pennsylvania Conservancy.

The purpose of this study is to help us understand what residents of the communities within these watersheds think of current conditions and how they would like to see the watershed resources and characteristics progress in the future. This will give the steering committee a basis for making recommendations for the watershed in the plan. Should you have any questions about the survey, or if you would like to find out more information or become involved in the planning process, please do not hesitate to contact Carla Ruddock of Western Pennsylvania Conservancy at 724-459-0953 ext. 107.

Thank you again for taking the time to complete this survey. We truly value your input.

Municipal Survey

1.) In what county and municipality do you reside?

County _____ Municipality _____(PA Only)

2.) In what watershed(s) is your county/municipality located?

□ Sideling Hill Creek
□ Fifteen Mile Creek
□ Other _____
□ Town Creek
□ Don't Know

3.) What do you think are the two most common land uses in your area?

□ Residential
□ Commercial/Industrial
□ Water/Wetlands
□ Forested
□ Agricultural
□ Other_____

4.) Number the following list in order of importance with regards to your county/municipality's future visions of the watershed. One being the most important.

_____ Attractive Natural Settings
_____ Recreation Opportunities
_____ New Business/Jobs
_____ Residential Development
_____ Other _____
_____ Preserving Historic Sites
_____ Water Quality Improvement
_____ Community Activities
_____ Educational Opportunities

5.) Number the following list of outdoor recreational opportunities in order of interest in your county/municipality. One being the most important.

_____ Boating
_____ Canoeing/Kayaking
_____ Hunting
_____ Visiting Scenic Vistas
_____ Visiting Public Parks
_____ Other _____
_____ Hiking
_____ Horseback Riding
_____ Bird Watching
_____ Organized Sports
_____ ATV Riding
_____ Fishing
_____ Swimming
_____ Picnicking
_____ Photography
_____ Biking

6.) Does your county/municipality have a comprehensive plan? YES or NO
If yes, what is the name of the plan(s) and when was it adopted?

_____
_____

7.) Does your county/municipality currently utilize zoning and subdivision ordinances? YES or NO
If yes, what types of ordinances do you have?

_____
_____
_____

8.) What are the three most critical needs or challenges in your county or municipality that affect the Three Sisters watershed?

1. _____
   _____
2. _____
   _____
3. _____
   _____

9.) a. Does your municipality/county have any public water services in the Three Sisters watershed area? YES or NO
If yes, please list the name and capacity of each facility.

_____
_____
_____

b. Do you foresee the need to upgrade or establish a public water supply in your county/municipality in the Three Sisters watershed area within the next ten years? YES or NO

10.) Does your county/municipality have any public sewage systems in the Three Sisters watershed area? YES or NO If yes, please list the name and capacity of each facility.

_____
_____
_____

11.) What projects would you like to see implemented in the area that you represent that could be included in the Three Sisters Watershed Conservation Plan? Please list short-term and long-term projects and goals.

a.) Land Use/Land Resources (farmland preservation, development, planning, etc.)

_____
_____
_____
_____
_____

b.) Water Resources (quality, quantity, etc.)

_____
_____
_____
_____
_____

c.) Biological Resources (plant, animal, terrestrial, aquatic, areas of concern, etc.)

_____
_____
_____
_____
_____

d.) Cultural Resources (historical, recreational, environmental education, etc.)

_____
_____
_____
_____
_____

e.) Other (roads/other transportation, economy/jobs, population & demographic trends)

_____
_____
_____
_____
_____

If you would like to be more involved in the planning process, please complete the information below.

Name _____ E-mail _____
Address _____ Home Phone _____
_____ Work Phone _____

Completed surveys can be sent to: Three Sisters Watershed Conservation Plan, 246 South Walnut Street, Blairsville, PA 15717, Attention: Carla Ruddock

Three Sisters Watershed Conservation Plan Name: _____
Key Individual Interview

1. How has the watershed changed in the past 10 years? (Were these changes good, bad, indifferent?)

2. How do the following currently meet the needs of the watershed community? (Are there too many, not enough, or correct amount? What condition are they in? Recommended solutions?)

    a. Transportation

    b. Infrastructure

    c. Employment Opportunities

d. Educational Opportunities

e. Land Use Controls/Zoning Ordinances

3. Do the recreational opportunities currently meet the needs of the watershed community? (Are there too many, not enough, or correct amount? What condition are they in? Are they easy to access? Recommended solutions?)

a. Parks/Picnic Sites

b. Hiking/Biking Trails

c. Off Road Vehicle Riding

d. Scenic Vistas/Photography

e. Wildlife/Bird Watching

f. Hunting/Fishing

g. Boating/Swimming

h. Historical Sites/Structures

i. Other

4. What are some of the impacts currently affecting the land, water, and biological resources?

   a. Land Resources (Examples: agricultural lands, logging, development)

   b. Water Resources (Examples: sedimentation, acid rain, runoff)

   c. Biological Resources (Examples: invasive species, habitat destruction)

d. Other (Examples: air quality, historical preservation, recreation, economy)

_____
_____
_____
_____
_____

5. Do you have any specific projects or type of projects that you would like to see identified in the plan?

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

6. What must the watershed conservation plan say to be successful?

_____
_____
_____

7. What must the watershed conservation plan not say to be successful?

_____
_____
_____

8. Do you know of any other people we should interview?
   Name _____ Phone _____
   Address _____

9. Do you have any other questions or comments before we conclude this interview?

_____
_____
_____
_____
_____
_____

APPENDIX K. FUNDING SOURCES

Sponsoring Organization	Description / Restrictions
BMP	
State Conservation Commission - Dirt and Gravel Roads Maintenance	Available to local municipalities and state agencies for projects dealing with the BMPs for erosion and sedimentation control problems and fugitive dust in watersheds; dirt and gravel road jurisdiction required.
Community	
Pittsburgh Foundation	Economic, community development, and the environment. Activities that increase employment, build strong neighborhoods, and promote civic engagement by all segments of the population. Funds for quality of life.
Energy	
DEP - Alternative Fuels	The Alternative Fuels Incentive Grants program continues to fund a considerable number of projects that use alternative fueled energy sources to reduce air pollution and our dependence on foreign oil. Alternative fuels include compressed natural gas.
Environmental	
Beldon II Fund	Support environmental organizations working at the state-level. Some grants are made to regional and national organizations for efforts that support the work of state-level groups.
Ben & Jerry's Foundation	Grant applications need to demonstrate that the project will lead to environmental change, address the root causes of environmental problems, and must help ameliorate an unjust or destructive situation by empowering constituents and facilitating leadership.
Eddie Bauer	Fund projects in certain local areas that support environmental goals such as clean rivers and streams or beautifying parks and school grounds. Must be 501(c) 3 and proposal should be kept between 2-3 pages.
Howard Heinz Endowment	This program promotes environmental quality and sustainable development by supporting efforts to eliminate waste, harness the power of the market, and create a restorative economy. Should promote sustainable urban design. Concentrated in western Pennsylvania.

Sponsoring Organization	Description / Restrictions

Environmental (continued)

Raymond Proffitt Foundation	The foundation's purpose is to protect and restore the quality of the natural and human environment by informing and educating the general public about the impact of human endeavors upon the natural environment. The RPF strives to advance this understanding.
Surdna Foundation	The foundation's goal is to prevent damage to the environment and to promote more efficient, economically sound, environmentally beneficial, and equitable use of land and natural resources. Does not fund environmental education, sustainable agriculture, food production, or toxic and hazardous waste.
Vira I. Heinz Endowment	This program promotes environmental quality and sustainable development by supporting efforts to eliminate waste, harness the power of the market, and create a restorative economy. The program's goal is to promote sustainable urban design. Western Pennsylvania watersheds only.

Environmental / Watershed

EPA - Clean Water State Revolving Fund	May also contact: Beverly Reinhold (717) 783-6589. Infrastructure Investment Authority, Keystone Building 22 South Third Street, Harrisburg, PA 17101. email: breinhold@state.pa.us or Peter Slack, (717) 772-4054; DEP 400 Market Street, Harrisburg, PA 17105
WREN - Conference/Training Scholarships	The activities funded must be educational and relate to drinking water source protection or watershed education. Applicant is required to provide a five percent match.
River Network Watershed Assistance Grants	Watershed projects and group startups.
Western Pennsylvania Watershed Program, Howard Heinz Endowments	Provides funding to grassroots organizations and watershed associations for specific watershed remediation in western Pennsylvania. Select western Pennsylvania watersheds only.

Environmental Education

Captain Planet	Supports hands-on environmental projects for children and youth to encourage innovative programs that empower children and youth around the world to work individually and collectively to solve environmental problems. Only for environmental education of children. Online only.
DEP Environmental Education Grants	Open to schools, conservation districts, and non-profits. Open in summer, awarded in spring. Final application due dates vary. Application available online. Requires twenty percent match and reimbursement program.

Environmental Education (continued)

Sponsoring Organization	Description / Restrictions
Education Mini Projects Program	Small grants for Pennsylvania-based grassroots educational projects that address non-point source watershed concepts.
Emerson Charitable Trust	Strong emphasis on cultural aspects and youth education, also science and education.
EPA Environmental Education Grants Region III	Grants awarded to small non-profit groups for various projects in Region III.
National Environmental Education and Training Foundation	To increase environmental awareness, environmental education, partnerships, etc. May also be reached at (202) 261-6464. Proposal deadlines: Jan. 1, March 1, July 15, and Sept. 1
PACD - Mini Projects	The objectives of the Educational Mini-Project must promote the We All Live Downstream message by: stimulating an awareness of and interest in Pennsylvania's non-point source water pollution problems and solutions; salaries are not an approved expenditure.
Project Wild	Project Wild is an interdisciplinary supplementary environmental and conservation program for educators of children in grades K-12. Small grants only.
The Dunn Foundation	Promote the issues of the negative effect that sprawl, visual pollution, and poorly planned development have on the visual environment of communities and the resulting loss of quality of life. Encourage dialogue within and between communities. Do not fund property acquisition, capital improvement projects, capital campaigns, endowments, individuals, religious groups, or political organizations.
The Pathways to Nature Conservation Fund - National Fish and Wildlife Foundation	A partnership between the more than 270 Wild Birds Unlimited, Inc. franchises and the National Fish and Wildlife Foundation. The Pathways to Nature Conservation Fund offers grants to enhance environmental education activities and bird and wildlife viewing opportunities at significant sites.
Water Resources Education Network - LWV	Funding to develop education programs for water issues facing communities. Local contact is shrerenehess@yourinter.net, Indiana PA, 724-465-2595. Must be 501(c)3.
WREN - Opportunity Grants	The activities funded must be educational and relate to drinking water source protection or watershed education.

Sponsoring Organization	Description / Restrictions
Environmental Justice	
EPA - Environmental Justice Small Grant Program	The program provides financial assistance to eligible affected local community-based organizations working on or planning to work on projects to address local environmental and/or public health concerns.
Nathan Cummings Foundation	The foundation's purpose is to facilitate environmental justice and environmentally sustainable communities by supporting the accountability of corporations, governments, and other institutions for their environmental practices. Does not fund individuals, scholarships, or capital or endowment campaigns.
Norman Foundation	Support efforts that strengthen the ability of communities to determine their own economic, environmental, and social well-being, and that help people control those forces that affect their lives. Only fund in U.S. They do not fund individuals, universities, conferences, scholarships, research, films, media, arts projects, capital campaigns, fundraising drives, or direct social service programs .
Environmental Planning	
Coldwater Heritage Partnership	Grants for prioritizing watersheds in need of protection, for assessment of coldwater ecosystems, and for the development of watershed conservation plans.
DEP Non-Point Source Control	Grants for planning and non-point source pollution control projects.
DCNR - Community Conservation Partnership Program	Available to organizations that conserve and enhance river resources. Planning grants are available to identify significant natural and cultural resources, threats, concerns, and special opportunities, and the development of river conservation plans. Grants require 50 percent match.
NRCS Watershed Surveys and Planning	Providing assistance for planning in water and coordinated water and related land resource programs in watersheds and river basins. Types of surveys and plans funded include watershed plans, river basin surveys and studies, flood hazard analyses, and floodplain studies.
Flood Protection	
DEP Flood Protection Grant Program	Open to communities that need to perform non-routine maintenance or improvements to already existing flood protection projects. Also applies to the purchase of specialized equipment. Open to communities that have flood protection projects that are deemed operable.

General

Sponsoring Organization	Description / Restrictions
Archer-Daniels-Midland Foundation	Proposals can be sent in letter form containing: 1) Description of the organization applying. 2) Description of the project/What funding would be used for. 3) A budget including how much is going to administrative costs. Emphasis is given to corporate operating locations.
Audrey Hillman Fisher Foundation, Inc.	Must refer to Application Procedures for more information. Preference given to southwestern Pennsylvania and central New Hampshire.
Eureka Company	No specific interest, but general focus is on social services, health, and the environment (wildlife, fisheries, habitat, and sustainable community development).
Henry Hillman Foundation	Preference is given to organizations in the Pittsburgh/southwestern Pennsylvania area.
Patagonia, Inc. Environmental Grants Program	Supports small grassroots organizations. Does not fund land acquisition.
The Boeing Company	Provides contributions for capital campaigns, seed money (one-time grants) for new programs or projects that address community needs and priorities, and one-time grants to buy equipment, improve facilities, or enable special projects.
The Education Foundation for America	EFA’s priorities include supporting the monitoring of the utility restructuring process as it impacts the environment, combating the growth of the "wise-use" movement, opposing large-scale live-stock confinement, and cutting federal "pollution." Letter limited to two pages.
The Prospect Hill Foundation	The foundation's environmental grant making concentrates on habitat and water protection in the northeastern region of the United States. Must have 501(c)3. The organization does not fund individuals, basic research, sectarian religious activities, or organizations that lack tax exemption under U.S. law.

GIS

DEP - GIS Software Grant	The grants consist of the latest commercial release of ArcView GIS software; several texts about utilizing GIS for environmental applications and land-use planning; CD-ROM containing spatial data about the commonwealth. Only issue 10 per quarter.

Sponsoring Organization	Description / Restrictions
Habitat	
General Challenge Grant Program -National Fish and Wildlife Foundation	Requires non-federal match of 2:1. Address actions promoting fish and wildlife conservation and habitat; should involve conservation and community interest; leverage available funding and evaluate project outcomes.
Keep the Wild Alive (KWA) Species Recovery Fund	Fund on-the-ground projects that directly improve conditions for the endangered species highlighted in the KWA campaign. Current National Wildlife Federation employees are ineligible and applications must be submitted in English.
Small Grants Program - National Fish and Wildlife Foundation	Address priority actions promoting fish and wildlife conservation and the habitats on which they depend; work proactively to involve other conservation and community interests; leverage available funding, and evaluate project outcomes. A 2:1 match of non-federal funds is required.
Internship	
Office of Surface Mining Intern Program	Candidates must organize their work, work well with community groups and on their own, quickly internalize the requirements of acid mine drainage remediation and the national Clean Streams program, write well, and enjoy public presentations. Academic credit. Can be undergraduate or graduate student. Positions available in AL, IL, IN, IA, KY, MD, MS, OH, OK, PA, TN, VA, WV. Must provide housing for interns.
Land Protection	
DCNR - Land Trust Grants	Provide funding for acquisition and planning of open space and natural areas which face imminent loss. Lands must be open to public use and priority is given to habitat for threatened species. Eligible applicants are non-profit land trusts and 501(c)3. Requires 50 percent match.
Lowes Charitable Foundation	Environmental initiatives that support the continued enhancement of the natural landscape, natural environment enhancers, and/or park improvement projects. Must apply online. Must be a 501(c)3.
Michael D. Ferguson Charitable Foundation	General environment, wildlife, fisheries, habitat, sustainable community, and development.
Nationals Parks Service - Land & Water Conservation Fund	Provide federal grants for land acquisition and conservation to federal and state agencies.

Sponsoring Organization	Description / Restrictions
Land Protection (continued)	
The Wilderness Society	To preserve wilderness and wildlife, protect America's prime forest, parks, rivers, and shore lands, and foster an American land ethic. Alternate address: Montana Regional Office, 105 West Main St., Suite E, Bozeman, MT 59715-4689.
Town Creek Foundation	Environmental issues of interest to the foundation include: 1) Preserving the ecological richness of our natural heritage, with a major focus on our federal public lands. 2) Promoting policies and practices to protect the land, estuaries, and coastal bays.
Loan	
Environmental Loan Fund	The loan can be used for membership development, creating and implementing a workplace giving program, cause-related marketing, donor development, special events, direct mail campaigns, mission-related business enterprises, or capital campaign work.
Pennsylvania Infrastructure Investment Authority Drinking Water Loans	Must show water quality impact, must have qualified loan candidate. Loans to stormwater projects and non-point source projects. Interest is 1-2.8 percent over 20 years.
Multiple	
Acorn Foundation	Interested in small and innovative community-based projects which preserve and restore habitats supporting biological diversity and wildlife, and advocate for environmental justice. Does not fund the following: direct services, capital expenditure, construction or renovation programs, programs undertaken by tax-supported institutions or government initiatives, emergency funding, scholarship funds, or other individual aid.
Allegheny Foundation	The Allegheny Foundation concentrates its giving in the western Pennsylvania area and confines its grant awards to programs for historic preservation, civic development, and education. No event sponsoring. Does not fund individuals.
Anne & George Clapp Charitable & Educational Trust	Fields of interest include education, social services, youth and child welfare, and aging. Limited support for cultural programs, historic preservation, and conservation. Southwestern Pennsylvania only; grants are not made to individuals. No grants are made for medical research, research projects, filmmaking, conferences, or field trips.
Charlotte and Donald Teast Foundation	Sustainable communities, arts, humanities, civic and public affairs, education, the environment, health, and social services.

Multiple (continued)

Sponsoring Organization	Description / Restrictions
DCNR Community Conservation Partnership Program	Conserve and enhance river resources by offering planning grants, technical assistance, implementation grants, development grants, and acquisition grants.
Ford Foundation	Interested in general/operating support, continuing support, endowment funds, program development, conferences/seminars, professorships, publication, seed money, fellowships, internships, research, technical assistance, consulting services, and program-related investments.
Max and Victoria Dreyfus Foundation	Consider support for museums, schools, educational and skill training projects, programs for youth, seniors, and the handicapped. Must be located in the U.S. Does not issue grants to individuals.
National Fish and Wildlife Fund - Five Star Restoration Challenge	Projects must involve diverse partnerships of, ideally, five organizations that contribute funding, land, technical assistance, workforce support, and/or other in-kind services. Projects involving only research, monitoring, or planning are not eligible. No mitigation work.
National Parks Foundation	Education, training, preservation, and conservation. The grants that are available change often. See the website for current funding opportunities. Projects must connect with national parks, be located on or next to national park or river, and work in cooperation with the national park. Alternate Phone: 202-785-3539.
Native Plant Conservation Initiative - National Fish and Wildlife Foundation	Through this initiative, grants of federal dollars will be provided to non-profit organizations and agencies at all levels of government to promote the conservation of native plants. There is a strong preference for on-the-ground projects that involve local communities and citizen volunteers in the restoration of native plant communities. Projects that include a pollinator conservation component are also encouraged.
Public Welfare Foundation	The Public Welfare Foundation supports organizations that address human needs in disadvantaged communities, with strong emphasis on organizations that include service, advocacy, and empowerment in their approach; service that remedies specific problems; advocacy that addresses those problems in a systemic way through changes in public policy; and strategies to empower people in need to play leading roles in achieving those policy changes and in remedying specific problems.

Sponsoring Organization	Description / Restrictions
Multiple (continued)	
Robertshaw Charitable Foundation	Money to assist those organizations who work to enhance the educational, health and welfare, cultural, youth development, social welfare, and community development needs of the area. Only one grant per year will be awarded to any organization. Preference to southwestern Pennsylvania organizations.
Scaife Family Foundation	Grants awarded will support programs that strengthen families, address the health and welfare of women and children, or promote animal welfare. No event sponsorships, endowments, capital campaigns, renovations, or government agencies. No grants to individuals.
The French Foundation	Environment, and natural resources.
The Lawrence Foundation	The mission of the Lawrence Foundation is to make a difference in the world by providing contributions and grants to organizations that are working to solve pressing educational, environmental, health, and other issues.
The Max and Anna Levinson Foundation	Interested in the environment, including preservation of ecosystems and biological diversity, but also environmental justice, alternative energy, alternative agriculture, and toxics. Must have 501(c)3 status. Rarely fund organizations with budgets in excess of $500,000.
Turner Foundation	Supports activities to preserve the environment, conserve natural resources, protect wildlife, and develop and implement sound population policies. Interested in protecting rivers, lakes, wetlands, aquifers, oceans. Does not provide funding for buildings, land acquisition, endowments, start-up funds, films, books, magazines, or other specific media projects. Alternate Phone: 404-681-0172.
Natural Resources	
Beneficia Foundation	Only applications for projects focusing on conservation of the environment or the arts will be considered. Beneficia has no geographic preferences, but favors requests for project support over general support and does not look favorably upon requests for general overhead or construction of facilities.
Canaan Valley Institute	Promotes the development and growth of local associations committed to improving or maintaining the natural resources of their watersheds in the Mid-Atlantic portions of Pennsylvania.

Charles A. and Anne Morrow Lindburgh Foundation	Grants awarded for the conservation of natural resources and water resource management. Grants are awarded to individuals for research and educational programs, not to organizations for institutional programs.

Natural Resources (continued)

Sponsoring Organization	Description / Restrictions
Dana Corporation	Will consider funding air quality, environment, general, and water resources projects. Emphasis is given to areas where the corporation operates.
DCNR - Community Conservation Partnership Program	Awarded for local recreation, park, and conservation projects, including rehabilitation and development of parks and recreation facilities, acquisition of land for park and conservation purposes, and technical assistance for feasibility studies, and trail studies. Requires 50 percent match, except for some technical assistance and projects eligible as small community projects.
Home Depot	Assistance is provided to non-profit organizations that direct effort toward protecting our natural systems. The grant program focuses on forestry and ecology, clean up, and recycling, green building design, and lead poisoning prevention.
W. Alton Jones Foundation, Inc.	The goals of the foundation are to build a sustainable world by developing new ways for humanity to interact responsibly with the planet's ecological systems, and build a secure world by eliminating the possibility of nuclear war by providing alternative methods of resolving conflicts and promoting security.
Leo Model Foundation	Grants for habitat conservation, watershed conservation, and species preservation in the U.S.
National Fish and Wildlife Fund Challenge Grants for Conservation	The foundation, in partnership with the NRCS and NACD (National Association of Conservation Districts) provides challenge grants. Primary goal of the program is to support model projects which positively engage private landowners.
Rivers, Trails and Conservation Assistance Program	Grants to work with National Park Service to conserve land and river resources, and provides funding for various projects dealing with the conservation of these resources, including the development of trails and greenways.
The River Restoration - NOAA	Submittal by email whenever possible. Encourage contact to discuss project prior to submitting application. Formal non-federal matches not required, but encouraged. Dam removal and fish passage. Available in northeast, Mid-Atlantic, and California.
The Watershed Protection and Flood Prevention Act	Plan development for natural resource concerns within a watershed area; cost sharing available to carry out plan.

Natural Resources (continued)

Sponsoring Organization	Description / Restrictions
The William C. Kenney Watershed Protection Foundation	Protecting the remaining wild rivers of the west and ensuring the effectiveness of small environmental organizations.

Other

Charles Stewart Mott Foundation	The environmental program is devoted to reform of international lending and trade policies. Projects must be part of a national demonstration when out of the Flint, Michigan area.
North American Fund for Environmental Cooperation	Funds community based projects in Canada, Mexico, and the U.S. to enhance regional cooperation, prevent environmental and trade disputes, and to promote the effective enforcement of environmental law.
PA DEP Brownfields Inventory	Grantees will be paid $1,000 for each site registered into the PA site finder. Municipalities and economic development agencies may apply for the grant by submitting an application.
Retired and Senior Volunteer Program (RSVP)	Provides a variety of opportunities for people aged 55+ to volunteer in the management of trails, rivers, and open space. Grants can be used for staff salaries, fringe benefits, travel, equipment, and transportation.

Plantings

National 4-H Council	Grants are used to stimulate community tree planting and/or reforestation projects. Awarded to communities in support of on-going community planting/reforestation project or to stimulate new and creative youth-led projects. Organization must secure matching funds or in-kind contributions from other sources equal to the amount requested.
National Gardening Association	One hundred grants to be awarded to start-up programs involving children, and 300 will be awarded to established programs. Covers tools, seeds, plant materials, products, and educational resources. Grant restricted to programs involving children. There is a $10.00 administrative fee.
Plant Material Centers	American Indian Liaison Resource Conservation and Community Assistance Division of USDA/NRCS. PMC select and grow plants that grow naturally and provide them to those people who wish to grow native plants.

Remediation/Restoration

Sponsoring Organization	Description / Restrictions
Abandoned Mine Land Reclamation Program - Office of Surface Mining	Applications accepted anytime Provides for the restoration of eligible lands and waters that have been mined, abandoned, or left inadequately restored. Two different grants are available. Protects land and corrects environmental damage caused by coal mining.
AMD Watershed Assessment - Bureau of Mining and Reclamation	Must be a municipality, municipal authority, or incorporated non-profit. AMD projects only.
American Canoe Association CFS Grants	For grassroots organizations to improve waterways. Cleanups, riparian corridor, and water quality monitoring projects. Very flexible as long as it is improving waterways and fish habitat. Cannot be used to pay staff. However, it can be used to pay a contractor. Must use volunteer help.
PA DEP - BAMR Abandoned Mine Reclamation Grants	Funds must be used for project development, design, construction, and directly related expenses. Site chosen must be located in a watershed or area with an approved rehabilitation plan. No administrative cost. Must be a municipality, municipal authority, or incorporated 501(c)3.
Bring Back the Natives - National Fish and Wildlife Foundation	Supports on-the-ground habitat restoration projects that benefit native aquatic species in their historic range.
Community Foundation	Projects related to abandoned mine drainage remediation, alkaline discharges, streambank preservation, removal of spoil piles, and other issues related to water quality are of interest to the foundation's board of advisors.
EPA - Non-Point Source Implementation Grants	Funds are provided to the state to carry out non-point source projects and programs pursuant to Section 319 of the Clean Water Act as amended by the Water Quality Act of 1987. Grants are awarded to a single agency in each state, designated by the governor. Forty percent non-federally funded match required. Only one administered to each state.
NOAA Fish Habitat Restoration Program	Financial assistance for community-based habitat restoration projects, to restore fish habitats.
Office of Surface Mining Clean Stream Initiative	This grant is used to treat AMD. Design and administration is covered but the bulk of funding must go into construction. Must have funding partners. Applications available upon request. Review period takes 2.5-3 months, depending on eligibility. Must be a cooperative agreement.
PA DEP - Stream Improvement Project Reimbursements	Provides assistance in an instance where a stream is posing a threat to structures, such as homes or businesses. Must pose threat to structure. Must be applied for by a conservation group or municipality.

Sponsoring Organization	Description / Restrictions
Remediation/Restoration (continued)	
PA Fish and Boat Commission	Habitat improvement and technical assistance.
Partnership with the U.S. Army Corps of Engineers	To foster cooperation on projects of mutual interest, such as fish and wildlife habitat restoration, non-structural flood control opportunities, wetland restoration, and endangered species protection.
Pinellas County Environmental Foundation - National Fish and Wildlife Foundation	A partnership between Pinellas County and the National Fish and Wildlife Foundation. These two groups share the common goals of actively pursuing the protection, restoration and enhancement of fish and wildlife habitat, and developing creative and sustainable solutions to natural resource issues.
Research	
Conservation & Research Foundation at Connecticut College	The conservation and enlightened use of the earth's resources to encourage research to deepen the understanding of the intricate relationship between people and the environment. Will support higher education, individuals, museums, non-profits, and research. Unsolicited proposals are not accepted; however, letters of inquiry including a budget may be sent.
USDA - Nutrient Science for Improved Watershed Management	Funds for integrated research in extension management of nutrients on a watershed level. Nutrients of interest are nitrogen and phosphorous. Please note that a research foundation maintained by a college or university is not eligible. These grants are for research.
Stormwater Management	
DEP Stormwater Management Program	Watershed planning for stormwater control and implementation of programs at local levels.
Streambank Fencing	
Ducks Unlimited - PA Stewardship Program	Provides strong incentives to landowners to create wooded stream buffers, create wider than minimum buffers, and fence cattle out of the stream. Grant is available for fencing and tree planting.
Fish America Foundation	Grants awarded for streambank stabilization materials, instream habitat improvements, contracted heavy equipment, and stream morphology work. Match not required, but is highly recommended.

Sponsoring Organization	Description / Restrictions
Streambank Fencing	
Partners for Fish and Wildlife Program	The Partners for Fish and Wildlife Program provides technical and financial assistance to private landowners for habitat restoration on their lands. A variety of habitats can be restored to benefit federal trust species (for example, migratory birds and fish and threatened and endangered species). Normally the cost share is 50 percent (the service and the landowner each pay half of the project costs), but the percentage is flexible. Services or labor can qualify for cost-sharing.
U.S. Fish and Wildlife Service	Assists landowners in installation of high-tensile electric fence to exclude livestock from streams and wetlands. No buffer requirements.
USDA Conservation Reserve Program	Statewide cost-share program for creating stream buffers. A 40 percent practice incentive as well as a $10/acre incentive. Buffers of 35-180 feet per side of the stream. Land must have been pasture.
USDA - Environmental Quality Incentives Program	A statewide program based on environmental problems. It addresses all environmental problems on a farm. They fund BMPs.
USDA Project Grass	A cooperative effort of local farmers, conservation districts, with assistance from USDA, to improve agriculture productivity in southwestern Pennsylvania. For local contacts see information brochure on file. Contact: james.harrold@pasomerset.fsc.usda.gov
Technical Assistance	
Watershed Assistance Grants	Funding supports organizational development and capacity building for watershed partnerships with diverse membership. Match requested but not required. Non-profits, tribes, and local government only.
Trails	
DCNR - PA Recreational Trails Program	Will consider proposals for maintenance and restoration of existing recreational trails; development and rehabilitation of trailside and trailhead facilities and trail linkages; purchase and lease of recreational trail construction and maintenance equipment. Must have 20 percent match. Eligible applicants include federal and state agencies, local governments, and private organizations.

Sponsoring Organization	Description / Restrictions
Trails (continued)	
DCNR - Rails to Trails	Provide 50 percent funding for the planning, acquisition, or development of rail-trail corridors. Applicants include municipalities and non-profit organizations established to preserve and protect available abandoned railroad corridors for use as trails. Grants require 50 percent match.
Volunteers	
3M Foundation	3M sponsors a volunteer program called Community Action Retired Employee Service (CARES). Company favors projects that impact 3M communities. Alternate Phone: 612-737-3061
Wetlands	
U.S. Fish and Wildlife Service	For wetland conservation projects. Must have 50 percent non-federal match in small-grant program with North American Wetlands Conservation Council.
Wetlands Reserve Program - USDA Natural Resources Conservation Service	Restore and protect wetlands on private property; provide landowners with financial incentives to enhance wetlands in exchange for retiring marginal agricultural land.

Appendix L. Conservation Programs Comparison

Agricultural Land Preservation Programs

Criteria	Maryland Agricultural Preservation Districts	Pennsylvania Agricultural Security Areas
Land Area	A minimum of 50 contiguous acres. Multiple owners can join together to obtain the 50 acres.	A minimum of 250 collective acres. Acreage need not be continuous, but each parcel must be at least 10 acres.
Type of Land	Land must be utilized or can be utilized for food or fiber production.	Viable agricultural land including pasture, hayland, woodland, and cropland.
Enrollment Period	Land must be maintained for a minimum of five years, but can stay enrolled indefinitely without renewing agreement.	Lands are reviewed every seven years, at which time landowners decide if they want to continue enrollment.
Benefits of Enrollment	Protecting agrcultural lands from development and an official acknowledgement that farming is the preferred use of the land.	Limited government ability to condemn land for roads, parks, or infrastructure projects.
	An additional benefit is the retention of eligibility to have up to three one-acre lots for landowners and their children, or a single unrestricted lot, that can be released from the district agreement.	Municipal agreement not to create "nuisance lawsm" including odor and noise ordinancesm that would limit agricultural practices.
Conservation Easement Purchase	In order to purchase an agricultural conservation easement through the agricultural program in Maryland, property must be enrolled in agricultural preservation area and have a completed soil conservation plan. If 50 percent or more is wooded, then a Forest Management Plan must also be completed.	Landowners are eligibile to sell the development rights of their farm as a conservation easement to the commonwealth of Pennsylvania.

Forest Stewardship Programs

Criteria	Maryland	Pennsylvania
Provider	Maryland Department of Natural Resources	Pennsylvania Department of Conservation and Natural Resources
Benefits	Management advise, develop forestry management plan, and receive financial assistance to implement plan.	Management advise and develop forestry management plan.

Conservation Districts

Criteria	Maryland	Pennsylvania
Description	District promotes methods to conserve soil and reduce runoff from agricultural operations. They discuss local, state, and national conservation issues and programs.	Districts serve a range of agricultural and urban interests and participate in a wide variety of resource programs. They study county natural resource issues and make decisions which enhance and protect their communities.
Programs	Environmental Education Soil Conservation and Water Quality Plans Erosion and Sedimentation Control Farmer Outreach Best Management Practices	Environmental Education Forest Management Stormwater Management Floodplain Management Dirt and Gravel Roads Nutrient Management Chesapeake Bay Abandoned Mine Reclamation Biosolids Permitting Stream Encroachments/Wetlands Agricultural Preservation Wildlife Management Erosion and Sedimentation Control