I. INTRODUCTION

The communities in the lower West Branch Susquehanna River valley are linked to each other, the past and the future by their river. The lands along the West Branch were vital hunting grounds and agricultural lands for Native Americans. During Pennsylvania's great lumbering era, the most significant log drive was conveyed on the West Branch of the Susquehanna River. The Susquehanna's West Branch Canal Division further shaped the corridor, linking towns and villages and providing vital opportunities for commerce. Finally, railroads in the corridor fused the links between communities and commerce within the corridor. Today this same corridor supports a new generation of forest growth, improved water quality, abundant wildlife, community parks, cultural and historical points of interest, unique habitats, and scenic viewsheds.

For these reasons, The Northcentral Pennsylvania Conservancy (NPC), a non-profit regional land conservation organization based in Williamsport, embarked upon developing this River Conservation Plan. The study corridor extends through a four county area from the confluence of the West Branch Susquehanna River and the Susquehanna River's main stem at Northumberland Borough, Northumberland County, upstream through Northumberland, Union, Lycoming and Clinton Counties to Lick Run near Farrandsville, Clinton County (Figure I-1). The width of the study corridor includes the river, and the land areas located within 1-mile of either bank of the river.

A. Corridor Vision

The vision of this plan is to enhance the lower West Branch of the Susquehanna River by improving water quality and plant and wildlife habitat and increasing wetlands and riparian buffers. The river valley communities' quality of life will be measured through their awareness of and respect for their river heritage, protection of viewsheds and reduction of flood hazards, each community linked to each other by a continuous greenway. This will be accomplished by educating the residents in the river corridor; advocating for the river; and, fostering quality economic development that supports livable communities.

INSERT FIGURE I-1 (Study Corridor Location Map)

Healthy River

A healthy river ecosystem is defined by a number of factors. You can look at the water quality, water quantity, health of the fishery, or quantity and diversity of aquatic insect life. The vision for the lower West Branch Susquehanna River includes all of these factors and others. The vision calls for continued improvement in the river's water quality that will be seen over time due to the continued monitoring of the water. In-stream flow needs will be studied and recommendations made on how to address periods of drought and low flow. There will be an evaluation of the return of shad and other native wildlife to the corridor. The aquatic insect life in the corridor should be more diverse and will be a useful tool in observing the river's health. Current wetlands and riparian buffers along the river should be protected and more may need to be established.

Untreated sewage discharges and combined sanitary sewer and urban stormwater overflow issues need to be addressed so that no sewage flow is allowed to by-pass treatment and be discharged directly to the river. The river's water should be treated with care.

Heritage

The river and its valley shaped the history and settlement patterns of this region. The vision for the river and its valley would not be complete without an increase in the general public's knowledge of this region's heritage, from pre-European settlement through the most recent flood event. This region's heritage will be interpreted for residents and visitors alike through exhibits, signage, and special projects that work to discover, document, convey, and celebrate this region and its people.

Education

One of the best ways to motivate people toward an appreciation of a resource is to educate them. The vision for the lower West Branch Susquehanna is to have information on the river, its resources, and its wildlife available to visitors and residents at kiosks and interpretive signs throughout the corridor. Environmental education will take place at centers designed to encourage, teach, and stimulate. Educational activities would be targeted to all age groups. Whether a presentation at a service club's monthly meeting, a field trip for elementary school students, or a canoe outing of grandparents with their grandchildren, the activities will help the residents and river users understand more about the animals, plants, and aquatic resource around them.

Greenways

Green infrastructure is made up of the open space, plants and water that provide communities with valuable resources and functions that support everyday life. Such greenway areas provide recreational space, wildlife habitat, ground water recharge areas, and trees that provide beauty to

a community landscape, filter the air residents breathe or shade on a residential street. The vision for the lower West Branch Susquehanna River is to have a continuous greenway (a linear corridor of open space, not necessarily open to the public) along its banks and tributaries.

The communities along the river are connected to the river. A goal of the Plan is to develop a trail system that provides recreation and provides commuters with a way to travel through a community and from one community to another. There are areas of permanently protected open space between the small communities in the valley. Natural resources are conserved and not wasted. Citizens in the river valley appreciate the resources around them. They recognize the viewshed as a valuable resource to the valley and it should be conserved.

Livable Communities

Without support and help from the people living in the river valley, nothing in this vision can succeed. The people in this valley need jobs, housing, food, and entertainment. The communities in the lower West Branch Susquehanna River valley need connections to the river; a sense of place; downtown areas that meet the needs of residents; and, economic development.

As the area changes or changes are proposed, such as with transportation system upgrades, the communities will work to ensure that the impact of those changes is positive to the communities and mindful of the natural resources.

Flood Hazards

When flooding events occur, the property damage and human impacts are lessened. Communities work to identify man-made obstructions that could be removed from the floodplain and high risk flood areas that that can be converted to open space to allow floodwaters to spread out. This not only provides communities with reduced property damage, more open space and green infrastructure, but also reintroduces the river to its traditional floodway and floodplain allowing water to infiltrate into the ground water table and continue the natural water cycle.

Storm water systems have been upgraded and implemented where needed. These facilities operate effectively and efficiently.

River Use

The various users of the river have found a way to share the resource. The recreational needs of boaters, fishermen, canoeists, birdwatchers, and people who visit the river to just “recharge” are all being met. The river’s access points are directed. Managed recreational areas allow for more people to use and enjoy the river.

Advocacy

This vision for the lower West Branch Susquehanna River can only be obtained through advocacy and citizen involvement. The municipalities, government agencies, and non-profit organizations located within this study corridor need the help of individual citizens. These groups also need to know which specific projects or ideas are important and need to be carried out. None of the ideas in this document can happen without someone, or some group, advocating for it to happen.

The Plan for the lower West Branch Susquehanna River corridor is for interested, committed, and vocal citizens who are willing to work together to achieve a better quality of life.

B. Goals and Objectives

This River Conservation Plan sets the framework for educating the public and developing a shared vision among the residents, municipalities, county and state agencies, private businesses and nonprofit organizations within the corridor to obtain state and federal funding to implement recommended beneficial projects. The goals and objectives of the Lower West Branch Susquehanna River Conservation Plan are as follows:

Goal 1: To establish plans, policies, and recommendations for the Lower West Branch Susquehanna River corridor which will provide for the conservation of valuable natural resources in the corridor, including wildlife habitat, water quality and supply, agricultural lands, wetlands, steep slopes, open space, riparian buffers and floodplains.

Goal 2: To provide opportunities for sustainable economic development for the population centers located within the corridor which balances environmental protection and economic growth.

Goal 3: To identify opportunities for public recreation, public access points, linkages, environmental education and nature tourism.

Goal 4: To promote community cooperation within the corridor, which will manage future growth and development activities within the Lower West Branch Susquehanna corridor and provide linear connections.

Goal 5: To identify opportunities for open space and floodplain conservation within the corridor.

Goal 6: To conduct a feasibility analysis and develop a vision, concept plan, action plan, implementation plan and management options for a Lower West Branch Greenway within the study corridor.

C. Project Documentation

The documents produced through the planning and writing of the Lower West Branch Susquehanna River Conservation Plan and information on where they may be located for review is provided below.

Executive Summary

An Executive Summary to the River Conservation Plan is available as a separate stand-alone document that outlines the planning, methods and recommendations that were provided in the plan. This text is also provided as Section I of the plan. The summary presents the key issues, concerns and opportunities in the 77-mile long river corridor and the recommended implementation projects to address the corridor's current and future problems and needs. A printed copy of the Executive Summary is available to the public for review. Please contact the Northcentral Pennsylvania Conservancy or log on to their web site to make a request for your own copy (570-322-6222 or www.npcweb.org).

The River Conservation Plan

The complete Lower West Branch Susquehanna River Conservation Plan is provided by section in PDF format online at www.npcweb.org. This document can be downloaded and read using the free Adobe Acrobat software that is available on the Internet at www.adobe.com. The River Conservation Plan is comprised of the Executive Summary and ten sections which include: (I) Introduction, (II) Project Area Characteristics, (III) Land Resources, (IV) Water Resources, (V) Biological Resources, (VI) Cultural Resources, (VII) Issues, Concerns, and Opportunities, (VIII) Management Options, and (IX) Greenway Element. The maps and figures referred to in the River Conservation Plan are provided separately. Printed copies of the plan are available for review at the following locations.

- County Planning Commissions: Clinton, Lycoming, Northumberland and Union Counties
- Annie Halenbake Ross Library – Lock Haven
- Jersey Shore Public Library – Jersey Shore
- James V. Brown Library – Williamsport
- Dr. W.B. Konkle Memorial Library – Montoursville
- Montgomery House Warrior Run Area Public Library – McEwensville
- Muncy Public Library – Muncy
- Montgomery Area Public Library - Montgomery
- Milton Public Library – Milton
- The Public Library for Union County – Lewisburg
- Priestly Forsyth Memorial Library – Northumberland

For a complete list of locations visit the Northcentral Pennsylvania Conservancy's web site: www.npcweb.org.

GIS Maps and Figures

Color maps and figures referenced within the River Conservation Plan can best be viewed in person at one of the locations listed above since each thematic map produced by Geographical Information System (GIS) data is comprised of one (1) 11" x 17" sheet (1-inch = 3 miles). Provided in Appendix A of the River Conservation Plan, there are a total of ten (10) thematic maps, including Watershed Features, Slope Analysis, Land Use, Existing Zoning, Soil Associations, Geological Formations, Drinking Water Sources, Hydric Soils, Floodplains and Wetlands, Open Space and Recreation, Cultural and Historical Resources and Proposed Greenway. The Proposed Greenway Map is comprised of five (5) 11" x 17" sheets (1-inch = 5,000 feet) to cover the 77-mile corridor.

Supporting Documentation

Relative supporting information referenced in the River Conservation Plan is provided in the plan's appendices. Appendix B contains data tables that are frequently referenced throughout the plan, while Appendix C provides a list of acronyms used in the plan. Additional supporting information including water quality and resource data tables, public meeting minutes, municipal questionnaire results, stakeholder interview results, excerpts from related studies, and water–related agency and regulation guidance are provided in a separate reference volume known as the Plan's "Technical Document". Copies of the Technical Document are available for public review at the Northcentral Pennsylvania Conservancy's office in Williamsport, PA and at the offices of the County Planning Commissions and Conservation Districts in Clinton, Lycoming, Northumberland and Union Counties.

D. Project Team and Funding

In January 1999, the Northcentral Pennsylvania Conservancy (NPC) began leading a four county effort to develop the Lower West Branch Susquehanna River Conservation Plan. In June 2000, NPC was awarded a Keystone Recreation, Park and Conservation Fund grant administered by the Pennsylvania Department of Conservation and Natural Resources (DCNR).

A complete listing of other funding sources can be found on the inside front cover of this plan. Additionally, the River Conservation Plan Steering Committee membership list is provided on the inside back cover.

When DCNR approves the River Conservation Plan, the 77-mile corridor of the Lower West Branch Susquehanna River can be inducted to the Pennsylvania Rivers Conservation Registry. Listing on the Registry is an additional step, which NPC plans to pursue. This step will allow municipalities and other organizations such as local historical societies, watershed associations, tourism promotion agencies and recreation authorities to apply for grant funds through the River Conservation program administered by DCNR.

II. PROJECT AREA CHARACTERISTICS

A. Geographic Location

The West Branch Susquehanna River begins just outside of Carrolltown, a small coal-mining town in Cambria County (Stranahan, 1993), some 163 miles upstream of the northern end of the project's 77-mile study corridor. From its source in Cambria County, the West Branch flows some 240 miles to the confluence with the main stem (North Branch) near Northumberland, PA.

The Lower West Branch Susquehanna River study corridor is situated within Northumberland, Union, Lycoming and Clinton Counties in northcentral Pennsylvania and includes a 77-mile segment of land positioned along the West Branch Susquehanna River extending 1 mile from either bank (Figure II-1). The study corridor begins at the confluence of the West Branch with the main stem and progresses north (upstream) through the river hills, agricultural and urban lands of Northumberland and Union Counties. Once it reaches Bald Eagle Mountain, the river corridor changes course to the west near the Borough of Muncy and then hugs the northern flank of the mountain in Lycoming and Clinton Counties until it reaches the Allegheny Front just above Lock Haven. The character of the corridor in Lycoming and Clinton Counties is comprised of a region of broad valleys separated by long, high ridges, while the terminus of the corridor in Clinton County is comprised of steep mountain slopes that rise to the Allegheny Front.

For ease of description and to help locate and describe specific points of interest or resources, the study corridor has been divided into 1-mile increments along the centerline of the river through the use of River Miles. A River Mile (RM) is a designation given to describe a distance (mile) between two points on a water body upstream from its confluence with its receiving stream (Susquehanna River). For the Lower West Branch Susquehanna River study corridor, this designation system begins at River Mile zero (0) at its confluence with the main stem of the Susquehanna River at Northumberland, and progresses upstream to River Mile 77 west of Lock Haven. The reader will note that River Miles will be referred to often throughout this River Conservation Plan, the distribution of which is shown on all of the thematic maps provided in Appendix A.

B. Political Boundaries

The study corridor is comprised of 44 municipalities and four counties. Using GIS technology and data, detailed maps were developed to outline the various features and resources of the study corridor and its contributing watersheds. Boundaries of the counties and municipalities within the corridor are depicted on each of the maps provided in Appendix A. The study corridor includes parts of all or some of the following municipalities:

- INSERT FIGURE II-1 (11 X 17 SHEET)

Northumberland County (7)

Delaware Township, Point Township, Milton Borough, Northumberland Borough, Turbot Township, Watsontown Borough and West Chillisquaque Township.

- **Union County (7)**

  Buffalo Township, East Buffalo Township, Gregg Township, Kelly Township, Lewisburg Borough, Union Township and White Deer Township.

- **Lycoming County (20)**

  Armstrong Township, Bastress Township, Brady Township, Clinton Township, Duboistown Borough, Fairfield Township, Jersey Shore Borough, Loyalsock Township, Montgomery Borough, Montoursville Borough, Muncy Borough, Muncy Creek Township, Muncy Township, Piatt Township, Porter Township, Nippenose Township, South Williamsport Borough, Susquehanna Township, Woodward Township, and City of Williamsport

- **Clinton County (10)**

  Allison Township, Avis Borough, Bald Eagle Township, Castanea Township, Colebrook Township, Dunnstable Township, City of Lock Haven, Pine Creek Township, Wayne Township and Woodward Township.

C. Size (Watershed)

The West Branch Susquehanna River watershed encompasses approximately 6,992 square miles (SRBC, 2001a), a much larger area than the study corridor, which is comprised of approximately 161.8 square miles or 103,552 acres. The drainage area of the tributaries within the Lower West Branch Susquehanna River study corridor itself (Northumberland to Lock Haven) is approximately 3,647 square miles. The river's water surface covers approximately 7.3 percent (7,532 acres) of the study corridor. The Pennsylvania Department of Environmental Protection (PADEP) created a statewide watershed designation system for the state's major waterways. For the purposes of this plan, Subbasins 9 (Central West Branch) and 10 (Lower West Branch) of the Susquehanna and Chesapeake Bay Basin are involved.

The individual subwatersheds of the tributaries within the Lower West Branch Susquehanna River study corridor are described in further detail in later chapters. Refer to Map 1 of Appendix A for a view of the counties, municipalities and subwatersheds within the corridor. The watersheds depicted in the Watershed Features Map are color-coded according to their stream order designation from PADEP's Chapter 93 Water Quality Standards as of February 2001. PADEP's stream designation proceeds from largest to smallest, in which the main stem of the Susquehanna River is an Order 1 stream and the West Branch is an Order 2 stream. All streams

that discharge directly into the West Branch Susquehanna River are considered Order 3 streams and include both larger streams and the smaller unnamed tributaries. Overall, there are 45 larger or named streams that flow into the West Branch Susquehanna River corridor and approximately 60 smaller unnamed tributaries.

D. Topography

The West Branch of the Susquehanna River originates in the westernmost zone of the Appalachian Mountain System topographic region. The Appalachian Mountains are the oldest mountains in the United States, and are thought to be the result of continental tectonic plates slamming into each other approximately 250 to 300 million years ago. Specifically, the continental plates of Africa slammed into North America, creating a series of parallel ripples or ridges on the North American plate from Newfoundland to Alabama in a northeast to southwest direction. Erosion of the ancient mountains began immediately, with billion of tons of sediment eventually washing down the mountains (Ashley, 1933). The original folded rocks and overlying sediment was deposited into an inland sea to form layers of limestone, sandstone, shale and conglomerates. Thick layers of sedimentary rock were uplifted during the late Appalachian Mountain building period. Streams and subsequent periods of erosion have since etched the plateau into an intricate system of knobs and low mountains that comprise the present topographic features of the study corridor (PSU, 1988).

The Appalachians are comprised of four parallel zones of different geologic and topographic landforms that include the Appalachian Plateau, Ridge and Valley, New England and Piedmont Provinces. The majority of the West Branch Susquehanna River watershed's northern half is situated within the Appalachian Plateau Province and the southern half is situated within the Ridge and Valley Province of Pennsylvania. The two provinces are separated by a topographic and geologic feature called the Allegheny Front, which is located just upstream of Lock Haven from approximately River Miles 72 to 77. There the Appalachian Plateau drops steeply and abruptly down to the Ridge and Valley Province (or the Susquehanna Lowland Section). The Ridge and Valley Province is comprised of low to moderately high, linear ridges, linear valleys, and the Susquehanna River Valley itself (DCNR, 2000a). The Lower West Branch Susquehanna River study corridor extends through the Ridge and Valley Province for approximately 72 miles to the confluence with the main stem of the Susquehanna River near Northumberland and Sunbury.

Topography throughout the watershed varies, with areas in the northern and western portions exhibiting more mountainous and forested terrain, while the lower end of the watershed tapers into narrower, forested mountain ridges and foothills, valleys and lowlands characterized predominantly by agriculture (USACE, 1997). The varying degrees of topography and the mixture of high flat-top divides separated by steep sided valleys and deeply entrenched streams makes the area one of the most beautiful and aesthetically pleasing areas in the state (PSU, 1988). The two highest elevations within the study corridor are both along Bald Eagle Mountain on the southern side of the Lower West Branch study corridor. One is an elevation of 1,894 feet above mean sea level (MSL) on a ridge top in Clinton Township, Lycoming County at River

Mile 34.7. The other is slightly higher at an elevation of 1,990 feet above MSL located further upstream at River Mile 68 on a ridge top in Castanea Township, Clinton County. The lowest elevation within the study corridor is 435 feet above MSL at the confluence with the Susquehanna River in Northumberland, Northumberland County.

The West Branch Susquehanna River drops approximately 120 feet in elevation from the end of the study corridor in Farrandsville, Clinton County, where the elevation at the river's edge is 555 feet above MSL, to an elevation of 435 feet above MSL at the beginning of the study corridor. Therefore, the average slope of the water surface on the West Branch over the 77-mile (406,560 feet) journey through the study corridor is approximately 0.03 percent.

A detailed analysis of the slopes present in the study corridor is illustrated in Map 2 of Appendix A. Although the entire study corridor contains slopes ranging from nearly level (0-3%) to steep (greater than 25%), areas where the slopes are consistently the steepest are predominantly located to the north and west of the Northumberland and Union County boundaries with Lycoming County.

In particular, these areas include the area north of the Northumberland – Lycoming County line (east side) from River Mile 23 to River Miles 27 and from Muncy (River Mile 29) upstream to Lock Haven (River Mile 69) along the north face of Bald Eagle Mountain. Approaching the Allegheny Front, River Miles 72 through 77, both sides of the river corridor are comprised of steeply sided mountain slopes. Other steep river hills are interspersed throughout the remainder of the corridor.

The corridor through Northumberland and Union Counties consists of more gently rolling hills to level slopes. The most level areas throughout the study corridor's valley are the developed communities and the fertile agricultural lands near Northumberland Borough, Lewisburg, Milton, Watsontown, Montgomery, Muncy, Montoursville, Williamsport, Jersey Shore and Lock Haven. These same communities are also or were at one time prior to the construction of the levees, prone to flooding as will be seen on the Floodplain Map discussed in Section IV.

E. Corridor

1. Land Use

Land uses in the study corridor are diverse and include both developed and undeveloped areas. Historically, development occurred along the West Branch Susquehanna River's floodplain and its tributaries. Current land use follows the same trend, although more agricultural areas and some mountain ridges are now experiencing the pressures of new land development. According to the information provided through GIS data acquired from the County GIS Departments and data sets available on the Internet, specific land use within the corridor varies with topography. Those areas with steeper slopes, such as the river hills, Bald Eagle Mountain and the area upstream of Lock Haven, are predominantly forested. The valleys and floodplains within the corridor have the largest diversity of land use, with agricultural, commercial, industrial

residential land uses being the most obvious. Map 3 in Appendix A illustrates the varying patchwork of different land uses throughout the study corridor.

Overall, the 77-mile study corridor is comprised of approximately 103,552 acres or 161.8 square miles. Of that area, the water surface of the West Branch Susquehanna River occupies approximately 7,532 acres or 7.3% of the corridor. The breakdown of the different land uses that comprise the remainder of the corridor are as follows:

- Forested 37.79%
- Agricultural 32.60%
- Residential 9.17%
- Industrial 3.10%
- Commercial 2.62%
- Transportation (including highways and airports) 2.45%
- Vacant 1.63%
- Public and semi-public 1.16%
- Recreation 0.76%
- Water (including lakes, ponds and wetlands) 0.70%
- Quarry and mined land 0.39%
- Utility (landfills) 0.36%

Generally, the west shore of the West Branch Susquehanna River serves as the boundary between Northumberland and Union Counties in the southern section of the study corridor. There is a much greater concentration of agricultural fields, including both row crops and pasture and hay fields on the Northumberland County side of the river. In contrast, the Union County side has a more diverse pattern of land uses. The largest populations in this segment of the corridor are concentrated near Northumberland, Lewisburg, Milton and Watsontown Boroughs where high and low density residential and commercial/industrial facilities exist (PSU, 1989).

Moving upstream into the Lycoming County segment of the study corridor, the populated and developed areas tend to be more concentrated along the northern side of the river, once the corridor makes a 90-degree turn around Bald Eagle Mountain near Muncy. Communities such as Montoursville, Williamsport and Jersey Shore are located on the valley floor north of the river, while Montgomery and South Williamsport hug the base of the mountain on the opposite shore. The lands north of the river are comprised of a mixture of urban land uses (low and high-density residential areas and commercial/industrial land), forested areas and agricultural fields, while the area south of the river is almost exclusively comprised of the steep forested terrain of Bald Eagle Mountain. In Clinton County residential and developed areas are concentrated south of the river in the Lock Haven area while the majority of agricultural lands are found north of the river.

2. Zoning

The Lower West Branch of the Susquehanna River corridor contains all or part of 44 municipalities in Northumberland, Union, Lycoming and Clinton Counties. All municipalities have zoning ordinances, except Union Township, Union County. As shown in Table B-1, 34 of 44 municipalities have Comprehensive Plans and all municipalities have Land Development and Subdivision Ordinances (5 of those are regulated by a county subdivision ordinance).

Map 4 in Appendix A provides available GIS data for existing zoning within the study corridor. Mapped zoning districts include: Agricultural, Commercial, Floodplain, Industrial, Residential, and Open Space / Conservation / Recreation. These maps should not be used for planning purposes since they are not an accurate reflection of all the existing zoning. This is especially true in Northumberland County where the municipalities have zoning ordinances but GIS zoning data was not available. Zoning districts are not consistent in all of the municipalities. The zoning districts used are representative of district categories and are comprised of a combination of the specific zoning districts found within the zoning ordinances. The following is a summary of the purpose, permitted uses, and specific zoning districts under the broad categories.

Agricultural

This is a rural district intended to preserve and protect the practice of farming, emphasize the economic importance of farming, and to ensure the preservation of prime agricultural soils for future generations. This district is also intended to reduce the amount of non-farm development in farming areas and ensure their rural character. Limited residential and agricultural related activities are permitted in this district. Some permitted uses include agriculture, family dwellings, seasonal dwellings, and timber harvesting.

Commercial

The purpose of this district is to set aside areas that can support a mixture of commercial, government, and residential uses including: commercial shops, warehousing, service operations, and municipal buildings. Such uses are intended to encourage new business activity and provide essential services to communities, while assisting in reducing encroachment on residential areas and maintaining neighborhoods. Some of the specific districts included are Commercial, Rural Commercial, Mixed Use, Village Center, Commercial Highway, Highway Interchange, Business, Central Business, and Business Park. Some permitted uses include: banks and financial services, hotels, motels, professional offices, restaurants, cafes, retail shopping centers, stores and shops for general merchandise, malls, and retail business.

Floodplain

The purpose of this district is to protect the sensitive nature of lands prone to flooding and to eliminate the location of structures and materials that may reduce the storage capacity of flood waters and pose a hazard or threat to areas downstream during periods of high water. In most cases, this district has an underlying district from one of the other districts. Permitted uses in the underlying district are also permitted, but are subject to the more restrictive conditions of the Floodplain District. The protective nature of this district is very important to a River Conservation Plan and the conservation of open space. Some of the specific districts included are Floodplain, Floodway, Flood Fringe & Flood Plain, and Floodway/Floodplain.

Industrial

The purpose of this district is to promote the development of industrial uses that are compatible with surrounding districts. The areas in this district often require amore improved transportation (highways and railroads) and utility (electric, water, sewer) infrastructure than other districts. The provisions of this district must permit continued growth, but must protect and be reasonably compatible with adjacent uses. Buffers, landscaping and screening can be used to isolate this district. Some permitted uses include: manufacturing, warehousing, repair services, transportation facilities, and related services. Some of the specific districts included are Industrial, Light Industrial, Rural Industrial, Manufacturing, Commercial Manufacturing, and Industrial Park.

Residential

This district is intended to encourage residential development with a density consistent and compatible with the surrounding area. Density is maintained through minimum lot sizes, maximum density provisions, setbacks, open space, and buffer requirements. The density and other provisions are intended to maintain and protect the integrity of residential neighborhoods. Permitted uses include single and multi-family housing, seasonal housing, family and group day care homes, home occupations, and semi-public uses such as churches and recreational facilities. Some of the specific districts included are Residential Single Family, Residential (Low, Medium, and High Density), Suburban, Estate, Village Center, Rural Center, Countryside, Residential Town, Rural Residential, and Urban Residential.

Open Space / Conservation / Recreation

The purpose of this district is to preserve open space and recreation areas, and to protect environmentally sensitive lands. This district also provides for the conservation and protection of natural resources such as timber, wildlife habitat, rare plant communities, scenic resources, and other natural areas. This district can also include special protection waters designated by the PADEP and protection of watersheds that are public drinking water sources. This district is very important to river conservation planning and establishment of greenways and future recreational

opportunities. Some of the specific districts included within this category are Nature Conservation, Rural Forest, Resource Protection, Agriculture Preservation, Special Conservation/Recreation, Conservation/Wooded, Rural Forest, Open Space, Recreation and Special Recreation.

F. Social/Economic Profile

1. Population Centers

The population of the municipalities within the study corridor is shown in Table B-2 of Appendix B. The population statistics do not represent the study corridor's actual population, but represent the entire population for the 44 municipalities that are part of the study corridor. The municipal boundaries extend outside the study corridor in many cases. All statistics reflect the 2000 census data published by the US Census Bureau in 2001.

Lycoming County has the largest population in the study corridor, followed in descending order by Union, Northumberland, and Clinton Counties. Union County has the youngest population, with a median age of 35.8. The communities with the youngest populations can be found in Lewisburg Borough, median age 22.4 and the City of Lock Haven, median age 25. This reflects the college student influence on these communities. Northumberland County has the oldest population, with a median age of 40.8. The communities with the oldest populations are located in Loyalsock Township, Lycoming County, median age 47.4 with Point Township, Northumberland County having the second oldest population, median age 44.5 (USCB, 2001).

Between 1990 and 2000, Pennsylvania experienced a population growth of 3.4%. During this time period, Union County experienced an increase of 15% growth, of which the majority can be attributed to inmates within the Allenwood Federal Correctional Complex that was constructed in Gregg Township. Lycoming County and Clinton County experienced only modest increases within the study corridor, while Northumberland County experienced a slight decrease. Brady Township in Lycoming County (-39.9%) and Woodward Township in Clinton County (-13.7%) experienced the largest decrease in population.

The major population concentrations within the study corridor in descending order of size are Williamsport, Loyalsock Township, Lock Haven, Milton, South Williamsport, Lewisburg, Montoursville, Jersey Shore, Muncy, Watsontown, Montgomery, Avis, and Duboistown. These municipalities make up 28% of the population in the study corridor. Although the population density of the townships along US Route 15 in Union County is increasing, for the most part the remainder of the population is located in rural areas and small communities with a low population density.

When identifying population characteristics of the study corridor, it is important to consider the distribution of population by age group. Each age group has differing needs that impose unique demands on municipal and county services. Also, the age groups have different desires and

needs for recreational and leisure activities. Within the counties of the study corridor, 15.4 % of those persons 65 or older have a mobility limitation. Table II-1 shows that the study corridor's population tends to be slightly older than the average for Pennsylvania and significantly older than the United States' average.

TABLE II-1 POPULATION COMPOSITION

County	Under 18 (%)	18 to 64 (%)	65 and Over (%)
United States	25.7	61.9	12.4
Pennsylvania	23.8	60.6	15.6
Study Corridor	21.6	61.8	16.6

Source: US Census Bureau, 2001

The study corridor's population has a lower percentage of minorities in comparison to both state and national averages. The corridor also has a lower percentage of high school and college graduates than both state and national averages.

Although there is a higher percentage of home ownership, the median household income is more than 13% lower than both the State of Pennsylvania and the United States as a whole. Houses within the study corridor have a wide age range, with more than half 50 years or older.

2. Transportation Facilities

Roads

Travel by cars is the primary mode of transportation for commuting and leisure activity within the study corridor. More than 45 percent of all households have two or more cars. The majority of the workforce commutes by driving alone, as seen in Table II-2 below.

TABLE II-2 TRANSPORTATION MEANS IN THE FOUR COUNTY AREA

County	Drive Alone (%)	Carpool (%)	Public Transportation (%)	Walk or Work at Home (%)
Northumberland	73.3	16.9	0.3	8.5
Union	73.2	10.6	0.3	14.3
Lycoming	76.2	13.8	1.7	7.6
Clinton	70.0	17.8	0.3	10.9
Total	74.1	14.9	0.9	9.1

Source: US Census Bureau, 2001

An important consideration regarding roadway systems is the function the transportation facilities have in collection of traffic, movement of traffic, and access. Transportation facilities can be classified as either part of the Major Highway Network or the Local Street System. The Major Highway Network functions to efficiently move traffic throughout a region and may be restricted to access by a series of entrance/exit ramps. It consists primarily of Interstates (controlled access highways), U.S. Highways, and PA Highways. In contrast, the Local Street System provides direct access to adjacent lands. The Local Street System consists of Township (municipal) Roads and Other Roads. The study corridor has a significant amount of local roads. The following roads comprise the Major Highway Network for the study corridor:

- I-80 provides east-west traffic movement and intersects the study corridor near River Mile 14. This is a limited access highway.

- I-180 provides north-south movement of traffic from I-80 to Williamsport. This is a limited access highway.

- US 15 provides north-south traffic movement from the southern portion of the study corridor to Williamsport. A short section of US 15 from West Milton to Allenwood (near I-80) is a limited access highway. A new alignment from Selinsgrove (south of the study corridor) to State Route 147 is currently under study. This project entails re-routing US Route 15 around Shamokin Dam and across the West Branch Susquehanna River (south of Winfield in Union County) to State Route 147 in Northumberland County and then I-180 to Williamsport. The proposed bridge across the West Branch will be nearly 4,000 feet long. This project would provide a limited access north-south route through the study corridor.

- US 220 provides east-west traffic movement within the study corridor. The section from Jersey Shore to Lock Haven is a limited access highway. The section from Jersey Shore to Williamsport is under study to provide a new limited access highway. Completion of this project would provide a limited access highway for east-west traffic movement through the study corridor, connecting I-80 with I-180 and US 15 North. This traffic route would then become a part of I-99, providing limited access traffic movement from Maryland to New York.

- State Route 147 currently provides north–south traffic movement from Northumberland Borough (at the southern end of the study corridor) to I-80.

Along the length of the study corridor there are several roads providing connecting access to corridors to the east, west and north. Starting at River Mile 0, they include: US Route 11, State Route 45, State Route 192, State Route 44, State Route 54, State Route 87, State Route 287, and State Route 150.

Rail

Complementing the extensive network of roads within the study corridor is freight rail transportation. Both Norfolk Southern Railroad, and the SEDA-COG Joint Rail Authority (JRA) and affiliated companies, operate freight rail systems within the river corridor and provide rail link outside the corridor. Rail lines are situated along both sides of the river throughout the study corridor. While some rail sections may be abandoned, railroad bridges cross the West Branch at River Miles 11, 22, 27, 46, and 63 to link active lines to service industrial hubs within the corridor or to continue rail service on the opposite side of the river.

JRA is a Pennsylvania Municipal Authority that owns a 200-mile regional rail system in Central Pennsylvania. The JRA serves all the counties in the study corridor through the Nittany & Bald Eagle Railroad, North Shore Railroad, Shamokin Valley Railroad, Lycoming Valley Railroad, and the White Deer & Reading Railroad. The North Shore Railroad and affiliated companies, operate all five JRA railroads and the Union County Industrial Railroad. These railroads provide freight service and are Norfolk Southern handling line carriers.

Air

There are three airports within the study are, Williamsport Regional Airport, Jersey Shore Airport and the William T. Piper Memorial Airport.

The Williamsport Regional Airport provides commercial passenger service through US Airways with service to and from Philadelphia and Pittsburgh. General aviation services include parking, hangars, fuel, aircraft maintenance, air cargo, and charter flights. Avionics service, flight instruction, aircraft rental, and aircraft sales are also available.

The Jersey Shore Airport is located in Nippenose Township, Lycoming County. General services include parking, hangars, fuel, aircraft maintenance, and charter flights. Flight instruction and aircraft rental are also available.

The William T. Piper Memorial Airport in Lock Haven was the home to Piper Aircraft Corporation and is adjacent to the Piper Aviation Museum. General services include parking, hangars, fuel, aircraft maintenance, and charter flights. Agricultural aerial spraying, flight instruction, and aircraft rental are also available.

3. Major Sources of Employment

Major employment sources in the region are centered in the population centers. Table II-3 shows the percent of the work force in each county by industry. Based on number of employees, manufacturing, retail trade, health services, mining & construction and other industry sectors (e.g., government) are the major industries of the four county area. The exception to this is

Union County, where educational, technical and professional services provide employment for approximately 20% of that county's workforce. Commercial development has been limited primarily to urban areas, along highways and at highway interchange areas. Farming is a mainstay of the rural areas in the corridor. The farm industry however, does not employ a large percentage of the workforce.

TABLE II-3 PERCENT OF WORK FORCE BY INDUSTRY

County	Manufacturing	Retail Trade	Other Sectors	Health Services	Mining/ Construction/ Warehousing/ Transportation/ Utilities	Education/ Technical/ Professional Services
Northumberland	31.0	20.0	20.0	12.0	9.0	3.0
Union	24.0	12.0	16.0	17.0	7.0	20.0
Lycoming	27.0	20.0	18.0	16.0	7.0	4.0
Clinton	34.0	23.0	19.0	11.0	6.0	2.0
Pennsylvania	16.0	18.0	23.0	15.0	9.0	10.0

Source: Center for Rural Pennsylvania, 2001

According to census data, the average unemployment rate in Pennsylvania in 2000 was 4.2%. The average annual wage was $32,512. Counties within the Lower West Branch Susquehanna River Watershed range above and below these state averages. Table II-4 below shows the unemployment rate and average annual income according to available information from the Center for Rural Pennsylvania.

TABLE II-4 AVERAGE UNEMPLOYMENT AND ANNUAL INCOME

County	Unemployment Rate 2000 Annual Rate (%)	Average Annual Income 2000
Northumberland	4.7	$25,128
Union	2.6	$24,683
Lycoming	4.7	$25,905
Clinton	5.4	$24,978
Pennsylvania	4.2	$32,512

Source: Center for Rural Pennsylvania, 2001

G. Outstanding or Unique Features

Within the study corridor and throughout the entire region of northcentral Pennsylvania, there are several unique natural features as well as scenic and recreational areas of interest. These areas include state parks and forests, natural areas, scenic vistas, rivers, lakes, streams, mountains, geologic features, dams, river access points, boating, fishing and camping areas.

The public lands within the study corridor include three State Gamelands (Nos. 193, 126 and 89), three State Parks (Shikellamy, Milton and Susquehanna State Parks) and two State Forests (Tiadaghton and Bald Eagle State Forests). In addition, there are many county, community and neighborhood parks and public school recreation areas located within the corridor. A comprehensive list of public lands in the corridor is provided in Table 2-1 of the Technical Document.

There are no known National Natural Landmarks in the study corridor. The Pennsylvania Department of Conservation and Natural Resources' (DCNR) publication "Outstanding Scenic Geologic Features of Pennsylvania, Environmental Geology Report 7" (Geyer and Bolles, 1979) lists four outstanding scenic geologic features within the study corridor. These include the Shikellamy Bluffs in Union County, the Montandon Sand Dunes (Montandon Marsh) situated in Northumberland County, the Williamsport Scenic Vistas and Devils Turnip Patch located in Lycoming County.

One additional scenic feature just outside of the corridor on State Gamelands 89 in Clinton County is an upstream section of Lick Run, which was designated as a Scenic River by the Commonwealth of Pennsylvania. The corridor is also known for its important archaeological sites and historic features. A summary of these unique features are provided below.

Shikellamy Bluffs

The Shikellamy Bluffs, is a scenic vista located within Shikellamy State Park near River Mile 1 in Union County. The park was named for Chief Shikellamy, an Iroquois chief from the early to mid-1700s. The overlook provides two views located 360 feet above the confluence of the West Branch and main stem of the Susquehanna River and was once used by Native Americans as a scouting site. The bluffs consist of calcareous shale cliffs that support a population of rare plants.

Montandon Marsh

Perhaps the most notable natural area located within the study corridor is Montandon Marsh, located in West Chillisquaque Township, Northumberland County just east of the borough of Lewisburg along the West Branch Susquehanna River (River Miles 8-9). It is one of the few diverse riparian wetland ecosystems remaining in central Pennsylvania and one of the most important natural sites within the four county area according to the Pennsylvania Natural

Diversity Inventory (PNDI). Montandon Marsh consists of a 44-acre wetland complex of glacial origin containing marshes, swamps, bogs, and seasonal ponds nestled among low sand dunes.

Scenic Vistas

Two popular scenic vistas that offer beautiful views of the West Branch Susquehanna River valley from the north face of Bald Eagle Mountain are located in the Lycoming County section of the study corridor. One such scenic vista is situated along Cemetery Hill Road just south of Montgomery near River Mile 22. The other vista, which is more accessible and popular, is the US Route 15 Overlook located near River Mile 36.

Devils Turnip Patch

Devils Turnip Patch is a boulder field formed by slow gravity-driven movement during a time of nearby glaciation. It is located along US Route 15 on Bald Eagle Mountain just south and upgradient of River Mile 36 in Armstrong Township, Lycoming County.

River Islands and Archaeological Sites

Several islands located within the West Branch are also rich in archaeological resources. Progressing upstream from the beginning of the study corridor they include Catbird, Duck, Sandy Block, Crow, Brash, King, Racetrack, Canfield, Wayne, Crane, Long, Great and Boom Islands. Canfield Island (Lycoming County) and Great Island (Clinton County) support many archaeological sites, as they were favorite spots for Native American villages from the late Archaic to Woodland epoc times.

Canal Remnants

Remnants of the 73-mile Susquehanna West Branch Division of the Pennsylvania Canal are present along sections of the river from Northumberland to Lock Haven. Old canal walls made of stone still stand today in the Muncy area, while other canal and lock remnants exist near Lock Haven.

Historic Log Booms

Within the West Branch itself, historic log cribs from former log booms used during the lumbering era to corral felled timber can still be seen and explored in the river near Williamsport, Jersey Shore and Lock Haven.

III. LAND RESOURCES

A. Soil and Geology Characteristics

1. Soils

The study corridor's soils are largely derived from limestone, shale, sandstone and siltstone as well as alluvial and glacial materials. Most of the study corridor consists of either floodplains or steep mountain slopes. Therefore, the major limitations of most soils within the study corridor are either flooding, steep slopes or shallow bedrock. The floodplain soils are mostly hydric soils, which are classified as soils that are saturated much of the growing season due to a high water table or poor drainage.

Because the study corridor is so large, common soil associations found within the corridor have been used to group soil types. Although a soil association may contain one or more minor soil units it is named for the dominant larger soil units found within the landscape. Map 5 of Appendix A shows the locations of the major soil associations found throughout the project area. Table 2-2 of the Technical Document provides characteristics of the topography, parent materials, other common soils, drainage, existing land uses and limitations for each of the soil associations within the study corridor by county.

Mountains and steep hills are present within the corridor's landscape in Northumberland County but broad, nearly level to sloping areas along the terraces and floodplains of the river dominate this section of the corridor. Alluvial material and outwash, weathered glacial till and weathered sandstone and shale formed most of the soils in this area of the corridor. The two major soil associations found in Northumberland County are the Holly-Basher-Wheeling and Weikert-Berks-Hartleton associations (Eckenrode, 1985).

Union County is divided into mountain ridges and low, rolling valleys. Again, alluvial materials, glacial till and weathered sandstone, shale and carbonate weathered to form the soils in this section of the corridor. The major soil associations found in Union County are Holly-Basher-Monongahela, Allenwood-Alvira-Shelmadine, Weikert-Berks-Hartleton and Edom associations (Eckenrode, 1985).

Lycoming County is dominated by mountains and hills interspersed with several broad valleys. Most of the soils in the county are well-drained and formed from various materials ranging from limestone and dolomite to calcareous shale, siltstone and sandstone. The soils on the floodplains of the West Branch Susquehanna River are rich and fertile. The major soil associations found in the Lycoming County section of the corridor are the Linden-Holly-Wheeling, Watson-Allenwood-Alvira and Weikert-Berks-Hartleton associations (Kohler, 1986).

The soils in the northwestern part of the study corridor in Clinton County mainly consist of soils weathered from shale, sandstone and limestone on ridges and in the valleys along the floodplains of the West Branch Susquehanna River. Much of this corridor section is forested. The major

soil associations found in the Clinton County section of the corridor are the Berks-Hartleton-Allenwood and Ashton-Huntingdon associations with portions of the Leck Kill-Meckesville-Klinesville, Pope-Barbour-Sequatchie, Murrill-Buchanan-Laidig and Dekalb-Lehew associations also being present in scattered areas (Steputis et. al, 1966).

2. Soil Limitations

As seen in Table 2-2 of the Technical Document, soil limitations for soil associations within the corridor vary with geographic and topographic location and the type of land use that may be proposed for a given area. Factors that may limit land development include steep slopes, flooding, seasonal high water table, slow permeability (which could lead to septic system failure in rural areas), and shallow depth to bedrock. Limiting soil factors for agricultural use for growing crops include steep slopes, susceptibility to drought, poor drainage, low natural fertility, large stones or boulders at the surface, shallowness to bedrock, and erosion. Flooding can be a limiting factor to crops that are grown in the corridor however, floodplains along the West Branch Susquehanna River and its tributaries support some of the most fertile soils within the region. Because hydric soils are poorly drained and often support wetland habitat, hydric soils can be limiting factors for both land development and agricultural uses.

3. Geology

The geologic formations that most commonly occur in the study corridor are the Lock Haven, Clinton, Wills Creek, Bloomsburg and Mifflintown Undivided, Hamilton Group and Tuscarora Formations. For a more complete list of geologic formations found within the corridor and their location within the study corridor refer to Map 6 in Appendix A.

The Allegheny Front Section of the corridor above Lock Haven is characterized by rounded to linear hills rising by steps to an escarpment. The hills in this region are cut by narrow valleys and the local relief is moderate to high. The underlying rock types are shale, siltstone and sandstone. The drainage pattern of tributaries within the region is parallel and trellis. The origin of this section is fluvial erosion and periglacial mass wasting.

The Appalachian Mountain Section of the corridor such as Bald Eagle Mountain, consists of long, narrow ridges and broad to narrow valleys with some karst topography (limestone areas prone to sinkhole formation) throughout the area. The local relief is moderate to very high and the underlying rock types include sandstone, siltstone, shale, conglomerate, limestone and dolomite. The patterns of the tributaries in this region are trellis, angulate and karst. The origin of this section is fluvial erosion and a solution of carbonate rocks and periglacial mass wasting.

The dominant topographic forms found in the Susquehanna Lowland Section, which exists in the majority of the study corridor, consist of low to moderately high, linear ridges, linear valleys and the Susquehanna River valley. The local relief is low to moderate and the underlying rock types consist of sandstone, siltstone, shale, conglomerate, limestone and dolomite. The geologic

structure is comprised of open and plunging folds having narrow hinges and planar limbs (DCNR, 2000a).

Most of the underlying rock in the study corridor is from the Devonian (365-405 million years ago), Silurian (405-430 million years ago) and Ordovician (430-500 million years ago) Periods. The Devonian Period contained rocks comprised of red sandstone, gray and black shale, limestone and chert. The Silurian Period consisted of red and gray sandstone, conglomerate, shale and limestone. The Ordovician Period was dominated by rocks of shale, limestone, dolomite and sandstone.

The entire study corridor is situated within the boundaries of oldest and southern most glacial advances in northeastern Pennsylvania. The glacial deposits within the study corridor date from the Pre-Illinoian period (>770,000 years ago). The areas directly adjacent to the West Branch Susquehanna River represent recent to late Illionian glacial deposits (0 to 198,000 years old). These stratified drift deposits consist of sand and gravel in eskers, kames, kame terraces and outwash materials principally found in valleys.

B. Ownership

The majority of the land (92.1%) within the study corridor is owned by private landowners. As seen in Figure II-1 (Page 8), most of the public lands are owned by the Commonwealth of Pennsylvania and include such areas as State Forests, State Game Lands and State Parks. There are also various county and municipal-owned land areas consisting of parks, recreation centers, historic sites, open space lands, public schools and public school recreation areas and other public buildings within the study corridor.

As seen in Table III-1 below, there are 8,160 acres of publicly owned land in the study corridor. This figure includes municipal, county and state owned lands and comprises 7.9 % of the study corridor's total area. See Table 2-1 of the Technical Document for a description of each of the public lands in and adjacent to the study corridor.

TABLE III-1 PUBLIC LANDS

Land Category	Acreage	Percent of Total Study Corridor
State Forests	6,417	6.2
County/Municipal	859	0.8
State Game Lands	705	0.7
State Parks	179	0.2
Total	8,160	7.9

(Calculated using data from DCNR, 2000c)

C. Critical Areas

Critical areas include geographic, topographic and geological features that limit the use of land for building or development. Examples of critical areas within the study corridor include areas with extreme slopes (those greater than 25%), floodplains and areas subject to severe erosion. Other concerns for development may include areas that are prone to the formation of sinkholes. Sinkholes are discussed in more detail in Section E (Hazard Areas).

The range of slopes within the study corridor are illustrated in the Slope Analysis Map (Map 2) provided in Appendix A. The Union and Northumberland County sections of the study corridor (from River Miles 0 to 22) are comprised of moderately steep river hills to rolling or level agricultural lands with the majority of the land ranging from 0 to 15% in slope. As the study corridor rounds the river bend near Muncy (along River Miles 22 to 29), the slopes are predominantly greater than 25% on the eastern side of the river, while moderately steep and rolling slopes exist on the western side of the river. Progressing west, from River Mile 29 to 71, the slope on the south side of the river is predominantly greater than 25% since the river is situated along the base of Bald Eagle Mountain. The areas on the north side of the river consist of lands with slopes ranging from 3 to 25%. Almost the entire area from River Miles 71 to 77 (west of Lock Haven) has slopes greater than 25%. The areas with extreme slopes have physical and financial limitations for development or agriculture uses and normally coincides with the large forested areas of the study corridor.

In contrast, the areas most susceptible to flooding are the valleys, which are level or have gradual slopes. These areas are depicted on the Floodplain Map (Map 7) in Appendix A. Flood prone areas are actually opposite images of the steep slope areas when the floodplain and slope maps are compared.

D. Landfills

Landfills are engineered facilities that are specifically constructed for the purpose of safely and permanently disposing of waste. They are typically constructed in cells or sections isolated from other parts of the landfill by soil or other non-combustible cover material. They are required to have double liners to prevent groundwater contamination, be able to treat leachate (liquids coming from the landfill), collect and control methane gas emissions and prevent erosion and sedimentation. If such mitigation control measures fail to operate as designed, pollution to ground water aquifers, adjacent surface waters and air quality could occur.

The two municipal waste landfills located in and near the study corridor are the Lycoming County Landfill Disposal Facility and the Wayne Township Landfill. Both landfill facilities have the appropriate and approved air quality, waste management and water pollution control permits from PADEP.

The Lycoming County Landfill Disposal Facility is located just west of the study corridor off of US 15 near the town of Montgomery in Brady Township, Lycoming County. This landfill is owned by Lycoming County and operated by Lycoming County Resource Management Services (LCRMS) of Lycoming County. LCRMS also manages a transfer station located on West Third Street in Williamsport, which is located within the study corridor near River Mile 42. The transfer station associated with LCRMS only has a waste management permit (PADEP, 1999a). The Wayne Township Landfill is located within the study corridor just off of State Route 220 east of Lock Haven in Wayne Township, Clinton County at River Mile 63. This landfill is owned and operated by the Clinton County Solid Waste Authority (CCSWA).

PADEP maintains a database of landfill violations on their Environment, Facility, Application, Compliance Tracking System (e F.A.C.T.S) web site on the Internet. According to that database, violations that have occurred in the past two years at the Lycoming County Landfill Disposal Facility include air quality control device operating problems, deviation in waste disposal timing and sequence operations and failure to meet minimum revegetation requirements. The Wayne Township Landfill in Clinton County has experienced similar landfill violations and abated the problems as required (PADEP, 2002). While no water quality violations were reported by the PADEP database, potential impacts from erosion and sedimentation or landfill effluent to adjacent water bodies exist for Black Run and the West Branch.

In addition, it should be noted that the CCSWA set aside 49 acres of the Wayne Township Landfill as a preserve to protect 13.8 acres of wetlands on their property. The Northcentral Pennsylvania Conservancy holds a conservation easement on the preserve. The easement prohibits any activity that would adversely affect water and soil conservation, erosion control, or fish and wildlife conservation in the easement area. Working with the US Army Corps of Engineers, the CCSWA also constructed 5.2 acres of wetlands to replace the 2.3 acres of wetlands that expansion of the Wayne Township landfill impacted.

E. Hazard Areas

1. Waste Sites

Handling, transporting, storing and treating hazardous waste materials are all regulated activities by both PADEP and the US Environmental Protection Agency (USEPA). The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), passed in 1980, deals with hazardous waste sites. This act focuses on identifying active and abandoned hazardous waste sites, planning their remediation and requiring the responsible parties to fund the clean up efforts. The most hazardous and contaminated sites are then compiled into a National Priority List (NPL). The sites on the NPL are commonly referred to as Superfund Sites and are eligible for federally funded remedial activities. Sites are chosen for the NPL based on the toxicity and quantity of the chemicals involved, the exposure pathways, the number of people potentially exposed and the vulnerability of the underlying groundwater (Masters, 1991). Although there are several sites in the study corridor (see Table 2-3 of the Technical Document) that are listed

by CERCLA's database only two of them are Superfund Sites, or sites currently listed on the NPL. The Superfund sites within the corridor are the AVCO Lycoming Textron Site located in the City of Williamsport, Lycoming County and the Drake Chemical Site located in the City of Lock Haven, Clinton County.

AVCO Lycoming was proposed to the NPL in January 1987. The site was formally added to the list in a final rulemaking on February 21, 1990. The site, located at 652 Oliver Street in Williamsport, Lycoming County, is a 28-acre active aircraft engine manufacturing plant. The plant also operates a wastewater treatment facility and a petroleum solvents reclamation facility. PADEP maintains that poor housekeeping resulted in contamination at the site. Monitoring wells near the site have detected trichloroethylene (TCE) contamination and groundwater has also tested positive for chromium. In 1995, a remedy for cleaning up the groundwater beneath the facility was proposed that involved metals precipitation using a diluted molasses solution, air sparging and soil vacuum extraction (SVE) to treat the organic-contaminated water. The metals precipitation system was approved and installed in January 1997 and is still operating. The air sparging system was approved by PADEP and USEPA, however it was later discovered that due to a higher than previously detected water table, the system would not be able to operate properly. A new design for the air quality phase of the clean up at the AVCO Lycoming Site is still being developed.

Drake Chemical was proposed to the NPL as one of the most serious or uncontrolled hazardous waste sites requiring long term remedial action in December 1982. It was formally added to the list in a final rulemaking on September 8, 1983. The site, located at 180 Myrtle Street in Lock Haven, Clinton County, consisted of a 10-acre abandoned chemical plant containing six buildings and over 60 process tanks and reactors. Drake Chemical manufactured chemical intermediates for pesticides and other organic compounds from 1960 through 1981. The site also housed at least 10 storage tanks containing acids, bases and fuel oils. There were also four wastewater lagoons; two of them unlined, on the site. The primary contaminants detected on-site were acids, inorganic chemicals, polycyclic aromatic hydrocarbons (PAH), metals, asbestos, pesticides, organic chemicals and volatile and semi-volatile organic compounds (VOC, SVOC). Contamination resulted from chemical manufacturing, chemical spills, chemical use and/or disposal, and specialty chemical mixing. Chemical sludge and contaminated oils covered or underlayed all of the open space on the site. In 1982, 1700 exposed drums and tanks were removed from the site and the leachate filtration system was installed in 1987. The cleanup of the contaminated soils began in April 1999 and resulted in over 295,000 tons of soil processed through an incinerator then backfilled on site. Compost was laid and grass planted. Remediation of the groundwater with carbon began in 2000. Remedial construction activities on the site were completed and the site was able to return to productive use on September 29, 2000 (USEPA, 2001a).

A state program similar to Superfund was implemented for Pennsylvania in 1988 through the passage of the Hazardous Sites Cleanup Act (HSCA). The only HSCA site located within the study corridor is the Reach Road Industrial Park Site located in the City of Williamsport, Lycoming County. At this site, PADEP detected Volatile Organic Compounds (VOC) at 14

sampling wells at a residential drinking water supply near the site in Williamsport. HSCA funds were used to connect all the residences and businesses in the area using the contaminated water supply to the municipal drinking water system.

A second state program involving hazardous waste sites is the Land Recycling Program signed into law in 1995. This program is similar to the brownfields program and encourages the recycling and redevelopment of old industrial sites into reusable land parcels (PADEP, 2001a). Within the study corridor, there are 21 redeveloped sites or sites scheduled for development through the Land Recycling Program. The majority of the 21 sites are located in Lycoming County (62 percent) and Clinton Counties (19 percent). They range from abandoned industrial facilities to active private residences that had leaking underground storage tanks.

The Land Recycling Program has had a positive impact on affected sites within the corridor by providing productive uses. Exposure pathways to human receptors from contaminated sites have been eliminated through the removal or capping of contaminated soils and the extension of public water supply lines to former ground water well users. The result of the program has been the conversion of vacant, contaminated sites with high liability clean-up costs to productive business space, parking lots or industrial uses. In some areas (such as the Reach Road area of Williamsport), residential homes with a new potable water source are once again marketable. In turn, the benefits of land recycling in the corridor help to stimulate economic growth and reduce the pressure to develop other open space, farmlands, or forested areas. Table 2-4 of the Technical Document lists the HSCA and Land Recycling Program Sites located within the study corridor.

The Resource Conservation and Recovery Act (RCRA), passed in 1976, regulates the generation, storage, transportation, treatment and disposal of hazardous substances. To treat, store or dispose of hazardous waste, a permit is required from USEPA. The Resource Conservation and Recovery Information System (RCRIS) is used by the USEPA to support its implementation of RCRA. There are hundreds of facilities listed by RCRIS that are located within the study corridor that range from manufacturing companies that produce hazardous chemicals to general businesses such as stores, schools and hospitals, which store and use hazardous chemicals to trucking companies and landfills which dispose of hazardous materials.

Finally, the Emergency Planning and Community Right-to-Know Act (EPCRA) requires annual reports of toxic chemical releases to the environment. These reports are submitted to USEPA on Form R, the Toxic Release Inventory (TRI) Reporting Form. The TRI list is available at no cost to any interested party on the Right-to-Know Network (RTKNET) or by contacting USEPA. There are 42 facilities within the study corridor that have reported routine or accidental releases of toxic chemicals to USEPA for listing on the TRI. Table 2-5 of the Technical Document provides a list of these facilities. Chemical constituents transferred from such facilities primarily include releases of metals, acids, ammonia, chlorinated compounds, sulfates and surface active and finishing agents. However, water quality studies of the Lower West Branch Susquehanna River showed that only a very small percentage of the pollution in the watershed comes from point sources. In fact, studies revealed that industrial point sources, package plants, municipal

point sources and surface mining account for less than 1% each of the total amount of impairment in the watershed. Therefore, any major impacts to the Lower West Branch are likely due to non-point sources such as agricultural runoff and acid mine drainage, which is discussed in more detail in the water quality portion of Section IV.

As part of the Clean Water Act, states are required to determine the total amount of pollution, toxic or conventional, that a given stream can receive and still achieve its designated use. These amounts are referred to as Total Maximum daily Loads (TMDL). When water bodies are polluted by sources such as acid mine drainage, pesticides and herbicides, nutrients and sediments from runoff, or sewage and industrial discharges, the TMDL process is a valuable and flexible regulatory tool that can be used to help solve the problems. TMDL's exist for facilities that are permitted to release toxic chemicals. Table 2-6 of the Technical Document provides information on facilities releasing toxic and conventional loads over permitted limits. Of the tributaries within the study corridor, only Buffalo Creek in Union County is targeted for TMDL development. Additional information on impaired streams is discussed in the water quality portion of Section IV.

2. Abandoned Mines and Quarries

The region of northcentral Pennsylvania along the Lower West Branch Susquehanna River study corridor does not have any bituminous or anthracite coal fields. However, there are still active and abandoned mining operations upstream of the study corridor. The non-fuel mineral materials most commonly mined in the study corridor include limestone, sand and gravel and sandstone. Significant amounts of clay, topsoil and shale are also mined. Again, mining sites may not be located directly within the study corridor but many, along with sources of Acid Mine Drainage (AMD), are located in the West Branch's watershed and can affect the water quality of the river (SRBC, 2001a). The impacts of AMD from abandoned mines on the West Branch are further discussed in Section IV, Water Resources.

According to the Pennsylvania Geological Survey, (PGS, 1997), there are at least eight quarries or mined land areas within the corridor, including five that are major producers of commodity materials. These larger productions include a limestone (lime) quarry in Union County near River Mile 4 (Eastern Industries), a sand and gravel open pit quarry in Northumberland County near River Mile 8 (Central Builders Supply Company), an open pit shale mining operation in Northumberland County near River Mile 15 (Watsontown Brick Company), a sand and gravel open pit quarry in Lycoming County near River Mile 34-35 (Milestone Material, Inc.) and a shale and clay open pit quarry in Clinton County near River Mile 69 (Mill Hall Clay Products).

3. Sinkholes

Karst topography includes those lands that overly limestone and dolomite bedrock and are subject to the formation of sinkholes. Sinkholes are depressions that have formed in land where limestone bedrock has dissolved through contact with surface water resulting in conduits to ground water aquifers. Sinkholes may form in agricultural areas or become used for dumps

making ground water subject to water borne contaminants and pollution. Small areas of possible karst topography are situated in the areas in Clinton and Lycoming Counties along Bald Eagle Mountain, particularly in the Jersey Shore area and at the southern end of the study corridor in Northumberland and Union Counties where limestone and dolomite or both are near the surface. However, no known areas of sinkholes or problems with sinkholes have occurred in these areas according to DCNR's Bureau of Topographic and Geologic Survey (DCNR, 2002).

IV. WATER RESOURCES

A. Major Tributaries

The study corridor is in the West Branch Susquehanna River Watershed within the areas identified by PADEP as Subbasins 9 (Central West Branch) and 10 (Lower West Branch) of the Susquehanna and Chesapeake Bay Basin. The West Branch Susquehanna River is the largest waterway in both subbasins however, it is the smaller, faster moving tributaries that carry the bulk of the sediment into the Susquehanna River and ultimately into the Chesapeake Bay (PSU, 1988).

A listing of the West Branch Susquehanna River's tributaries is compiled in Drainage List L of the Pennsylvania Code, Title 25, Chapter 93, Water Quality Standards. Chapter 93 assigns varying water quality classifications or protected use designations to streams regarding their suitable uses. High Quality waters are given more protection than Cold Water Fisheries, which in turn have more protection than Warm Water Fisheries.

There are 45 named, Order 3 tributaries that discharge directly into the West Branch within the study corridor (PADEP, 2001c). The majority of these are classified as Cold or Warm Water Fisheries (CWF, WWF) or Trout Stocked Fisheries (TSF). Cold Water Fisheries are known to support species adapted to colder mountain and limestone streams, such as brook trout, while Warm Water Fisheries support various species of warm water fish, such as bass, bluegill, carp and catfish. Only White Deer Creek, Pine Creek, Queen's Run and Lick Run are listed as High Quality (HQ) streams within the reaches located in the study corridor. The list of tributaries along with their protected uses is provided in Table B-3 of Appendix B. In addition to the larger streams, there are approximately 60 unnamed small tributaries that flow into the West Branch within the study corridor. All streams and their watershed divides can be seen on Map 1 in Appendix A.

B. Wetlands

Wetlands as defined by the United States Fish and Wildlife Service (USFWS) are those transitional lands located between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. These lands must, at least periodically, support hydrophytic vegetation, have predominantly undrained hydric soils as their substrate and be saturated with water or covered by shallow water at some time during the growing season of each year. While this definition is widely interpreted by various scientists and regulatory agencies, it includes the three parameters that define wetland areas.

Several freshwater wetlands types are found within the study corridor. Palustrine and riverine systems are the most common wetland ecosystems found in the corridor, however there are also

some lacustrine wetlands ecosystems present within the dam pools of the West Branch. Palustrine wetland ecosystems are inland freshwater wetlands dominated by trees, shrubs, or emergents in non-tidal areas, commonly known as swamps and bogs. Riverine wetland ecosystems are freshwater wetlands and deepwater habitats contained within a channel, commonly defined as rivers and streams. Lacustrine wetland ecosystems are freshwater wetlands or deepwater habitats situated within a topographic depression or dammed river channel, commonly known as lakes or ponds (Mitsch and Gosselink, 1993).

The most common wetland class types in the study corridor include palustrine emergent, scrub-shrub, open water and forested wetlands; and riverine, lower and upper perennial and intermittent wetlands. There are also a few lacustrine wetlands within the dam pools of the West Branch. Because the study corridor is concentrated on the area 1-mile in either direction of the banks of the West Branch, the majority of the wetlands are fringe wetlands associated with the river or its tributaries and are located within the 100 or 500-year floodplain. The locations of National Wetland Inventory (NWI) mapped wetlands within the study corridor are outlined on Map 7 of Appendix A. Some functions of these wetlands may include flood storage capacity, wildlife habitat, plant species diversity, the establishment of riparian buffer zones, stormwater retention and pollutant filtration, aesthetic and scenic opportunities and groundwater recharge.

In past decades, wetlands were looked upon as unsightly, undevelopable lands that needed to be filled or drained to make them profitable. As a result, much of the state's wetlands were drained for agriculture or filled to accommodate development. However, in 1977 the Clean Water Act (CWA) was passed and Section 404 of this act gave the US Army Corps of Engineers (USACE) jurisdiction over all waters of the Commonwealth, including wetlands, and regulation of activities within these areas began. The act defines wetlands as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of hydrophytic vegetation typically adapted for life in saturated conditions" (Mitsch and Gosselink, 1993). Wetlands in Pennsylvania are regulated by the United States. Army Corps of Engineers (USACOE) under Sections 404 and 401 of the Clean Water Act and by PADEP under Section 105 of the Dam Safety and Encroachment Act.

About 1.4 percent (404,000 acres) of Pennsylvania is covered by wetlands. Deciduous and forested wetlands are the most common types, followed by open water, marshes, shrub wetlands, and others. Wetlands are most densely distributed in the glaciated northwestern and northeastern parts of the State. Wetland area in Pennsylvania has decreased by more than one-half in the last 200 years. The primary causes of wetland loss or degradation have been conversion to cropland, channelization, forestry, mining, urban development, and the construction of ponds and impoundments. Within the Lower West Branch Susquehanna Watershed, approximately 56% of wetlands in the National Wetlands Inventory database have been lost over the past two decades. However, the USEPA estimates that Pennsylvania has lost 50 to 79% of its wetlands within the past 200 years (USEPA, 1999).

As previously stated, one of the most important wetland complexes located within the study corridor is Montandon Marsh located in West Chillisquaque Township, Northumberland County. Montandon Marsh is a 44-acre wetland complex located just east of the town of Lewisburg along the West Branch Susquehanna River. The marsh is a very diverse riparian wetland ecosystem of glacial origin and contains marshes, swamps, bogs, and seasonal ponds nestled among low sand dunes. Because it is situated on the West Branch Susquehanna River, which is an ancient, glacial-oriented, braided river course, the habitat is a unique mixture of low sand dunes and wetland areas able to support a diverse population of rare plant and animal species.

Some of the plant species present in Montandon Marsh have northern bog affinities like *Chamaedaphne calyculata* (leatherleaf) and *Vaccinium corybosum* (highbush blueberry). Furthermore, Montandon Marsh is one of the few remaining areas in Pennsylvania that contains a healthy population of the state rare species *Scirpus fluvialitis* (river bulrush) and *Carex bullata* (bull sedge). The marsh is also known for its large pocket population of *Scaphiopus platifhinos* (Eastern spadefoot toads). Two bird species listed as threatened in 1985 by the Pennsylvania Game Commission, *Cistothorus palustris* (marsh wren) and *Ixobrychus exilis* (Least Bittern), have occasionally been observed and are suspected of nesting in the marsh. Montandon Marsh is also utilized as a stopover area for migratory birds flying through the region.

Many Bucknell and Susquehanna University students and faculty have completed studies and written theses describing Montandon Marsh's unique sand dune and wetland habitat and the species it supports. Although gravel mining has been proposed in the area, with the appropriate minimization and mitigation techniques, the mining should not have an adverse impact on the marsh (Hochman, et. al 1996). This wetland area is part of land owned by Central Builders Supply, Inc. of Sunbury, PA. Another 34-acre parcel of the Montandon Marsh ecosystem, known as the Belles Tract, is owned and preserved through a conservation easement by the Merrill W. Linn Land and Waterways Conservancy of Lewisburg, PA.

C. Floodplains

As seen on Map 7, the valley section of the entire 77-mile study corridor is located within either the 100 or 500-year floodplain of the West Branch Susquehanna River.

A floodplain includes those lands adjoining a river or stream that have been or may be expected to be inundated by floodwaters in a 100 or 500-year frequency flood. The alluvial soils of floodplains are typically fertile and productive soils that receive adequate hydrology, therefore agricultural areas tend to be concentrated in and around floodplain areas. During colonization, floodplains were where the settlers were able to easily travel. They could survive due to the level transportation routes and significant water sources. For these reasons, cities and towns tended to develop along the floodplains of major rivers.

With increased development however, floodplains have lost their capacity for storing floodwaters. Heavy flood damage has occurred to structures and properties within the study

corridor. The Susquehanna River Basin Commission (SRBC) maintains that the Susquehanna River basin is one of the nation's most flood-prone areas. The topography of the area, specifically the narrow gorges that the otherwise wide river must pass through, result in flooding events from ice jams and the subsequent melting that cause downstream surges. In addition, areas along the river that have very shallow banks and little slope, are flood prone areas. Heavy rainfall events easily cause the river to swell and flood these banks. Although these areas are prone to flooding, nearly 30% of the population in the Susquehanna basin lives along the major rivers (SRBC, 2001b).

For these reasons, SRBC and PADEP have developed one of the most extensive flood protection programs in the nation. SRBC and PADEP are authorized to provide structural flood protection in any area of the Commonwealth that requests such protection, if it can be economically justified. The program works best when it combines structural and non-structural flood protection methods. Structural protections include dams, reservoirs, floodwalls and levees, and channel excavation and modification.

Williamsport and South Williamsport became the first communities in the study corridor to have structural flood protection when the US Army Corps of Engineers (USACE) constructed a levee system in the 1950's. Lock Haven received their flood protection levees in the early 1990's. Flood control reservoirs that also help to mitigate flooding in the study corridor include the Stevenson, Bush, Sayers and Curwensville dams, all of which are located upstream of the study corridor.

Non-structural flood protections methods include the Susquehanna Flood Forecast and Flood Warning System, flood insurance, relocation, flood training and education, floodproofing and floodplain management. In 1998, Lycoming County became part of the Pennsylvania Project Impact Partnership, which is a flood disaster resistance initiative to implement proactive, long-term strategies to reduce the risk of damage from natural and man-induced disasters. Union County was awarded a Project Impact Grant in 2001. Recorded flood stages from the National Weather Service along the West Branch are 18 feet in Lewisburg, 19 feet in Milton, 20 feet in Williamsport, 26 feet in Jersey Shore and 21 feet in Lock Haven (SRBC, 2001b). It should be noted that flood stages are representative for a whole reach of a river and indicate the point at which flood warnings are issued by the National Weather Service.

Most comprehensive flood protection projects are designed to provide protection from the 100-year flood (i.e., a flood that has a one percent chance of occurring in any given year). In some cases economic limitations, or restrictions by bridges, buildings, or other encroaching structures, make it impractical to provide this degree of protection. No local flood protection project will completely eliminate the possibility of future flooding since past flooding events cannot be presumed as the greatest that can ever occur.

Floodplain protection projects typically include acquisition and clearing of structures experiencing repetitive flooding and the removal of small dams, abandoned bridges and other man-made structures that alter the flow of floodwaters. Buyout programs could also result in

opportunities to create new open space and public access greenway areas within the study corridor. Work within any floodway in Pennsylvania requires the appropriate water obstruction and encroachment permits issued under Section 105 of the Dam Safety Act from PADEP and/or the USACOE. A floodway is the channel of a watercourse and portions of the adjoining floodplains that are reasonably required to carry and discharge the 100-year frequency flood (PADEP, 1999b). Work in the 100-year floodplain is regulated or restricted by municipalities and county planning commissions.

D. Lakes and Ponds

According to the USEPA, there are 135 lakes consisting of 2,926.9 acres in the Lower West Branch Susquehanna River Watershed and 7 lakes totaling 246.2 acres in the Middle West Branch Susquehanna River Watershed. However, most of these lakes are not located directly within the study corridor.

As previously mentioned, lakes are formed within the banks of the West Branch from waters that back up and form pools behind dams. There are three dam pools or "lakes" that provide various opportunities for water recreation. The Adam Bower Dam at Sunbury (formerly known as the Fabri-Dam) is located on the main stem Susquehanna River below the confluence, but the dam pool, also known as Lake Augusta, extends up the West Branch to River Mile 6 in Northumberland County. The Hepburn Street Dam in Williamsport is located at River Mile 40 and the dam pool ends at River Mile 52. The Grant Street Dam in Lock Haven is located at River Mile 70 and the dam pool ends at River Mile 73. In addition, previous restoration, flood control and/or stormwater control efforts in the corridor have resulted in the creation of stormwater detention basins, constructed ponds, open-water wetlands and other water sources in the study corridor.

E. Water Quality

Numerous studies conducted on the Lower West Branch Susquehanna River and within the overall watershed indicate that water quality within the watershed and in the West Branch Susquehanna River is good. Sources of water quality problems include agriculture, urban and storm sewers, stormwater runoff from construction sites, atmospheric deposition, abandoned or acid mine drainage (AMD), removal of vegetation, industrial point sources, package plants, municipal point sources, surface mining, on-site sewage and sewage treatment systems. These sources of impairment for the West Branch and its tributaries are listed by waterbody in Table 2-7 of the Technical Document.

The USEPA Surf your Watershed website provides an Index of Watershed Indicators that characterizes the condition and vulnerability of aquatic systems in each of the watersheds in the United States. The overall classification for the Lower West Branch Susquehanna River Watershed is "Better Water Quality and Low Vulnerability" (USEPA, 1999). This is the highest

rating in the system. "Better Water Quality" refers to watersheds where data is sufficient to assert that the State or Tribal designated uses are largely met and other indicators of watershed condition show few problems. "Low Vulnerability" refers to watersheds where data suggest pollutants or other stressors are low, and, therefore there exists a lower potential for future declines in aquatic health. Actions to prevent declines in aquatic conditions in these watersheds are appropriate but at a lower national or statewide priority than in watersheds with higher vulnerability. It should be noted however, that some water quality problems do exist in the West Branch regardless of this rating by the USEPA.

There are numerous opportunities for water quality studies and data collection throughout the 77-mile study corridor. Students at the Pennsylvania State University's Landscape Architecture Department produced a West Branch Susquehanna Scenic River Study (Lock Haven to Muncy) in 1988 and (Muncy to Sunbury) 1989. Data on surface water quality collected included pH, temperature, flow discharge, biochemical oxygen demand (BOD), dissolved oxygen and specific conductance.

The study indicated that most of the pH problems in the northern section of the study corridor are derived from abandoned coal mines to the north and west of the study corridor. Severe acid pollution exists in the Lock Haven area from AMD located upstream making the pH of the West Branch around 4.0 in that area at the time of the study. However, Bald Eagle Creek is very alkaline and once it merges and mixes with the West Branch just east of the City of Lock Haven, the river stabilizes to a near neutral pH of 7.0. The pH remains fairly stable and around neutral throughout the rest of the corridor. This is the result of the limestone fed tributaries that merge with the river, neutralizing any acid pollution picked up from AMD throughout the study corridor. High levels of specific conductance resulting from dissolved solids were detected near Lock Haven and Williamsport. The study did not find any significant water temperature changes along the northern part of the corridor (PSU, 1988). In addition, the dissolved oxygen and specific conductance were fairly stable in the southern section (Muncy to Northumberland) of the corridor (PSU, 1989).

In 1997, the USACE studied the level of federal interest in environmental restoration, streambank protection, flood control, floodplain management, flood damage reduction and stormwater management of the Lower West Branch. The USACE used the study to develop a plan for both identifying necessary feasibility studies and finding viable sponsors to fund the proposed work.

The studies revealed that the water quality was good in Buffalo, White Deer, Muncy, Loyalsock and Lycoming Creeks. There have been few groundwater pollution incidents from landfill leachate or septic systems malfunctions. However, the studies did find a variety of water related problems in other areas including flooding, streambank erosion and sedimentation, degraded environment and aquatic habitat and reduced water quality.

Development within the watershed had increased the percentage of impervious surfaces resulting in reduced infiltration rates and increased volumes of stormwater runoff and flooding. The

increased flood flows have contributed to severe bank erosion along certain tributaries. This led to an increase in the amount of sediments entering the West Branch. The increased sediment can lead to other problems including alterations in the natural configuration of the channel, loss of stream meanders, decreased occurrences of pool, riffle, and run patterns and a destruction of the variety and abundance of aquatic habitat.

Much of the river is affected by non-point source pollution, which was not the focus of water quality measurements by natural resource agencies in the past. A major source of non-point source pollution in the West Branch Susquehanna River is from AMD. Nearly 200 miles of the West Branch Susquehanna River are impaired to various degrees by AMD, however most of the impaired reaches are located upstream or in the last 5 miles of the study corridor (above Lock Haven). As the river travels through the study corridor the water chemistry gradually improves once neutralized by limestone fed streams (USACE, 1997).

Although many of the streams that flow into the West Branch have good water quality, there are a few that have experienced severe pollution problems. The USEPA and PADEP use an impaired waters list (Section 303 (d)) to identify those waters where existing pollution controls are not stringent enough to achieve state water quality standards even after implementation of technology-based controls. Section 303(d) of the Federal Clean Water Act requires states to establish total maximum daily loads (TMDLs) in accordance with a priority ranking. The 303(d) list is submitted to USEPA and updated every two years (PADEP, 2000). A list of the water bodies within or drain into the study corridor on the 303(d) list in Pennsylvania is provided in Table 2-7 of the Technical Document.

In 1995, PADEP conducted a study of the West Branch from Williamsport to Lewisburg. The study, provided in Section 8 of the Technical Document (TD-8), focused on municipal sewage treatment plants that discharge directly into the river. Parameters measured or studied included benthic macroinvertebrates, fecal coliform, chlorine, pH, dissolved oxygen, BOD, suspended solids, and other chemical parameters and habitat and substrate observations. Thirteen of the 14 effluent sampling points indicated biological scores above 83% of the respective reference sites, indicating no impairment. Only the Kelly Township site recorded a score of 75% of its reference site indicating slight impairment. The impairment was attributed to an increased chlorine content of the effluent. Three of the discharges, Williamsport Central, Montgomery and Lewisburg contained high fecal coliform counts. There were a few slight increases in ammonia, nitrogen and total phosphorous at the effluent sites, but none were excessive. All other chemical parameters were unaffected and indicated good water quality. Some metal precipitates were present at all the sites but were greater toward the north end of the study corridor where coal mining has contributed to precipitates in the water (Hughey, 1996).

In July 2000, the Lycoming College Clean Water Institute started collecting water quality data from twelve different monitoring locations on the West Branch Susquehanna River throughout the length of the study corridor. These locations include Sunbury, Lewisburg Milton, Watsontown, Montgomery, Muncy, Montoursville, Williamsport, Susquehanna Campground, Jersey Shore, Great Island and Lick Run. Parameters that the Clean Water Institute monitors

include ortho-phosphorous, total phosphorous, temperature, dissolved oxygen, pH, alkalinity, conductivity, total dissolved solids, nitrate and coliform. Data from these water quality monitoring events are provided in TD-8 and indicate that nitrates and coliform are higher in the river from Sunbury to Montoursville, while ortho-phosphorous and total phosphorous have been high in the Watsontown area. High nitrate and coliform concentrations suggest influence from untreated wastewater or animal manure (barnyard runoff). Higher concentrations of phosphorous and orthophosphates indicates influence form wastewater treatment plants, fertilizers and detergents. Alkalinity once again proves to be highest at the Sunbury and Lewisburg sample locations and remains fairly consistent up to the Jersey Shore sample location. This supports the fact that Bald Eagle Creek, and other smaller limestone streams, provide a large source of carbonate buffering to the river. The lack of buffering and the effects of AMD above Lock Haven are apparent from low alkalinity concentrations and higher total dissolved solids and conductivity, the latter of which can likely be attributed to high concentrations of dissolved metals.

Finally, another study involved a baseline assessment, which quantified current impairment data for the Big Bend Watershed (also known as the Lower West Branch Susquehanna River; PADEP Subbasin 10). The Big Bend watershed encompasses the Antes-Lycoming Creek (10A), Loyalsock Creek (10B), White Deer-Buffalo Creeks (10C) and the Muncy-Chillisquaque Creek watersheds. Completed by PADEP's Big Bend Project Team, the study was part of a monitoring effort conducted to determine the causes and effects of pollution within the Lower West Branch Susquehanna Watershed. The study revealed that of the 3,377.08 stream miles (within the watershed), 393.82 stream miles (11.7%) are impaired. The Muncy-Chillisquaque Creek Watershed (Subbasin 10D) was by far the most impaired, claiming nearly 83% of the total impaired River Miles (Aldenderfer, 2001). The impairment in this area is likely due to the extremely high concentration of agricultural farms and developed areas adjacent to the streams and the river in this region. A discussion of the various point and non-point sources of pollution and the methods for monitoring water quality in the study corridor are described in the sections that follow.

1. Point Sources

Most often, water quality is measured by the absence or presence of certain sources of pollution. Point sources of pollution to water systems are direct discharges coming from a known facility, pipe or ditch to a known location in a stream or river. Point source pollution is most often associated with industries or municipalities that discharge wastewater to natural waters through a pipe or ditch (Brooks, et. al., 1997). Point sources of pollution can be measured and treated, therefore discharges of wastewater in the United States are regulated under the provisions of the Clean Water Act and sources must obtain permits issued under the National Pollutant Discharge Elimination System (NPDES) in order to discharge wastewater into streams. An NPDES permit requires the discharger to meet certain technology-based effluent limits and perform effluent monitoring.

There are 147 facilities within the study corridor that have NPDES permits to discharge wastewater into the waterways of the Lower West Branch Susquehanna River Watershed. These facilities discharge predominantly sewage and industrial waste effluents. The majority of the facilities are concentrated in the urban centers of Northumberland, Milton, Williamsport, Jersey Shore and Lock Haven. See Table 2-8 of the Technical Document for a detailed list of the NPDES facilities within the study corridor.

The previously mentioned baseline assessment done for the Big Bend Watershed or Lower West Branch Susquehanna River showed that only a very small percentage of the pollution in the watershed comes from point sources. The study revealed that industrial point sources, package plants, municipal point sources and surface mining account for less than 1% each of the total amount of impairment in the watershed. The reason for this is likely due to our ability to measure, monitor, control and reduce the amount of point source pollution coming from any one given facility or location. In addition, there are existing laws and agencies that have the ability to regulate and enforce effluent standards to reduce the total point source pollution. Therefore, any major impacts to the Lower West Branch are due to non-point sources, which are discussed in further detail below.

2. Non-point Sources

Unlike point sources, non-point sources of pollution occur over a wide area and are usually associated with large-scale land activities such as agriculture, livestock grazing, mining, logging and development of impervious surfaces resulting in increased amounts of often polluted stormwater runoff. Non-point source pollution is difficult to measure, regulate and treat because of the nature of the activities that cause it and the large-scale area that it is derived from (Brooks, et. al., 1997).

The baseline assessment done for the Big Bend Watershed or lower West Branch Susquehanna River revealed that 9 of the top 10 sources of pollution in the watershed were caused by non-point sources. The study revealed that the largest contributor of impairment (70%) in the entire watershed was agricultural pollution. Remaining impairment sources (30%) included road runoff, atmospheric deposition, small residential runoff, abandoned mine drainage, urban runoff and storm sewers, natural sources and removal of vegetation.

In the southern section of the study corridor, agriculture and development pressures along tributaries contribute to an increase of non-point source pollution to the West Branch. Types of pollution common to agricultural areas include increased soil erosion and deposition, barnyard runoff and wastes from livestock loafing in waterways. The primary problem resulting from increased land development is the increase in stormwater runoff from impervious surfaces such as roofs, parking lots, roads and driveways. The increase in stormwater volumes and velocities results in accelerated erosion and sedimentation, while thermal and chemical pollution from roads and large parking lots further degrades water quality. The increase in impervious surfaces within the corridor also reduces infiltration and groundwater aquifer recharge.

Acid mine drainage (AMD), discharged from abandoned mines located throughout the state, is currently the largest non-point source pollution problem in Pennsylvania (SRBC, 2001a). Fortunately, tributaries flowing into the lower West Branch area do not directly contribute to AMD due to the absence of large-scale mining activities within and adjacent to the study corridor. However, as previously mentioned, AMD from bituminous coal mining upstream of the corridor is the primary non-point source pollution problem in the northern section of the study corridor. In fact, the river upstream of the corridor is devoid of aquatic life due to the impacts of AMD, such as high acidity and dissolved metal concentrations. As a result, fish populations within the study corridor upstream of Lock Haven are sparse. However, AMD impacts become buffered and reduced by limestone streams such as Bald Eagle Creek and other good quality mountain tributaries within the study corridor and the fishery progressively improves downstream. The efforts to mitigate AMD impacts on impaired tributaries upstream of the study corridor are strongly encouraged to continue even though such projects are not within this study corridor.

Methods for controlling and minimizing non-point source pollution from agriculture include the use of sound land management practices such as crop rotation, proper timber harvesting, balanced use of fertilizers, barnyard waste management, erosion control and streambank fencing. Methods for reducing non-point source pollution from land development include zoning laws to help control and restrict development to certain areas and the use of best management practices (BMP's) to treat increased runoff from impervious surfaces and help stormwater infiltrate back to the groundwater. The establishment of riparian buffers along streams and the use of passive wetland treatment systems to filter and treat stormwater runoff before it enters receiving streams can further reduce non-point pollution.

3. Monitoring

The water that flows through our many creeks and rivers holds the key to life. Our waters support terrestrial and aquatic life, including plants, animals, and people. Though often taken for granted, water is a precious resource that should be cherished. Good quality water is an essential component of recreational, educational, and industrial opportunities and the well-being of our civilization. The only way to assess and evaluate the quality of streams and rivers in the watershed is through consistent and accurate monitoring. Traditionally, most of the water quality sampling and monitoring in the state was done by either PADEP, the United States Geologic Survey (USGS) or some other governmental agency such as the Pennsylvania Fish and Boat Commission.

There are eight stream flow gauging stations operated by USGS located along the West Branch Susquehanna River within the study corridor. The stations are in Lewisburg, West Milton, Watsontown, Montoursville, Williamsport, Jersey Shore and Lock Haven. Although these gauging stations help to provide valuable water quality and quantity data, there has been an increasing concern and quest for more detailed data and knowledge of water quality problems throughout entire watersheds in recent years. The government agencies' staffs cannot handle comprehensive water quality monitoring for all the streams in the Commonwealth, therefore

citizen-based groups are becoming educated and have begun volunteer monitoring programs across the state. Even before the formal inception of the Citizen's Volunteer Monitoring Program by PADEP, citizen volunteers have been involved in monitoring the quality of the waters in their area since the 1960's. The Citizen's Volunteer Monitoring Program now enables even more watershed groups, interested citizens, schools, clubs and others to learn about and participate in the monitoring of the water quality in their watersheds (PADEP, 2001b).

Recently formed watershed groups within the study corridor include the Chillisquaque-Limestone Creek Watershed Association, Buffalo Creek Watershed Alliance, White Deer Creek Watershed Restoration Committee, Muncy Creek Watershed Association, Loyalsock Creek Watershed Association, Lycoming Creek Watershed Association and the Nippenose Valley Watershed Association. For more information on watershed groups, visit PADEP's web site at www.dep.state.pa.us or Pennsylvania Organization for Watersheds and Rivers web site at www.pawatersheds.org.

Most importantly, the study corridor has a broad base of private and public colleges and universities, which have the professional staff and students to plan, supervise and implement water quality studies within the corridor. The Lycoming College Clean Water Institute is one such entity that plans to continue monitoring the water quality within the corridor. Other institutions that conduct biological, chemical and geological studies of the corridor's surface and groundwater resources include Bucknell University, Lock Haven University and Susquehanna University. These institutions not only have volunteers, equipment and laboratories to complete monitoring, they have the need to involve their students in meaningful curricula and projects. It is a win-win situation for everyone who partners with and uses these educational institutions as a means to monitor and solve water resource problems within the West Branch Susquehanna River corridor. Such partnerships will be key to implementing water quality management options and projects identified in Section IX, Management Options.

F. Water Supply Areas

1. Public vs. Private

Within the study corridor, there are approximately 102 municipal and private water supply sources that provide potable water from springs and wells for customers they serve or for private businesses (PADEP, 2001d). Public or private utilities provide water for 66% of the households, while 30% utilize individual residential wells (USCB, 2001). The water supply systems within the study corridor include five nontransient, noncommunity systems and 42 community systems. Of the municipal community systems, the Montgomery Borough Water and Sewer Authority, Muncy Borough Water Company, Montoursville Water Company and the Williamsport Municipal Water Company have sources located directly in the study corridor. There is only one surface water intake on the West Branch Susquehanna River. Owned by the Pennsylvania American Water Company, this intake is located along the eastern shore at River Mile 11 in the Borough of Milton. Pennsylvania American Water Company is a private water company.

According to information provided by PADEP (listed in Table 2-9 of the Technical Document), these water sources serve populations from 25 to 5,200. The Williamsport Municipal Water Authority sources include 9 wells that serve as a reserve for the Williamsport area. Pennsylvania American Water Company's single intake can serve up to 40,160 consumers. It should be noted, however, that these water supply sources are not the only sources that service the population within the study corridor. For instance, Williamsport's primary water supply source is from large reservoirs in the Mosquito Creek and Hagermans Run Watersheds outside of the corridor. Pennsylvania American Water Company also draws water from White Deer Creek and Spruce Run Reservoir (a tributary to Buffalo Creek in Union County). Other municipalities such as Jersey Shore and Lock Haven also receive their primary drinking water sources from areas outside the corridor. Map 7 shows the locations of municipal and private groundwater supply wells and the surface water intake point. These locations can be cross-referenced with the source information provided in Table 2-9 of the Technical Document. It should be noted that the data does not include individual groundwater supply wells that service private residents located in the corridor.

2. Well Head Protection Areas

Wellhead protection is defined in Section 1428 of the Federal Safe Drinking Water Act (SDWA) as a comprehensive program to protect wellhead protection areas (WHPA) from man-induced contaminants, which have an adverse effect on the health of people. The Pennsylvania Safe Drinking Water regulations, 25 PA Code Chapter 109, direct public water suppliers to find the best source available and take those measures necessary to protect that source to provide a continual and safe water supply. The SDWA regulations define wellhead protection and wellhead protection areas, set permitting requirements for ground-water sources, set operations requirement and establish elements necessary for state approval of local wellhead protection (WHP) programs. Not all, but many of the WHP management approaches for a comprehensive local WHP program would require local government action, cooperation or support. PADEP has been developing a state Wellhead Protection Program Plan for Pennsylvania since 1989. Most of these efforts have focused on encouraging voluntary local program development through education and incentive grants, formulating technical WHP area delineation strategies and the establishment of regulations and associated compliance assistance.

Public education and participation are key to local WHP program development. A series of approaches can be developed to educate and involve the public in WHP. PADEP reviews and approves local WHP programs, which meet the basic elements set-out in the state SDWA regulations. PADEP can provide data to local WHP programs on state or federally regulated potential sources of ground-water contamination and can advise them on approaches for WHPA delineation, conducting contaminant source inventories, public education programs and management approaches. Existing federal guidelines and recommendations can be utilized for the program and guidance will be developed only if a need arises. The principles of the Comprehensive State Ground Water Protection Program should be applied to coordinate point and non-point source pollution prevention programs with the local WHP programs. Funding for

local wellhead protection programs is available from SDWA State Revolving Set-Aside Funds and through PADEP's Source Water Protection Grant Program. Additional PADEP field and central office staff and fixed assets can be used to support WHPA delineations, assessments and management plan development and to support public participation and public promotion of these activities (PADEP, 2001e).

Within the study corridor, there are several known wellhead protection programs in various municipalities. The Montoursville Water Company was recognized by PADEP for its voluntary efforts to develop the first state-approved wellhead protection program in the state in 1999. The Borough began developing the program in 1995. The program emphasizes technical, educational and financial assistance to encourage the development of voluntary local wellhead protection programs (PADEP, 2001d). In a similar effort, the Jersey Shore Area Joint Water Authority became a member of the Partnership for Safe Water in January 2000. The partnership is a voluntary effort involving rigorous self-assessment procedures specifically geared toward identifying weaknesses in existing plant operations, design and administration. In August 2000, Williamsport also joined the Partnership for Safe Water. Other areas in Union and Northumberland Counties were awarded grants in past years to conduct feasibility studies or develop wellhead protection programs in the study corridor (PADEP, 2001e).

Continued wellhead protection efforts are encouraged within this River Conservation Plan. Specific implementation projects to promote wellhead protection programs to protect the quality and quantity of community ground water supplies are identified in Section VIII, Management Options.

V. BIOLOGICAL RESOURCES

A. Wildlife

1. Terrestrial

Because the land uses are so varied throughout the study corridor, there are a variety of habitat cover types and therefore, many different wildlife species that exist in the region. The southern section of the study corridor in Union and Northumberland Counties is comprised of forested river hills, agricultural lands, urban developed areas and floodplain wetlands. A very large portion of the northern section of the study corridor in Lycoming and Clinton Counties is relatively undisturbed forestland. Over 50 different species of mammals can be found in the study corridor. Bird life within the study corridor is comprised of approximately 114 species of songbirds, gamebirds, waterfowl and birds of prey. There are also numerous species of reptiles and amphibians including snakes, frogs, turtles, toads and lizards. Management options and specific implementation projects to further inventory biological diversity and important wildlife habitat areas are identified in Section VIII, Management Options.

Northcentral Pennsylvania is known for its abundance of game and non-game animal species. Of the mammals, common game animals that inhabit the study corridor include the white-tailed deer, black bear, gray squirrel, cottontail rabbit, and the woodchuck. As individual counties, Lycoming and Clinton Counties maintain the largest bear harvests each year in Pennsylvania. Furbearing mammals occurring in the corridor that may be trapped or hunted include the red fox, gray fox, coyote, raccoon, opossum, weasels, striped skunk, mink, beaver and muskrat. Non-game mammal species include the porcupine, various species of bats, mice, rats, voles, and moles.

Another common mammal that inhabits the corridor is the bobcat, which was a protected species from 1970 to 1999. After 30 years of protection and 15 years of field research, the Pennsylvania Game Commission (PGC) decided to provide limited hunting and trapping opportunities for bobcats in the northern counties of Pennsylvania where adequate habitat supports larger populations than the remainder of the state. During the 1999-2000 hunting and trapping season, the Pennsylvania Game Commission (PGC) began to permit a limited number of bobcats to be harvested in Furbearer Management Zones 2 and 3, which includes that area of the corridor north of US 220 in Lycoming and Clinton Counties. Seasons on bobcats have been held during the last three years and are scheduled once again for the 2003-2004 season.

Several species of game birds also inhabit the corridor including wild turkey, ruffed grouse, ring-necked pheasant (introduced), mourning dove, common snipe, American woodcock, Canada geese and various species of ducks. Non-game birds such as songbirds, birds of prey, herons, swans and seagulls are also abundant within the corridor. Common birds of prey in the corridor include owls, hawks, osprey, turkey vulture, American kestrel, peregrine falcon and bald eagles.

Extirpated species in Pennsylvania include the gray wolf, wolverine, moose, bison. The marten, fisher, badger, mountain lion and lynx are listed as species of uncertain occurrence in Pennsylvania (Merritt, 1987). The river otter and fishers were thought to be extirpated, however in recent years, a few populations have been reintroduced in select areas of northcentral Pennsylvania. Although the Eastern elk native to Pennsylvania were extirpated from the state by the late 1870s, the PGC reintroduced elk from Yellowstone National Park in 1913. Elk have occasionally wandered into the Clinton County and western Lycoming County sections of the study corridor (PGC, 2001). A complete listing of all bird and mammal species found within the study corridor is provided in Table 2-10 of the Technical Document.

According to the Pennsylvania Fish and Boat Commission, the study corridor provides acceptable habitat and is within the home range for several salamander, frog, toad, turtle, lizard and snake species (Shaffer, et. al., 1999). These groups may be represented by as many as 13 species of frogs, 6 species of turtles, 2 species of lizards and 12 species of snakes. Some of the more common species of amphibians and reptiles present within the corridor include the red spotted newt, American toad, Northern spring peeper, bull frog, pickerel frog, wood frog, painted turtle, Eastern box turtle, Northern black racer, black rat snake, Eastern milk snake, Eastern hognose snake, Northern water snake, Eastern garter snake, Northern copperhead and the timber rattlesnake. For a complete list of amphibians and reptiles that may occur within the study corridor, please refer to Table 2-11 of Technical Document.

2. Aquatic

The West Branch Susquehanna River and its tributaries exhibit good water quality and provide some excellent habitat for aquatic wildlife including fish and benthic macroinvertebrate species. Several of its tributaries are classified as cold water fisheries and many of them support large populations of game species, such as native brook trout. Two such streams are even considered true limestone streams, that are fed by cold springs. These streams are Antes Creek in Lycoming County and Bald Eagle Creek in Clinton County. Other waters in the study corridor are classified as warm water fisheries (WWF) or trout stocked fisheries (TSF). At least 49 species of fish are known to occur within the study corridor. Some tributaries to the West Branch even sustain non-native trout (brown and rainbow trout) reproduction. Common species found in the study corridor are minnow species including shiners and dace, perch species including darters and walleye, sunfish species including small and large-mouth bass, bluegill and crappie, trout species including rainbow, brook and brown trout, catfish species including bullhead, channel and madtom, sucker species including white, creek and northern hog sucker, sculpin species including mottled and slimy sculpin, pike species including northern pike, muskellunge and pickerel and American eel (PSU, 1989). The list of fish species present or suspected present in the West Branch is provided in Table 2-12 of the Technical Document. Specific locations of documented fish species were observed in the corridor through scientific collection is provided in Table 2-13 of the Technical Document.

Up until the early 1900's, American shad (*Alosa sapidissma*) and hickory shad (*Alosa mediocris*) migrated up the Susquehanna from the Atlantic Ocean in mass numbers and up the West Branch to the Allegheny Front above Lock Haven. Their abundance made for a bountiful harvest each spring during spawning runs and were a valued commodity for commerce.

Between 1904 and 1932, four hydroelectric dams were built on the Lower Susquehanna River and by 1928, there were no shad migrating to be harvested. Those barriers to migration have been reversed! Since the early 1980s, shad restoration efforts (stocking fingerlings) and retrofitting the hydroelectric dams with fish ladders and fish lifts have once again allowed fish to migrate up the Susquehanna River (USFWS, 1999). Now, efforts are underway to restore shad passage to the upper reaches of the main stem and the West Branch by retrofitting the inflatable dam in Sunbury with a fish passage structure that should be operational in spring 2004.

Restoration is currently managed by the Susquehanna River Anadromous Fish Restoration Cooperative (SRAFRC), whose membership includes the Pennsylvania Fish and Boat Commission, U. S. Fish and Wildlife Service, National Marine Fisheries Service, Maryland Department of Natural Resources, New York Department of Conservation, and the Susquehanna River Basin Commission. Additional support for the restoration has been provided by the Pennsylvania Department of Environmental Protection, Alliance for the Chesapeake Bay, Chesapeake Bay Foundation and numerous fisheries interests. The ultimate goal is to restore an annual population of two million American shad and 15 million river herring to the Susquehanna River Basin. The restoration of American shad and other migratory fishes to the Susquehanna will provide enormous angling opportunities and other economic benefits to the citizens of Pennsylvania (Carney, 1999).

In addition to a large diversity of fish, there are also numerous species of benthic macroinvertebrates that inhabit the West Branch and its tributaries. These most commonly include the aquatic larval stages of insects. Benthic macroinvertebrates from 13 different Orders were found by the Clean Water Institute including Turbellaria (no specific taxa cited), Annelida (1 taxa), Decopoda (1 taxa), Plecoptera (3 taxa), Ephemeroptera (11 taxa), Odonata (2 taxa), Megaloptera (1 taxa), Trichoptera (12 taxa), Lepidoptera (1 taxa), Coleoptera (4 taxa), Diptera (18 taxa), Gastropoda (3 taxa) and Pelecypoda (1 taxa). Invertebrates from the Orders Ephemeroptera (mayflies), Plecoptera (Stoneflies), and Trichoptera (Caddisflies) are generally considered to be pollution-sensitive species so their presence at a site is generally an indicator of good water quality, since their sensitivity precludes them from inhabiting degraded areas. Both mayflies and caddisflies are present in the West Branch and its tributaries. The list of benthic macroinvertebrate species found in the study corridor is provided in Table 2-14 of the Technical Document.

B. Vegetation

The vegetation found along the West Branch Susquehanna River is indicative of other study corridor aspects such as topography, geology, wildlife resources, soils, climate and land use.

The vegetation also plays a very important role in the region's history. Overall, approximately 37.8% of the study corridor is forested. This vegetation is not only valuable for its timber resources but also for its scenic, environmental and wildlife habitat values. Once dominated by virgin pine and hemlock and hardwood forests, the forested sections are now comprised of second growth deciduous forests with mosaic stands of evergreen and mixed deciduous species. Another 32.6% of the land cover in the study corridor consists of agricultural lands. The crops grown in this land use cover type are also important for its resources and economy for the region.

The southern section of the study corridor includes Northumberland and Union Counties, where the landscape is comprised of a mixture of urban and agricultural areas with sporadic forested river hills and floodplains. Urban and residential areas support some native evergreen and deciduous species but are also manicured with, non-native ornamental species such as yew, hybrid species of maples, dogwoods, azaleas and rhododendron. Agricultural areas in this section of the corridor are comprised of hay, corn, small grains, soybeans, vegetables, tobacco, orchards or plant nurseries.

The forested river hills in the southern section of the corridor (Northumberland and Union Counties) are characteristic of the Virginia Pine - Mixed Hardwood/Rich Shale Woodland and the Dry Oak Heath Woodland community types (Fike, 1999). On the ridge tops and the drier south facing slopes, predominant species include scarlet oak, black, red and chestnut oak, shagbark, pignut and mockernut hickory, black walnut, red mulberry, sassafras, red cedar, Virginia Pine, pitch pine and sweet birch. The north-facing slopes and cooler swale corridors have moister soils that can support red oak, hemlock, red and sugar maples, mountain laurel and the native rosebay rhododendron. The species found on the lower southern slopes that are non-floodplain areas are red and white oak, red maple, black gum and yellow poplar (PSU, 1989). The floodplain areas in the southern section of the study corridor are most representative of the Sycamore - (River birch) - Box-elder Floodplain Forest and the Silver Maple Floodplain Forest community types (Fike, 1999). Species in these communities include silver maple, black willow, American sycamore, box elder, river birch, black walnut, green ash and swamp chestnut oak. Red-osier dogwood, poison ivy and buttonbush are also present in the understory of these forests.

The northern section of the study corridor includes Lycoming and Clinton Counties, where the landscape is comprised of a region of broad valleys separated by long, high, forested ridges. The northern corridor's valley is comprised of a mixture of urban and agricultural areas. Urban and residential areas support similar native and non-native species similar to the southern section of the corridor. Agricultural areas in this section of the corridor are comprised of corn, soybeans, alfalfa, hay, vegetables and orchards or plant nurseries. Snap beans and tomatoes are the main vegetable crops, while apples, peaches and cherries are the main tree fruit crops.

The two general forest associations in the northern part of the study corridor in Lycoming and Clinton Counties are the Oak/Chestnut Association and the Hemlock/White Pine/Northern Hardwood Association (PSU, 1988). Because of the blight on the American chestnut, the oaks are the major species present in the Oak/Chestnut Association. The Oak/Chestnut Association can be further broken down into community types. The forest ridges and slopes in the northern

section of the corridor are characteristic of the Dry Oak - Heath Forest and the Dry Oak-mixed Hardwood Forest communities (Fike, 1999). The main oak species include white, northern red, scarlet and chestnut oaks. Major understory species include flowering dogwood, striped maple and witch-hazel. Common shrub species in the communities include mapleleaf viburnum, lowbush blueberry and mountain laurel. The moist flat-bottomed ravines are dominated by yellow poplar, American basswood, sweet birch and hickories. On the deep soils of the valley floors, white oak is most dominant.

The forest community types that are most characteristic of the Hemlock/White Pine/Northern Hardwoods Association, is the Hemlock (white pine) - Northern Hardwood Forest and the Hemlock – Tulip tree – Birch Forest (Fike, 1999). The most common species are eastern hemlock, tulip tree, yellow birch, sweet birch, black cherry, red maple, sugar maple, American beech, basswood and eastern white pine. The three main species of the pine communities surviving in the shallower, sandier soils are the white, pitch and scrub pines. An understory is mostly absent, but a few herbaceous species such as wild oat grass, plantain-leaved pussytoes and common cinquefoil can be found. Hemlock communities are also present in the flat-bottomed ravines with a thick understory of rosebay rhododendron. Moister soil conditions may allow the presence of wild lily-of-the-valley, pink lady's-slipper, fringed polygala, sweet white violet, New York fern and partridgeberry.

The floodplain areas in the northern section of the study corridor are also most representative of the Sycamore - (River birch) - Box-elder Floodplain Forest and the Silver Maple Floodplain Forest community. Such communities comprise the riparian forested buffer adjacent to the river and are comprised of American sycamore, silver maple, river birch, box-elder, green ash and black willow. Wetlands within the study corridor have their own set of unique communities comprised of hydrophytic species. Some common species found in the forested wetlands in the corridor include Silver maple, red maple, American elm, green ash, black ash, black gum, pin oak and swamp chestnut oak in addition to those species found in floodplain forest communities. Wetland species found in scrub-shrub areas include alder, black willow, buttonbush, red-osier dogwood, silky dogwood, spirea and river birch. Common herbaceous species found in the emergent wetlands include cattail species, bulrush species, sawgrass, common reed, mannagrass, slough grass, arrow arum, pickerelweed and arrowhead (PSU, 1988).

A complete listing of the most common vegetation species that can be found within the study corridor is provided in Table 2-15 of the Technical Document.

C. Threatened and Endangered Species (PNDI Species)

The Pennsylvania Natural Diversity Inventory (PNDI) is a partnership between the Western Pennsylvania Conservancy, the Pennsylvania Bureau of Forestry and The Nature Conservancy to conduct, inventory and collect data to identify and describe Pennsylvania's rarest and most significant ecological features. These features include plant and animal species of special concern, rare and exemplary natural communities, and outstanding geologic features. The goal is

to build, maintain, and provide accurate and accessible ecological information needed for conservation, development planning, and natural resource management (DCNR, 2001a).

PNDI was contacted for a list of threatened, endangered, rare and candidate species or other ecological areas of concern located within the 77-mile study corridor of the West Branch. Their response cited 10 animal species and 15 plant species listed as Pennsylvania Threatened, Endangered or Rare; and 5 natural communities being known to exist in or near the study corridor. The results included no Federally listed species. Of the 30 resources, 13 of the listed species and one of the natural communities, the sand dunes, are known to be located in West Chillisquaque Township, Northumberland County in Montandon Marsh and are likely contained exclusively in that area of the corridor. These include several endangered wetland plant species such as scirpus-like rush, gramanoid marsh, false loosestrife seedbox, broad-leaved water plantain, spotted bee-balm and bull sedge. The endangered animal species on the list likely found in Montandon Marsh include the least and American bitterns and sedge wren. The Eastern spadefoot toad is rare in Pennsylvania and also can be found in the Montandon Marsh.
Table B-4 identifies the threatened, endangered and rare species identified by PNDI within the study corridor (DCNR, 2001b).

D. Important Habitats

As previously mentioned, PNDI also provides information on important ecological habitats within a given area. The important natural communities identified in the study corridor included northern Appalachian shale cliff communities in Union Township, Union County, sand dunes in West Chillisquaque Township, Northumberland County (Montandon Marsh), floodplain swamps and forests in Clinton Township, Lycoming County and xeric central hardwood-conifer forests in Porter Township, Lycoming County. These communities are ranked as critically imperiled, imperiled or vulnerable. Table B-4 identifies these communities and provides the global and state rank of each. Generally, in addition to these unique habitats, wetlands within the corridor are considered to be important habitats and are regulated for protection by state and federal laws.

E. Invasive Species

In addition to native indigenous vegetation species that live within the study corridor, there are other non-native aggressive plants that crowd out native plant species. Such species are known as invasive or noxious plants that are known to choke out native plants. Invasive plants tend to appear more on disturbed ground or waste areas; however, they can also colonize other areas and invade existing native ecosystems. Some of the more well known invasive species that are likely to occur within the study corridor are herbaceous plants such as purple loosestrife *(Lythrum salicaria)*, Japanese knotweed *(Polygonum cuspidatum)* and common reed *(Phragmites australis)*. Purple loosestrife and common reed are commonly found in wetland areas. Both of these plants colonize rapidly by seeds and rhizomes (roots) to choke out native wetland plants. The third invasive species, Japanese knotweed, occurs in disturbed upland areas and looks like bamboo with the characteristic swollen nodes along their stems. Other species of invasive plants

that may occur in the study corridor include Canada thistle, bull thistle, multiflora rose, Tartarian honeysuckle, wild parsnip, reed canary grass, Japanese honeysuckle and Tree-of-heaven. However, purple loosestrife, Japanese knotweed and common reed are the most threatening species to native plants and ecosystems within the study corridor.

VI. CULTURAL RESOURCES

A. Recreational Resources

1. Recreational Preferences

The Lower West Branch of the Susquehanna River has historically welcomed visitors and area residents with its scenic beauty and rich recreational offerings. This area lures people with opportunities for hunting, boating, fishing, hiking and camping. The lumbering era of the 1800s brought more people to live in the area and the river became important for transportation for people and materials.

As industrialization and manufacturing grew in the area, the West Branch Susquehanna River and its tributaries became victims of pollution, resulting in the radical decrease in native fish, bird and other animal populations. The thirty to forty year efforts to clean up and reclaim the affected areas and to reduce and stop the sources of pollution have produced positive results. Area sportsmen have commented on the increase in the native game fish populations. Waterfowl migrations through this corridor are also increasing.

In addition to the boating, fishing, hunting, hiking and camping opportunities, the area offers a wide variety of other forms of recreation. Along the corridor, there are many passive recreation areas offering scenic views, picnicking, bird watching and quiet reflection. More active forms of recreation include: baseball, softball, soccer, tennis, basketball, bicycling, horseback riding and community festivals.

Map 8 of Appendix A shows the existing Open Space and Recreation Areas within the study corridor. Map 3 shows current land use and the more prominent recreational land use areas.

2. Facilities

<u>Boating Access</u>

Boating in the West Branch Susquehanna River has always been a very popular recreational activity. Types of boating-related activities in the corridor include: motor boating, water skiing, sailing, canoeing, row boating, jet skiing, crewing, a large passenger paddle wheeler and inner tube floating. Area boating enthusiasts expressed concern that the increased variety and types of boats, and the increase in participation has created conflicts among river users.

The entire length of the lower West Branch Susquehanna River is listed as navigable waters of the Commonwealth. Many tributaries are also passable waters for canoes, including Chillisquaque Creek, White Deer Creek, Muncy Creek, Loyalsock Creek, Lycoming Creek, and Pine Creek (Pennsylvania Department of Fisheries, 1917). Buffalo Creek in Union County is

also used for canoeing. Those islands that are owned by the state or municipalities (such as Crow Island in Milton State Park) could serve as potential water trail rest areas for canoeing.

Boat access and travel is controlled by dams and water depth. During dry seasons the river's depth drops to levels that prohibit the operation of powerboats. Boating enthusiasts suggest that inflatable dams be installed during these dry seasons, raising water levels to depths where powerboats can be operated safely. In general, the Pennsylvania Fish and Boat Commission is opposed to inflatable dams because they interfere with the natural migration of native fish.

Boat access points are referenced in Appendix B, Table B-5. There are 21 river access points within the 77 mile study corridor. The Pennsylvania Fish and Boat Commission owns and operates 8 boat access areas, while three access points are located in State Parks. Municipalities own and operate four access points. Public access to the river is limited and many believe that it should be expanded and improved.

Canoeing the Lower West Branch of the Susquehanna River and its major tributaries in the corridor is very popular with the public. The scenic section from Montoursville to Muncy is a favorite day trip for many canoeing enthusiasts.

Community Parks

There are a wide variety of community and neighborhood parks within the corridor. These parks are owned and maintained by the municipalities where they are located. Table VI-1 provides a list of these parks and the amenities that they offer.

TABLE VI-1 COMMUNITY PARKS WITHIN THE STUDY CORRIDOR

River Mile	Facility Name, Owner & Location	Amenities
0.0 E	**Pineknotter Park** Route 11, just west of Route 147 Northumberland Borough Northumberland County	3 Acres: Community Park - playground, picnic tables, pavilion, ballfield, open space, parking.
7.6 W	**Hufnagle Community Park** Lewisburg Borough, Market Street Between 5th and 6th Streets Lewisburg, PA Union County	7 Acres: Playground, Gazebo, Benches, Picnic Tables, Exercise Trail, Open Space, Parking and Portable Comfort Facilities.
7.6 W	**Mariah Quant Memorial Garden** Walnut Alley along riverfront Lewisburg, PA Union County	0.5 Acre Flower Garden, Benches, View of the River

TABLE VI-1 COMMUNITY PARKS WITHIN THE STUDY CORRIDOR (CONT'D)

River Mile	Facility Name, Owner & Location	Amenities
7.7 W	**Water Street Park** Lewisburg Borough Water Street & Route 45 Lewisburg, PA Union County	2 Acres: Community Park – benches and open space adjacent to the river.
7.8 W	**Daniel Green Park** Lewisburg Borough 7th Street & St. Mary's Street Lewisburg, PA Union County	2 Acres, Community Park – 2 Little League Baseball Fields, Playground, Basketball Court, Picnic Tables.
7.8 W	**St. Mary's Street Park** Lewisburg Borough 15th Street & St. Mary's Street Lewisburg, PA Union County	20.2 Acres, Community Park – Tennis Courts (4), Basketball Court, Swimming Pool, Picnic Tables, Pavilion, Playground, Open Space with Stream, Portable Comfort Facilities, and Parking.
7.9 W	**Soldiers Memorial Park** Route 45 & Water Street Lewisburg Borough Union County	1.0 Acre Community Park, Flower Plantings, Benches
7.9 W	**Wolf Field Complex** St Anthony's Street Lewisburg Borough Union County	27.2 Acre Community Park – Baseball Field, Softball Field, Picnic Tables, Pavilion, Playground, Comfort Facilities and Parking.
8.0 W	**Mountain View Baseball Fields** Ziegler Road Kelly Township Union County	11 Acres: a Battery of Midget Baseball Fields
11.5 W	**West Milton Community Park** White Deer Township Union County	4.5 Acre Community Park – Ballfields (2), Picnic Tables, Pavilion, Playground, Open Space and Parking.
15.5 – 17.0 E	**PA Canal Towpath** Entire Length of Watsontown Watsontown Borough Northumberland County	10 Acres: Public Open Space – Birdwatching, Walking / Biking Trail.
16.0 E	**Watsontown Memorial Park** Canal St. & SR 405 Watsontown Borough Northumberland County	20.2 Acres: Community Pool, Softball Field, Shelter, Picnicking, and Parking.

TABLE VI-1 COMMUNITY PARKS WITHIN THE STUDY CORRIDOR (CONT'D)

River Mile	Facility Name, Owner & Location	Amenities
16.0 W	**White Deer Park** White Deer Exit off Rt.15 North White Deer Township Union County	3 Acres: Community Park – Open Space, Playground, Benches.
17.0 E	**Eighth Street Playground** W. Eighth Street Watsontown Borough Northumberland	1 acre: Neighborhood Park – Tennis Courts (2), Paved Surface with Remnants of Play Equipment. Locked with No Trespassing Signage.
22.5 W	**Montgomery Public Park** Rt 405 along the Susquehanna River Montgomery Borough Lycoming County	20 Acre Community Park, Picnicking pavilion, center, playground, soccer field, parking, public comfort facilities
23.0 W	**Heritage Park** Southern end of Church Street Montgomery Borough Lycoming County	1.5 Acre Neighborhood Park
27.5 W	**Lions Park** East Penn Street Muncy Borough Lycoming County	Maintained by the Muncy Lions Club – Large Picnic Pavilion, grills, picnic tables, Concession Stand, playground area, gravel access road,
27.5 W	**R. J. Patrizzio Community Pool** Next to Muncy Elementary School Muncy, PA	Gravel access road, gravel and grass parking area, bath house, concession area,
28.25 W	**Mechanic Field** Mechanic Street Muncy Borough Lycoming County	Soccer field, port-a-john, gravel pull off area, bleacher, storage building.
35.5 N	**Montoursville Landing** Southern end of Mill Street Montoursville Borough Lycoming County	2.52 Acre Community Park, Jr/Sr Baseball Field, half size soccer field, full size soccer field, parking areas, port-a-johns, boat launch, small floating dock, picnicking, children's playground
37.5 N	**Loyalsock Riverfront Park** Loyalsock Township Lycoming County	56.53 Acre Community Park picnicking, parking, hiking, open space

TABLE VI-1 COMMUNITY PARKS WITHIN THE STUDY CORRIDOR (CONT'D)

River Mile	Facility Name, Owner & Location	Amenities
38.5 N	**Bruce Henry Park** Ritchey Street & Miller Avenue Loyalsock Township Lycoming County	14 acre Community Park: pavilion, picnicking, playground, open space, parking, baseball fields
39.0 N	**Lymehurst Park** Loyalsock Township Lycoming County	4.3 Acre Neighborhood Park
39.0 S	**South Williamsport Recreation Complex** E. Mountain Avenue South Williamsport Borough Lycoming County	20 Acre Community Park: Parking, picnicking, pavilions, playgrounds, a swimming pool, soccer fields, softball fields, little league baseball fields, baseball field, tennis courts
39.0 S	**E. Central Avenue Park** E. Central Avenue South Williamsport Lycoming County	19 Acre Community Park: Softball, soccer, tennis, swimming pool, wading pool, tot lot
39.3 N	**Shaw Place** Sherman St and Shaw Place Williamsport Lycoming County	Community Park Pool, parking, volleyball courts, 4 tennis courts, walking paths, handball court/ practice tennis wall, ½ mile exercise path, playground area, basketball court, picnic pavilion.
39.3 N	**Youngs Woods** Railway Street City of Williamsport Lycoming County	7 Acre Neighborhood Park Picnicking, pavilion, benches, playground, sandlot ball field, sand volleyball court, limited parking, walking path
39.8 N	**Brandon Park** Packer Street City of Williamsport Lycoming County	60 Acre Community Park: Passive recreation area, walking paths, outdoor arboretum, bandshell, children's pool, tennis courts little league fields, baseball field playground, benches, parking
40.0 S	**Louie Mack Park** West Southern Avenue South Williamsport Borough Lycoming County	1.3 Acre Neighborhood Park: Little league field, playground, parking, monument

TABLE VI-1 COMMUNITY PARKS WITHIN THE STUDY CORRIDOR (CONT'D)

River Mile	Facility Name, Owner & Location	Amenities
40.4 N	**Flanigan Park** Walnut Street & Memorial Avenue City of Williamsport Lycoming County	8 Acre Neighborhood Park: Community center, playground, open space, paved basketball courts, parking, little league field
41.2 N	**Ways Garden** Walnut Street & West Fourth St. City of Williamsport Lycoming County	4.4 Acre Neighborhood Park: Passive recreation area, walking paths, monument, flagpole, landscaping, benches
42.0 S	**Duboistown Park** 2651 Euclid Avenue Duboistown Borough Lycoming County	0.7 acre Neighborhood Park: Playground
42.2 N	**Memorial Park** West Fourth Street & Lycoming Creek City of Williamsport Lycoming	40.6 Acre Community Park: Parking, picnicking, pavilions, playground, swimming pool, open space, basketball court, monument commemorating the birthplace of Little League Baseball, Bowman Field, a minor league baseball stadium, and public comfort facilities, tennis courts
42.2 N	**Elm Park** West Fourth Street City of Williamsport Lycoming	40.6 Acre Community Park: Concession stand, softball fields, public comfort facilities, parking and open space
43.0 N	**Newberry Park** Pearl & Linn Streets City of Williamsport Lycoming County	1.9 Acre Neighborhood Park: Playground, tennis courts, basketball courts, open space, walkways, concession building
46.0 – 48.0 S	**Susquehanna Township Park** River Road Susquehanna Township Lycoming County	10 Acre Community Park: Baseball field, basketball court, volleyball court, picnicking, playground, parking and open space
51.0 – 55.0 N	**Piatt Township Ballfield** Next to Township Building (Linden) Piatt Township Lycoming County	1 Acre Community Park

TABLE VI-1 COMMUNITY PARKS WITHIN THE STUDY CORRIDOR (CONT'D)

River Mile	Facility Name, Owner & Location	Amenities
56.0 E	**Jersey Shore YMCA Field** Route 44 On the Island Nippenose Township Lycoming County	Baseball Field, picnicking, parking
56.0 W	**Jersey Shore Borough Recreation Area** Thompson Street Jersey Shore Borough Lycoming County	20.5 Acre Community Park: Pool, picnicking, parking, playground, open space
57.0 E	**Nippenose Township Recreation Area** Antes Fort Nippenose Township Lycoming County	Community Park Baseball field, 2 softball fields, football/soccer field, picnicking, playground, parking
62.0 N	**South Avis Recreation Area** Henry Street (T-438) Pine Creek Township Clinton County	4 Acre Neighborhood Park Little League Baseball field, Basketball, Tot Lot, Parking.
63 S	**Alan Gardner Memorial Park** North end of T-421 Wayne Township Clinton County	2 Acre Community Park Picnicking, Pavilion, Open Space, Fishing, Boat Launch, Privy, Parking.
65.5 S	**Dixie Weise Memorial Park** Big Plum Run Road Dunnstable Township Clinton County	4.3 Acre Neighborhood Park Picnicking, tot lots, baseball fields
66.0 S	**Wayne Township Municipal Park** Linnwood Drive off SR-1005 Wayne Township Clinton County	3.3 Acre Neighborhood Park Pavilions (3), Picnicking, Softball, Tot Lot, Tennis Courts, Open Space, Parking.
69.0 S	**Memorial Park** East end of Water Street SR1002 City of Lock Haven Clinton County	2 Acre Neighborhood Park Picnicking, Open Space, Parking, Adjacent to Levee Trail.
69-72 S	**River Walk / Amphitheater** East end of Water Street SR1002 City of Lock Haven Clinton County	Community Trail along the Levee Walking Trail, Benches, J. Doyle Corman Amphitheater for Concerts and River Events

TABLE VI-1 COMMUNITY PARKS WITHIN THE STUDY CORRIDOR (CONT'D)

River Mile	Facility Name, Owner & Location	Amenities
69 S	**Harmon Field** Race and Bald Eagle Streets City of Lock Haven Clinton County	1 Acre Neighborhood Park Tot Lot.
69.5 S	**Canal Park** Main Street City of Lock Haven Clinton County	3 acre Community Park Open space, historic site
70.0 – 72.0 S	**Eberhart Playground** Barton and Center Streets City of Lock Haven Clinton County	1 Acre Neighborhood Park Tot lot, open space
70.0 – 72.0 S	**Hammermill Playground** Linden and Pearl Streets Castanea Township Clinton County	2.5 Acre Neighborhood Park Baseball field, tot lot, Open Space.
70.0 – 72.0 S	**Hoberman Playground** East Park and Prospect Streets City of Lock Haven Clinton County	5 Acre Neighborhood Park Softball field, tennis courts, multi-purpose area (proposed skateboard park), basketball court, tot lot, picnicking, pavilion.
70.0 – 72.0 S	**Kistler Park** Central Mountain School District West Bald Eagle Street City of Lock Haven Clinton County	1 Acre Neighborhood Park tot lot, open space
71.0 S	**Frank L. Taggart Memorial Park** East Park and Myrtle Streets City of Lock Haven Clinton County	5.7 Acre Neighborhood Park Softball fields (2), baseball fields, Restrooms, Parking
71.0 N	**Woodward Municipal Park** Route 664 just west of the Jay Street Bridge Woodward Township Clinton County	2 Acre Community Park View of Lock Haven's J. Doyle Corman Amphitheater, Pavilions (3), Picnicking, Gazebo, Playground, Volleyball, Walking Trail, Open Space Fields, Stream, Restrooms, Parking.
71.5 S	**Triangle Park** Main Street and Bellefonte Avenue City of Lock Haven Clinton County	0.8 Acre Community Park Open space, Gazebo, Benches.

TABLE VI-1 COMMUNITY PARKS WITHIN THE STUDY CORRIDOR (CONT'D)

River Mile	Facility Name, Owner & Location	Amenities
72.5 S	**Hanna Park** S.R. 120 City of Lock Haven Clinton County	8 Acre Community Park Tennis, basketball, Tot Lot, Picnicking, Lights, Pavilions, Restrooms, Walking Path, Parking.
73 S	**Peddie Park** North of Lock Haven on S.R. 120 Allison Township Clinton County	70 Acre Community Park Softball fields, Soccer Fields, Open Space, Restrooms, Parking.

Source: DCNR, 2000c

There are 21 public School recreation areas through out the study corridor. These outdoor recreation facilities include playgrounds, open space, and athletic fields and are vital recreation facilities.

State Parks

State Parks comprise approximately 179 acres of the corridor and include Shikellamy, Milton and Susquehanna State Parks. These parks and their amenities are provided in Table VI-2.

TABLE VI-2 STATE PARKS WITHIN THE STUDY CORRIDOR

River Mile	Facility Name, Owner & Location	Amenities
0.2 W	**Shikellamy State Park** Bridge Avenue Sunbury, PA Union & Northumberland Counties	131.5 Acres (77 acres are within the study area): Picnicking, Boat Mooring, Boat Launch, Parking, Playground, concession Area, Fishing, Pubic Comfort Facilities, Hiking, Bicycle Rentals, Ice Sports, X-Country Skiing, Scenic Overlook
11.0 – 12.0	**Milton State Park** Mahoning Street Milton, PA Northumberland County	82.4 Acres: An island in the Susquehanna River, Public comfort facilities, parking picnicking, boat launching, playground, open space, hiking, bicycling, fishing
42.5 N	**Susquehanna State Park** West of Arch Street City of Williamsport Lycoming County	19.6 Acres: Picnicking, large pavilion, portable restrooms, Hiawatha River Boat, Boat Dock, boat launch, paved access road, parking areas trails, fishing

Source: DCNR, 2000c

Hiking Trails

Two of the popular hiking trails within the study corridor are the Mid-State and Donut Hole Trails located in Clinton County. The Mid-State Trail System is a long distance hiking trail with many connector trails in central Pennsylvania. The Mid-State Trail begins at the Pennsylvania Grand Canyon near Blackwell, Pennsylvania and connects to the Green Ridge Hiking Trail in Maryland at the Mason-Dixon Line. Principle features of the Mid-State Trail are it's many views, side trails and fragile illusion of isolation and wilderness. The Mid-State Trail can be accessed at Woolrich or in Wayne Township within the study corridor.

The Donut Hole Trail system is a 50-mile, moderate to rugged trail for backpackers. Principal attractions of the Donut Hole Trail are scenic views, and a sense of remoteness and solitude not often found with other major trails. The Donut Hole Trail can be accessed at Farrandsville within the study corridor.

Bicycling & Walking Trails

Probably the most popular recreation facilities are walking/bicycling trails. The Lower West Branch of the Susquehanna River Study Corridor includes several bicycle/walking trails. The Loyalsock Bikeway connects to the Montoursville Bikeway on the east and the Williamsport Bikeway on the west in Lycoming County. While the Loyalsock and Montoursville trails are exclusively designed for bicycling and walking, the Williamsport Bikeway is designed for shared roadway with limited exclusive use. The Williamsport Bikeway connects with the Old Lycoming Bikeway at Memorial Park. The Old Lycoming Bikeway is designed for biking and walking. The William J. Clinger Walkway in Clinton County is 2.25-mile macadam trail designed for walking. Located on the south side of the river, the walkway is situated on the top of the Lock Haven levee and offers a great view of the river and mountains.

Camping

Seven privately owned campgrounds operate within the Lower West Branch Susquehanna River Corridor. These campgrounds and their locations are listed in Table VI-3.

TABLE VI-3 PRIVATE CAMPGROUNDS WITHIN THE CORRIDOR

River Mile	Campground Name	Location & Telephone Number
3.0 W	**Winfield Rivers Edge Campsites**	RR 2, Box 97 Winfield, PA 17889 Union County (570) 524-0453
6.0 E	**Shangri-La On The Creek**	RR 1, Box 245 Milton, PA 17847 Northumberland County (570) 524-4561
7.0 E	**Fort Boone Campsites**	RR2 , Box 15 Milton, PA 17847 Northumberland County (570) 742-9113
11.0 W	**Central Oak Heights Campground**	US Route 15, Box 367 West Milton, PA 17886 Union County (570) 568-0431
13.8 E	**Libby's Shoreside Campground**	RD 1 Box 227-A Milton, PA 17824 Northumberland County (570) 524-9433
23.0 W	**Riverside Campground**	125 South Main Street Montgomery, PA 17752 Lycoming County (570) 547-6289
54.0 N	**Susquehanna Campground**	460 Susquehanna Drive Jersey Shore, PA 17889 Lycoming County (570) 398-0462

Source: Campgrounds in PA, 2001

State Game Lands

There are portions of three State Game Lands (No. 193, 126 and 89) located within the study corridor for a total of 705 acres. State Gamelands No. 193 consists of 323.1-acres, of which 6-acres are located in the study corridor at River Mile 4 on the west bank of the river in Union County. State Gamelands No. 126 consists of 652.8-acres, of which 627.1-acres are located in the study corridor between River Miles 42 and 44 in Armstrong Township, Lycoming County. Finally, State Gamelands No. 89, consists of 10,571-acres, of which 68.1-acres are located in the study corridor at River Mile 77 in Colebrook Township, Clinton County. The locations of the State Games Lands are shown on Map 8 of Appendix A, and are indicated Table 2-1 of the Technical Document.

State Forest Lands

The Tiadaghton and Bald Eagle State Forests encompass approximately 415,000 acres in northcentral Pennsylvania. The two forest districts offers natural and wild areas, cold water fishing, hunting, primitive camping, hiking trails, cross country skiing trails, mountain biking trails, picnic areas, snowmobile trails, horseback riding and ATV trails. There are approximately 6,417 acres of state forest land in the study corridor situated within 8 municipalities of Union, Lycoming and Clinton Counties. The locations of the Tiadaghton and Bald Eagle State Forest lands within the study corridor are shown in Figure II-1 and Maps 8 of Appendix A.

B. Archaeological and Historical Resources

A variety of source materials, repositories, and repository personnel were consulted in an effort to identify cultural resources within the study corridor. The Pennsylvania Historical and Museum Commission's (PHMC) records were reviewed to identify properties, such as historic structures and districts, as well as archaeological sites, both prehistoric and historic, within the study corridor that have been listed or determined eligible for listing on the National Register of Historic Places (NRHP).

Structures within the study corridor were identified in these records as being "potentially historic" if they were 50 years old or older. The structure locations were then marked on USGS maps that provided coverage for the corridor. In a second phase of historic structures analysis, USGS maps of the study corridor published approximately 50 or more years ago were compared with modern USGS maps. This allowed structures that appeared to have been standing in their present locations for at least 50 years to be identified. The locations of these "historic" structures were added to the USGS maps upon which the previously surveyed historic structures had been denoted.

A review of Pennsylvania Archaeological Site Survey (PASS) data in PHMC's collection identified prehistoric and historic archaeological sites within the study corridor that have been

officially "recorded" through the completion and submission of PASS forms. Basic data pertaining to each of these sites—including its location, its site number, and its cultural age(s)—were collected by researchers for analysis leading to the creation of a computer-generated prehistoric archaeological potential and sensitivity map. A preliminary version of this map was produced based on the following "prehistoric archaeological potential" parameters:

- That areas within 300 feet of a water source, on well-to-moderately drained soils, with slopes of 12% or greater be identified as having low-to-moderate prehistoric potential.

- That areas within 300 feet of a water source, on well-to-moderately drained soils, with slopes of 8% or greater, but not 12% or greater, be identified as having moderate-to-high prehistoric potential.

- That areas within 300 feet of a water source, on well-to-moderately drained soils, with slopes of 0% or greater, but not 8% or greater, be identified as having high prehistoric potential.

Rivers, streams, ponds, lakes, and springs fell within the category of "water sources"; wetlands, hydric soils, and wells did not.

Based on local topography and other natural features, minor hand-drawn adjustments were made to the boundaries of the high potential zones. With reference to the numerous recorded prehistoric sites in the study corridor (as documented in the PHMC's PASS files), the boundaries of the high prehistoric potential zones were manually expanded as necessary to encompass the whole of each recorded prehistoric site. These adjustments were based on the fact that any area where a prehistoric site has been recorded must be included in a high prehistoric potential zone.

When the location of every apparent historic structure, district, archaeological site and prehistoric archaeological potential zone had been denoted on the series of modern USGS maps, the data was incorporated into the GIS database for the study corridor.

1. Archaeological Resources

Located within the study corridor are 357 archaeological sites that have been recorded in the PASS files administered by the PHMC. Sixty-four of these sites are located in Northumberland County, 55 in Union County, 156 in Lycoming County and 82 in Clinton County. A break down of these sites dated by cultural period are as follows:

- Paleo-Indian Period: 12
- Archaic Period: 19
- Transitional Period 73
- Woodland Period 102
- Contact Period 5
- Historic Period 40
- Undetermined 156

As these numbers suggest, many sites include components dating to more than one cultural period. Of the sites that have lent themselves to classification, 112 are classified as "open" sites, and 21 are classified as "camp" sites. Map 9 in Appendix A shows the locations of the archaeological resources that were identified within the study corridor.

One of the archaeological sites known as Canfield Island is listed on the National Register of Historic Places (NRHP). Located in Lycoming County just upstream of Loyalsock Creek along the north shore of the West Branch Susquehanna River, a portion of Canfield Island was listed in 1982 due to the abundance of Native American archaeological artifacts found there.

Evidence from prehistoric sites in the eastern United States indicates a number of successive regional cultural traditions. Although the exact number and nature of these traditions, which varied locally, remains the subject of debate, three major cultural periods can be defined: Paleo-Indian (12,000-8,000 BC), Archaic (8,000-1,000 BC) and Woodland (1,000 BC-AD 1500). These traditions are best viewed as responses to changing social and environmental conditions.

2. Historical Resources

Also located within the study corridor are 63 historic structures, properties, and districts (not including archaeological sites) which have been listed or determined eligible for listing on the National Register of Historic Places (NRHP). Twenty-two of these resources are located in Northumberland County, 16 in Union County, 17 in Lycoming County and 8 in Clinton County. A break down of these National Register-eligible resources by category is as follows:

- Historic Districts: 13
- Residences/Farmsteads: 20
- Bridges 4
- Industrial/Manufacturing 7
- Governmental Buildings 2
- Commercial Buildings 6
- Transportation Resources 6
- Educational Institutions 2
- Churches 2
- Memorial Park 1

The industrial/manufacturing properties include armories, table works, mills, or furnaces while governmental buildings include post office and city hall buildings. The transportation resources include canals and railroads. Resources listed or determined eligible for listing on the National Register have passed uniform standards of evaluation. Almost all of them are at least 50 years old. Advantages of being listed or determined eligible for listing on the National Register include recognition as a significant historic resource, consideration in planning for federal benefits, and eligibility to receive federal historic preservation funding and tax benefits.

Map 9 of Appendix A shows the locations of areas listed or determined eligible for the National Registry of Historic Places (NRHP) within the study corridor. Table B-6 in Appendix B lists and includes basic information pertaining to the 63 resources, structures, sites or districts identified as being listed on or eligible for listing on the NRHP within the study corridor. The locations of historic properties or historic districts referenced in Table B-6 can be found on Map 9 by cross-referencing each historic resource's identification number.

3. Historical Timeline

The West Branch Susquehanna River Corridor has a wealth of history from the Native Americans that once lived there to its various settlements that sprung up along its banks. Various industries have flourished and faded away within the corridor and many floods have impacted the infrastructures and the corridor's inhabitants. The following is a chronological timeline of some of the region's most notable historical events from the 16th Century to present day.

1570

- The Seneca, Oneida, Cayuga, Onondaga, and Mohawk allied themselves to form the Iroquois confederacy.

- The Susquehannocks, an Iroquois speaking tribe, inhabited the area. They were not part of the Iroquois tribe, but an enemy.

1590

- Tribes of the Algonquin Indians are overthrown in the West Branch Region, but allowed to remain in the area.

1615

- Etienne Bruté may have traveled to Muncy in an attempt to solicit help from the local tribes for a battle against the Iroquois. This would make him the first person of European descent in the area.

1682

- William Penn arrives in Pennsylvania.

1696

- Thomas Dongen, Governor of the Province of New York, claims land in northeast Pennsylvania, which includes present day Lycoming County, for England. He justifies his claim by stating that he acquired the land from certain Indian chiefs.

- Dongen leases Northeast Pennsylvania to William Penn for 1,000 years.

1701

- In spite of confusion of the Indians over the idea of land ownership, William Penn finally persuades the Indians to confirm his contract of ownership on April 1.

1737

- Conrad Weiser travels through the West Branch Valley with Shikellamy, an Indian interpreter and a viceroy of the Six Nations from 1728-1749. They travel through the region and up Lycoming Creek. He is the first documented and confirmed person of European

descent to travel through the region. French trappers and soldiers from Canada are documented as the first people of European descent in Clinton County.

1743

- Moravian missionaries visit present day Montoursville for the first time.

1748

- Moravian missionaries arrive at Great Island.

- Indian trails provide the earliest means of access to the Susquehanna Valley for pioneers.

1755

- A meeting is held on Great Island for the purpose of discussing the French and Indian War. Andrew Montour, Chief Monagatootha, the Delawares and Shawnees discuss the war and their participation.

1756

- French settlers contact local tribes to unite them against the English.

- Fort Augusta is built. It is dismantled in 1794. The fort is established to fortify the river at the forks of the river at Sunbury to prevent the French from entering the valley. Though not in the study area for the Lower West Branch River Conservation Plan, this Fort played a major role in the settlement of the study area. It was the largest of all forts built during that period and it was never attacked.

- Col. John Habright and 40 men are sent from Fort Augusta to Great Island.

1757

- Forts and smaller stockades were found throughout the study corridor. Many of the forts or stockades are documented and a date of completion can be found. Several however, are mentioned without associated dates, Fort Reed (at Lock Haven), Fort Huff, Fort Brady (in present day Muncy), Fort Boone (at Muddy Run, between Milton and Watsontown), and Fort Menninger (on White Deer Creek). They are being mentioned here because of the important role they played in settlement of the West Branch Valley.

1759

- It is prohibited to survey or settle land west of Lycoming Creek in order to prevent further controversy with the Indians.

1763

- Col. John Armstrong and 300 men of the Kittanning Expedition destroy a village at Monseytown and the one on the Great Island. Neither village is rebuilt.

1768

- The Six Nations sell another tract of land to William Penn at the Conference of Fort Stanwix on November 5.

- There is a dispute over the definition of the Western boundary between the Indians and the settlers.

1769

- The New Purchase land south of the Susquehanna in Clinton County is opened up for purchase as tracts up to 300 acres without a special permit.

- Officers of the Pennsylvania Regiment return to the region and, after making peace with the Indians, are granted a special permit to purchase 24,000 acres in southern Clinton County. They set out to establish a compact, defensible town that is some distance from the main population and could serve as a barrier for the province.

- Samuel Wallis builds the first permanent dwelling in Lycoming County at what is now Halls Station.

- The first settlement in Clinton County is documented. Charles Lukens, Deputy Surveyor of Berks County, visits present day Lock Haven. There he finds Clarey Campbell and his family.

- The Fair Play settlers begin settlement of the area between Lycoming Creek and the Great Island. These settlers are here illegally. Since they cannot go to the authorities for assistance, they set up their own court system, the Fair Play system. The Fair Play era ends in 1784.

1772

- March 21 - Northumberland County is formed from parts of Berks, Bedford, Cumberland, Lancaster and Northampton Counties. It totals 18,000 square miles.

- Fort Augusta is established as the county seat of Northumberland County.

- The first road in the region is surveyed. It extends from Fort Augusta to Lycoming Creek.

- John Alward builds the first gristmill in Lycoming County near the junction of Big and Little Muncy Creeks.

- Captain John Lowden established Northumberland Borough.

- Ludwig Derr settles in Lewisburg.

1773

- The first sawmill is built in Williamsport.

- Ludwig Derr becomes owner of the land that is now Lewisburg.

1775

- A bridle road on the west side of the river is completed which links Bald Eagle Creek to Sunbury.

- The first building in present day Milton is built.

1776

- The Fair Play Men sign the Pine Creek Declaration of Independence on July 4 along the banks of Pine Creek. In the Declaration, settlers claim ownership over the land that had been disputed at the Fort Stanwix Conference.

- Catherine Smith builds a boring mill at the mouth of White Deer Creek. The widow uses this mill to bore gun barrels for service in the Revolutionary War.

- The Penn regime in Pennsylvania ends as the Constitution takes effect.

1777

- A small stockade is constructed above Milton, Fort Schwartz.

- Colonel Henry Antes builds a stockade at what is now Antes Fort.

- Fort Horn is constructed along the river near McElhattan.

1778

- Fort Muncy is built.

- The settlers of the valley flee during what is known as the Great Runaway. This flight takes place following the July 3 Indian massacre at Wyoming. All settlers from Clinton County down river evacuated. The settlers retreat, using the river and its banks to Fort Augusta.

1779

- The settlers flee the valley for a second time.

1783

- The Susquehanna River is declared a public highway by act of the State Legislature.

1784

- The Indians concede that the government had been right about the western boundary at the Fort Stanwix Conference.

- Land deeds in the disputed area are granted to those settlers who signed the Pine Creek Declaration of Independence.

- William Dunn applies for ownership of the Great Island and pays $1.50 per acre.

1785

- A road from Great Island through the gap at Muncy Mountain to Bald Eagle's Nest is completed

1786

- As a result of a large influx of settlers, there is a motion to establish a new county and then a new county seat that would be more centrally located and farther upriver in Northumberland County. Both requests are denied.

1790

- The Supreme Executive Council commissions Samuel Maclay, Timothy Matlack, and John Adlum to determine if a route exists connecting the Allegheny River and West Branch Susquehanna River

1792

- The county legislature drops the price of land in northern Clinton County to 5 pounds per 100 acres. The price is still too high and the majority of the county remains vacant.

1794

- Dr. Joseph Priestly arrives in Northumberland.

1795

- Lycoming County is formed out of Northumberland County.

- Williamsport is laid out by Michael Ross and becomes the county seat of Lycoming County.

1798

- Joseph Priestly helped to establish the Northumberland Academy.

1799

- Benjamin McCarty lays out the town of Muncy at a point where 4 Indian paths intersect, Shamokin, Wyalusing, Wyoming, and Towanda.

1806

- Williamsport is incorporated as a borough.

1813
- Union County is formed out of Northumberland County.

1817
- The first bridge across the river at Lewisburg is opened.

- Milton Borough becomes incorporated.

1822
- Lewisburg Borough becomes incorporated.

1828
- Northumberland Borough becomes incorporated.

- Building of the West Branch division of the Pennsylvania Canal begins.

- The Muncy Dam is built across the West Branch just upstream of Montgomery to create slack water for the canal.

1829
- Coal is discovered in northern Clinton County.

1832
- A bridge across the river at Milton is completed.

1833
- The Lewisburg Cross-cut Canal is completed. The canal is 5/8 of a mile long and contains 3 lift locks. This canal allowed canal boats to cross the river from Lewisburg to Montandon where they could enter the West Branch of the canal

- Great Island Dam (now known as the Grant Street Dam) was constructed in Lock Haven.

1834
- A canal from Northumberland to Lock Haven and an 800-foot dam on the West Branch is completed and links the Pennsylvania Canal to the Bald Eagle Cross Cut at Lock Haven.

- Continuous lumber manufacturing begins in Williamsport as a result of the completion of the canal.

1839
- Clinton County is formed out of Lycoming and Centre Counties.

1841

- A 2-foot high dam is built across the West Branch near Hepburn Street in Williamsport for a large water-powered sawmill known as the Big Water Mill.

1845

- Major James H. Perkins opens a hugely successful sawmill in Williamsport.

- A liberal charter for the University of Lewisburg (now Bucknell University) is filed.

1849

- The West Branch Boom is developed and implemented. It is a structure which stops saw logs on the river and allows for them to be secure and manufactured in Lock Haven and Williamsport. This structure resulted in the addition of many more jobs in the region.

- The first bridge across the river at Williamsport is opened.

1859

- The main line of the Pennsylvania Railroad is run through the region.

1861

- Eli Slifer moves into his home just North of Lewisburg where he can overlook the river. Slifer was the Secretary of the Commonwealth during the Civil War. In this role he assisted Governor Andrew Curtin in mobilizing the state's men for the war effort. His house is still standing and is open to the public as a museum.

1866

- Williamsport becomes an incorporated city.

1867

- The Hepburn Street Dam is rebuilt in Williamsport. The 9 to 10 foot-high wooden dam replaced the smaller 2-foot dam and raised the water level of the river by 6 or 7 feet. This dam was removed in 1985 and replaced with the reinforced concrete dam that exists today.

1869

- Robert Lowry, famous hymn writer, moves to Lewisburg where he lived until 1875. Lowry wrote "Shall We Gather at the River."

1871

- Jacob Brown and P. W. Keller laid out the town of Castanea one mile from Lock Haven to be a center for wood and pulp manufacturing.

1873
- This is the peak of the lumber industry. 1,582,460 logs are processed resulting in 318,342,712 board feet of lumber.

1878
- The Maynard Street suspension bridge in Williamsport is completed.

1889
- Major flooding occurs from May 31 to June 2 throughout the region, caused by excess logging results in widespread property losses.

- The flood damages the PA canal in the Lock Haven area extensively. The canal in this area goes out of use.

1894
- A major flood all but eliminates the logging industry.

1895
- It has become more economical to transport logs by railroad than by canal. This symbolizes the beginning of the death of the canal system.

1901
- Up to this point the PA canal had been used up through the Muncy area, but now goes out of use.

1909
- This is the end of the water era and canal transportation.

1915
- Lumbermen are warned that they will exhaust the lumber supply within 30 years if they continue at their present intensity.

1919
- Lumbering as an industry is exhausted.

1940
- Priestly's home designated as a museum.

1942
- The Ordnance Dam was constructed across the West Branch near the Union-Lycoming County line for a power plant that would service the Susquehanna Ammunitions Ordnance (which is now the site of State Game Lands 252 and the Federal Prison Reservation near Allenwood). The power plant was shut down after World War II.

1970
- The Fabri-Dam (now known as the Adam Bower Dam) was built on the main stem Susquehanna River in Sunbury and provided a recreational boating pool that extends 6 miles up the West Branch.

1972
- Hurricane Agnes hits the region causing major damage.

1985
- The old wooden Hepburn Street Dam in Williamsport is removed and a new dam is rebuilt out of reinforced concrete with a fish ladder on the South Williamsport side.

1994
- Lock Haven levee project completed.

1996
- A January flood causes damages and loss of life in the valley and up the river's tributaries.

The canal and logging industries played a very important part in shaping the communities and history of the Lower West Branch Susquehanna River. Therefore, a brief description of these historical industries and the remnants that they left behind within the study corridor is provided below.

Canal History

The inauguration of canal service through the valleys of the Susquehanna River and its North and West Branches in the 1830s brought significant changes to the Susquehanna Valley. Offering faster and easier access to eastern markets, the region's interlinked canal lines contributed, among other things, to an increase in cash-crop farming. Instead of producing a range of goods for their families or other local consumers, Susquehanna Valley farmers began specializing in one or two crops for export to larger, more-distant markets. The opening of canal lines also helped jump-start small industrial ventures, many of which were dependent on coal or lumber. The most conspicuous result of the Susquehanna River's "canalization" was the emergence of villages and towns where canal lines intersected major roadways. Many of these settlements had been founded in the years following the American Revolution, but they did not begin to grow into economic, social, and/or cultural centers until the advent of the Canal Era.

Construction of the "West Branch Division" of the Pennsylvania Canal began in 1828 and concluded in 1835. This line ran along the east and north side of the Susquehanna's West Branch, from Northumberland to Farrandsville, Clinton County (Baer, 1981; Shank, 1973). The Division was incorporated by an Act of the Legislature on March 24, 1828. Robert Faries was appointed Chief Engineer, and he chose James D. Harris as his assistant (Meginness, 1892).

Extending along the east side of the Susquehanna's West Branch from Northumberland to Muncy, Williamsport and Lock Haven, the West Branch Division would measure 117.48 kilometers (73 miles) in length, and employ 19 locks to surmount a rise of approximately 36.57 meters (120 feet) (Zimmerman, 1984). The canal was completed as far as the Muncy dam by November 1830. It took another five years for the remainder of the Division, extending to Farrandsville, to be completed (Baer, 1981). Most of the canal boats towed eastward on this Division over the course of the next 70 years were loaded with lumber harvested in the mountains around Williamsport (Shank, 1973).

In addition to the canal prism, basins, locks, lockkeeper houses, and towpaths, several other canal-related features were built along the West Branch. In 1831, contractor Reuben Field constructed a six-span covered bridge across the Susquehanna River's West Branch between Blue Hill and Northumberland. While serving as a toll bridge for vehicular and pedestrian traffic, this span also carried a tow-path which enabled mules to tow canal boats across the Shamokin dam slackwater to the basin in Northumberland where the waters of the North Branch and East Branch Divisions came together. With the opening of this bridge, the towpaths of the three central Susquehanna Valley divisions of the Pennsylvania Canal were joined (Snyder, 1976). Another important component of the West Branch canal was the Lewisburg cross-cut, built to provide a link between the West Branch Division and Lewisburg (Deans, 1963). Through this vital connection to southern markets, Lewisburg grew into a trading hub for Union and Centre Counties, and its population more than doubled from 924 persons to over 2,000 between 1830 and 1850 (Snyder, 1976).

The West Branch and Susquehanna Canal Company was able to turn a healthy profit from its investment. Through the West Branch Canal, it tapped into the extensive lumber trade of north-central Pennsylvania. During the decade beginning in 1858, the West Branch and Susquehanna Canal Company generated a profit of $502,703.55 on revenues of $1.4 million. Proceeds from coal shipments peaked in 1863, at the height of the Civil War (Petrillo, 1987). In 1869, the West Branch once again changed ownership. It was purchased by the Pennsylvania Canal Company (PCC), a subsidiary of the Pennsylvania Railroad Company (PRC). The PCC was interested in increasing its coal-shipping business by developing the coal fields in Luzerne County and using the North Branch and Susquehanna Canals to transport coal down to a connection with the Pennsylvania Railroad's Main Line at Harrisburg. The West Branch Canal, which was still serving primarily as a conduit for lumber, was a less-valuable acquisition for the PRC subsidiary (McCullough and Leuba, 1973).

On June 1, 1889, after two days of torrential rain had pushed the level of the West Branch 33 feet above normal, a log boom at Williamsport broke, sending more than two hundred million feet of lumber downriver. Water and lumber damage to the canal between Williamsport and Muncy was so extensive that repairs were not attempted (Snyder, 1972). The canal south of Muncy was patched up and reopened for what turned out to be a final decade of service. The location of the original West Branch Division Canal alignment is depicted in Map 9 of Appendix A. Other historical maps of the canal are available in the *Atlas of Lycoming County Pennsylvania* (Pomeroy, 1873) and in *Williamsport – Lumber Capital* (Taber, 1995).

Lumber History

Sections of the following historical overview on the logging industry along the Susquehanna River's West Branch is excerpted from *Sunset Along the Susquehanna Waters: Williamsport, Leetonia, Slate Run, Cammal, Glen Union, Gleastonton* by Thomas T. Taber, III, Book No. 4 in the Series *Logging Railroad Era of Lumbering in Pennsylvania*, published in 1972 by the author.

The West Branch of the Susquehanna River drained the largest area of the dense pine and hemlock forests, approximately four thousand square miles, a vast, and even today, a relatively uninhabited area of the state. Besides rafting, the river was the only one of the four lumbering regions to have "great log drives." This was made possible by the boom at Williamsport which caught the logs and sorted them according to mill owner. Where there was only a single mill on a stream, logs could easily be floated to it; where there were several mills, the logs had to be sorted. This could be done by catching them in a log boom. A log boom consisted of piers or "cribs" that were built in a log cabin style in the river and filled with tons of stone to anchor them down. Each crib was spaced between 150 and 200 feet apart and connected with floating logs and chains.

On the West Branch there were few, lumber rafts. The finished lumber was shipped by canal and railroad. The rafts on the West Branch were square and round timber rafts and spar timber rafts. These differed from the lumber rafts. The latter were made of sawed timbers on which lumber was loaded. The former included a single layer of logs secured together. Round and square timber rafts went to Lock Haven and below Harrisburg to be cut into lumber. Much of the lumber cut from logs coming down the West and North Branches went to Baltimore to be used in clipper ships. The spar rafts were unique to the West Branch. The spars were mostly used for sailing ship masts. They were the finest white pine that could be found. Less desirable pine was cut into logs and floated to saw mills.

Besides the Williamsport boom, there were smaller booms at Muncy, Montoursville, Jersey Shore and Lock Haven. Historical maps depicting the original locations of these log booms can be found in *Williamsport – Lumber Capital* (Taber, 1995). Remnants of the log booms are shown on Map 9 of Appendix A.

Floating the logs, destined for booms above Williamsport, required careful scheduling into the river to keep them apart from Williamsport logs. The Montoursville boom was used for Loyalsock Creek logs and catching strays that passed the Williamsport boom. The Muncy boom was small and served logs cut downstream from below Williamsport. The construction of a boom at Williamsport in 1851 eliminated the need for large mills on the river network that fed Williamsport. The average white pine log was larger than the hemlock. Records of the Susquehanna Boom Company report the logs of the 1860s and 1870s averaged two hundred board feet. In the 1890s and 1900s, which represented the hemlock period, the average was only one hundred thirty feet.

Because of the dominant position of Williamsport, with its many saw mills, the water era of saw milling on the West Branch is a history of the Williamsport mills. It covers a period of about seventy years. Saw milling at Williamsport dates from 1773 when the first was recorded. Sawing was done sporadically. Continuous lumber manufacturing did not start until 1838 after the canal was completed, and the lumber could be more easily shipped. In that year Cochran, Biers and Company erected a water powered mill near Hepburn Street. After three years of haphazard operation, it was closed down. Updegraff and Armstrong purchased it, but in 1846 sold it to James H. Perkins. In 1851 Nehemiah Shaw who was to operate saw mills in Williamsport probably longer than any other man, joined Perkins. Peter Herdic then bought Perkins's interest. It is often said that Herdic "made Williamsport." He was involved in several of the saw mills, paved streets, erected costly buildings, built a street railway, had the town incorporated as a city, became mayor.

The key to making Williamsport the lumber city was the boom. The idea for a boom at Williamsport, according to the 1876 History of Lycoming County, should be credited to John Leighton. In 1844 he persuaded James H. Perkins of Lincoln, Maine to visit Williamsport. Perkins took the initiative to interest John DuBois to invest in the project. On March 26, 1846 the Susquehanna Boom Company was organized with John DuBois as president. Then everyone turned their interests to other matters. Nothing was done for three more years. Not until 1851 was the boom finally constructed. The boom proved inadequate. It broke during a flood in 1860. Fifty million board feet of logs went down the river. The next year a repeat performance resulted in a similar loss. More cribs of heavier construction were added between those already in place. Gradually the boom was extended up river until it was seven miles long and had almost four hundred cribs. For many years the boom performed satisfactorily. Disaster again struck on June 1, 1889 when the flooding Susquehanna rose three feet above the cribs. The boom broke, and an estimated 200,000,000 board feet of logs headed for Chesapeake Bay. About half of the logs washed up along the bank and were cut by portable mills.

In May, 1894, the final disaster occurred. Another flood washed out about the same number of logs. Fifteen years later the boom closed. More than twenty saw mills at a time depended upon the boom. It is hard to determine exactly how many mills and which ones were operating each year. Historical maps and other information of sawmills located along the river in the Williamsport area can be found in the *Atlas of Lycoming County Pennsylvania* (Pomeroy, 1873) and in *Williamsport – Lumber Capital* (Taber, 1995)..

VII. ISSUES, CONCERNS, CONSTRAINTS AND OPPORTUNITIES

A. Key Issues and Concerns within the Corridor

The majority of the key issues and concerns that are addressed in the River Conservation Plan were identified through the public participation process. This process included public meetings, municipal surveys, and stakeholder interviews. Additional or related issues were brought forth through discussions held by the Steering Committee. Following is a summary of the main issues and concerns which served as the foundation for the management options and implementation projects that were developed as part of this River Conservation Plan.

1. Loss of Natural Habitats and Native Species

The study corridor contains many different terrestrial and aquatic habitats that support a diversity of plant and animal species. The public expressed great interest in maintaining the integrity of the corridor's habitats and scenic natural features. However, the increase of land development pressures, certain agricultural practices and the spread of non-native invasive plants have threatened wetlands, riparian buffers, and native plants in the corridor. Because wetlands are critical habitats that support a diversity of plant and animal species, the inventory and protection of wetlands and other unique habitat types within corridor was a common concern. The lack of riparian buffers along streams in agricultural areas of the corridor has created soil erosion problems that affect water quality and fisheries. The identification and control of noxious and invasive plant species from spreading in the corridor was also noted as a priority to protect native habitats, plants and animals.

2. Fisheries Management

Fishing is a very popular form of recreation in the study corridor. Fisheries management is of great interest to anglers in the corridor because of the non-point source pollution impacts from Acid Mine Drainage (AMD) and agricultural runoff. Such impacts not only limit some fish species' ability to survive in the northern reaches of the river corridor, but it also limits the survival of aquatic organisms (benthic macroinvertebrates) on which they feed. This places a large void in the aquatic food chain of the river. While anglers would like to see the mitigation of these impacts on the river's fishery, they would also like to see stable or improved fishing opportunities on the West Branch. As such, anglers expressed a strong interest in protecting the log crib remnants from the lumbering era that provide excellent fish habitat. The proposed removal of those structures by different interest groups is of great concern to the anglers who depend on them to provide smallmouth bass and panfish habitat. Still others would like to see the return of fishable populations of shad on the West Branch Susquehanna River. This would require the installation of fish passage structures on the Grant Street Dam in Lock Haven. The development of a fisheries management plan for the Lower West Branch was identified as being a tool that could be used to evaluate and improve fishing opportunities in the corridor.

3. Economic Potential

Because of the corridor's scenic beauty, rich history and significant opportunities for outdoor recreation, many entities consider nature tourism an industry that could improve the local economy. Through the cooperation of local visitor bureaus and chambers of commerce, a regional marketing plan that promotes the corridor as a Pennsylvania destination attraction could be a great investment in sustaining the future of the corridor's communities. Developing a greenway that links natural, cultural and historic resources together and provides recreational benefits could stimulate economic growth within the corridor. Tourism efforts that promote the corridor's history would further compliment the greenway initiative.

4. Need for Public Outreach and Education

Based on responses at public meetings, there is an interest and need to provide more educational opportunities on the natural, historical and cultural resources within the study corridor. If public programs and school curriculum are developed and offered to identify the corridor's environmental issues and concerns, present and future generations can become better stewards to help correct problems and recognize the value of enhancing, restoring and protecting the corridor's resources. Likewise, there is also an interest in providing the public with a better understanding of the Native American, canal and lumber history of the corridor.

5. Historic Preservation

The need for better historic interpretation of the corridor's Native Americans and showcasing the area's lumber heritage and remnants of the Pennsylvania Canal can also meet the need of both economic potential and public outreach issues described above. Other needs of preservation include identifying and protecting historic sites and structures and restoring historic structures in need of repair. Such features may include canal walls and log crib remnants. The corridor's floodplain and river islands have a high potential for the presence of archaeological resources and need to be protected.

6. Land Use Planning and Development

Because of land development pressures in suburban and rural areas of the corridor, the need to protect unique habitats and valuable agricultural lands through zoning and special programs was identified. Opportunities for sound land use in the corridor include development of resource protection ordinances, formation of comprehensive plan partnerships and strengthening land use ordinance enforcement. The management and maintenance of recreational river lots along the banks of the West Branch were also issues identified in need of being addressed through zoning. The lack of coordinated planning at the local municipal level and the need to improve the education of municipal officials and residents on planning and zoning practices was another area identified for improvement.

7. Flooding and Floodplain Management

Some of the larger communities along the West Branch and its tributaries such as Williamsport, South Williamsport and Lock Haven are protected from flooding by constructed levee systems. Flood control reservoirs upstream of the study corridor that also help to mitigate flooding in the study corridor include the Stevenson, Bush, Sayers and Curwensville dams. Stormwater management basins further work to reduce flooding impacts by temporarily storing runoff from impervious surfaces such as roads, developments and large parking lots. However, floodplain encroachments (such as structures built in the floodplain) decrease the area that can store floodwaters. When the floodplain storage capacity is reduced by such development, floodwaters tend to spread out and affect properties and people's safety during a flood. The resulting property damage and sometimes loss of life are serious issues. Therefore, floodplain management programs, zoning restrictions, compatible open space land use, conservation easements and transfer of development rights have been identified as potential management options that can help reduce the impacts of flooding.

8. Sports & Recreation Opportunities and Water Safety

Because of the corridor's beautiful scenery, the presence of public lands (community parks, state forest and state game lands) and the recreational opportunities provided by the West Branch Susquehanna River, the corridor is used for various types of recreation by several user groups with different needs. Land based recreation needs or opportunities that were identified by the public include community recreation facilities, hiking and biking trails, picnicking, bird watching and camping. Water based recreation needs and opportunities include better riverfront access, motorized boating, jet skiing, swimming and tubing, fishing, waterfowl hunting, canoeing and kayaking, crewing and the need for portage trails around the corridor's two dams. Multi-purpose recreational opportunities include special community events, relaxation/spiritual renewal and stress relief.

With the many different user groups comes the need for balancing user interests. This became very apparent at the public meetings where user groups expressed different concerns that need to be addressed in order to improve their recreational pursuits. One example of this included boating enthusiasts who wanted to expand dam pools for motor boats and jet ski use, while other avid hikers or bird watchers wanted to preserve the serenity of the environment along their favorite stretch of the river and eliminate noises from boat motors. Another example included anglers who wanted to preserve log cribs in the river for their valuable fish habitat while motorized boat users and jet skiers wanted them removed for safety concerns.

With the presence of deep dam pools that offer a wide water body surface for motor boats and jet skis and a long scenic river corridor that is attractive to canoeist and kayakers, water safety is also a public concern. Motorized boat owners and jet skiers were predominantly concerned with submerged hazards and obstructions in the river, while canoeist and kayakers were more concerned with low head dams and the lack of any portage trails around them. Anglers, who

often use non-motorized boats or quiet electric motors to reach their favorite fishing hole, were concerned about the noise and wakes that other motorized boats and jet skiers created in the river. With users of different recreational pursuits and watercrafts of varying speeds, it became very clear that competing interests on the river do pose important safety issues that currently are not addressed by zoning or boating regulations.

9. Protecting Scenic Views and Litter Management

The forested river hills and the high mountain ridges that comprise the periphery of the river valley provide beautiful scenery and significant vistas within the river corridor. Bald Eagle Mountain and the stretch of river corridor between Montoursville and Muncy are prime examples of what makes the river corridor an attractive place to live and visit. Some sections of forested ridges that are state forest or state game lands are protected from development. However, privately owned tracts on mountain sides or river hills are now experiencing pressures of new land development. The primary concern of public and municipal officials was the lack of protection for scenic viewscapes along the north face of Bald Eagle Mountain. Unless important viewscapes are protected by conservation easements and land use control ordinances, a very important amenity of the river corridor could become degraded.

Another concern that can spoil the scenery of the corridor is the impact of illegal dumps and litter along the floodplain and waterways. Such trash is an eyesore that degrades the beauty of the natural habitats and the appearance of the river and its tributaries. While floods and high waters often wash trash and debris downstream from upstream sources, efforts that prevent illegal dumping and trash deposition in the river and its floodplains need to be made. Illegal dumps need to be removed and strict zoning guidelines and regulations for river lot users need to be adopted to mitigate the problem. Annual community clean-up events and Adopt -A- River programs were identified as ways to combat the problem at a volunteer level.

10. Improving Water Quality and Balancing Water Resource Use

While ongoing studies indicate that the West Branch Susquehanna River and its tributaries exhibit good water quality, water pollution problems from point and non-point sources still exist in the study corridor. Some studies revealed that the largest contributor of impairment (70%) in the entire watershed was agricultural pollution. Remaining impairment sources (30%) included road runoff, atmospheric deposition, small residential runoff, Acid Mine Drainage (AMD), urban runoff and storm sewers, natural sources and removal of vegetation. AMD pollution comes from sources upstream of Lock Haven but still needs to be mitigated to improve water quality of the river.

The use of Best Management Practices (BMPs) in agricultural areas of the corridor, including planting trees and shrubs to establish or improve riparian buffers is one obvious way to reduce stream bank erosion and filter out excess silt and nutrients. Stream bank fencing, grass-lined waterways, contour farming and proper manure storage are other BMPs that could be

implemented in agricultural areas of the corridor. The use of BMPs for timber harvesting operations can also reduce the amount of soil erosion and sedimentation along tributaries.

Encouraging sewer and septic system upgrades, and separating combined sewer systems into separate storm and sanitary sewers is an improvement that could be made at the residential and community levels to improve water quality. Stormwater runoff management from construction sites and developed areas is also of concern. While regulated by PADEP and the local county conservation districts, BMPs such as bioretention and infiltration strips could improve the quality of stormwater runoff by filtering out pollutants. Other efforts to protect water quality in the corridor include continued water quality monitoring for water borne pathogens and pollutants, wellhead protection programs and source water protection measures.

Regarding water use, northcentral Pennsylvania suffered from several drought emergencies within the past 5 years. The need to establish minimum and optimum flows in the West Branch and creating a low flow trigger system to help identify drought emergencies and implement conservation measures is an issue that needs addressed. Implementing strategies to balance water needs of public water utilities and agricultural and industrial operations in the corridor is also an important concern. Water consumption studies and subsequent water budgets will need to be completed to address these issues and concerns.

B. Public Meetings

1. Round 1 Public Meetings

In addition to identifying specific projects that will enhance the corridor, a river conservation plan provides an invaluable opportunity to educate the public, to identify shared interests, and to take note of conflicting priorities that might hinder plan implementation. A public involvement program is the primary tool used to gather this essential information. The purpose of the Round 1 Public Meetings was to educate the public on the lower West Branch Susquehanna River study corridor, the River Conservation Plan process and to gather information on public interests and concerns. Goals for the public meetings included:

- Develop public understanding of what a River Conservation Plan is and how it can benefit them.
- Develop public understanding of the process for developing the River Conservation Plan.
- Develop positive outlook toward project and the Northcentral Pennsylvania Conservancy.
- Get municipalities to understand the project and determine their willingness to support it.
- Generate interest in the river.
- Identify concerns and interests, including user conflicts.
- Identify Citizens' relationship to the River.
- Develop a public vision for the River.

The format used for Round 1 meetings included a 30 minute presentation to the entire group, followed by 60 minute working sessions in groups of 5 to 12 people. Each group was led by a trained facilitator and given six questions to discuss. A copy of the Working Session Agenda is contained in provided in Section 3 of the Technical Document (TD-3). Large-scale mapping was available for each group for visual reference and to record comments. The entire group then re-formed and each working group presented the highlights and main points from their work session. A series of six public meetings was conducted in communities located throughout the study corridor. The location and schedule for those meetings included:

Muncy	March 19, 2001
Williamsport	March 20, 2001
Lewisburg	March 22, 2001
Watsontown	March 26, 2001
Lock Haven	March 28, 2001
Jersey Shore	March 29, 2001

Approximately 150 people attended the Round 1 Public meetings to share their ideas of potential improvements and concerns about the river corridor's resources within the corridor. Minutes of the Round 1 Public Meetings are contained in TD-3. The summary below provides the public's responses to four main questions:

1. How do you currently use the River?
2. What do you see as opportunities or strengths of the River now?
3. What are your concerns about the River?
4. If you could do one thing to affect the River today, what would that be?

Current River Corridor Use

The West Branch of the Susquehanna River study corridor provides a multitude of opportunities for people to enjoy nature, sports and recreational activities, or free time with family and friends. The way that the public utilizes river resources largely depends on where people live in the corridor, the presence of public lands, the proximity to recreational dam pools and their hobbies. According to the public meeting participants, the way that people use the river now or how they would like to use it in the future include the following major activities:

- Bird Watching
- Camping
- Fishing
- Motorized Boating/Jet Skis
- Non-motorized Boating
- Picnicking
- Special Events
- Sports and Recreation
- Swimming/Tubing
- Relaxation/Spiritual Renewal
- Walking/Hiking
- Waterfowl Hunting

Perceived Conflicts Between Uses

Along with multiple opportunities to utilize the river and its resources come conflicts of interest between different user groups. Some people go to the river to relax and enjoy the beauty and peacefulness of nature. Some look at the river as their highway to fun via motorized watercraft. Still others cherish the history that the river holds and want to protect the remnants of the river's lumber and canal heritages. The major conflicts of interest most often occur in areas where recreational dam pools exists or in areas near river lots. The conflicts that were perceived the most by meeting participants included:

- Log crib removal for motorized safety vs. Preservation for historical and habitat value
- Noise of motor boats and jet skis vs. Serenity of the environment
- River lots vs. Scenic floodplain
- Safety issues between motorized and non-motorized boating

Concerns Regarding the River

The people that use or enjoy the river often are the same people that are most knowledgeable about the river's resources, its problems and potential concerns regarding current or future uses. Among those concerns the public meeting participants identified the following:

- Development Pressure
- Erosion Control
- Floodplain Development
- Garbage / Wastes along river banks
- Habitat Loss
- Habitat / Natural Features
- Highway Project Impacts
- Industrial Pollution
- Invasive Plant Species/ Impacts to Native Plants
- Protection of Unique Areas from Development
- River Vistas/ Scenic Buffers
- Sewage Effluent
- Shallow Depth due to Sedimentation
- Stormwater Runoff from impervious surfaces
- Unmanaged River Lots
- Waterborne Pollutants
- Water Quality

Components of the Public's Vision for the River

When public meeting participants were asked what they would do if they could do one thing to affect the River today, their answers predominantly reflected how their existing concerns about the river could be solved or mitigated. The main categories of how to improve the river corridor and protect, preserve or improve its resources included the following:

- Water quality improvement
- Better access to River from communities
- Protection of critical habitats areas
- Return of native species to the area (fish, plants, etc.)
- Remove obstructions in the River
- Provide fish ways or ladders around dams
- Portage trails around dams
- Education opportunities for Environmental, Historical and Cultural Resources
- Improve recreation opportunities
- Trails, and how to access them
- Improve fishing opportunities
- Maximize the river's potential for stress relief
- Develop a community wide environmental conscience
- Commercial use / economic use must be part of the RCP
- Adopt a River Program

From the information gathered during Round 1 Public Meetings, the Stakeholder Interviews and Municipal Questionnaires, the River Conservation Plan Steering Committee categorized the issues by theme into major resource categories. These issues fell into eleven (11) different resource categories:

- Conservation & Natural Resources (CN)
- Economic Development (EC)
- Education (ED)
- Flooding & Floodplain Management (FM)
- Historic Preservation (HP)
- Planning & Zoning (PZ)
- Sports & Recreation (SR)
- Viewscapes (VS)
- Water Quality (WQ)
- Water Safety (WS)
- Water Resource Use (WU)

After grouping the issues into resource categories, the Steering Committee identified the needs related to these issues. The River Conservation Plan Steering Committee then developed a set of

actions for each issue within each resource category. Each action was documented and the appropriate partners for each issue were identified. Such partners were determined by the type of agencies, planning bodies, interest groups, beneficiaries, and resource professionals that were both the most knowledgeable, and able to carry out a proposed action to fruition. A priority and timeline to carry out such actions were also identified. Management Options are further discussed in Section VIII of the River Conservation Plan.

2. Round 2 Public Meetings

Round 2 Public Meetings were held in May 2003. A total of five public meetings were conducted in communities located throughout the study corridor. The location and schedule for those meetings included:

Williamsport	May 14, 2003
Lewisburg	May 15, 2003
Lock Haven	May 19, 2003
Muncy	May 21, 2003
Jersey Shore	May 22, 2003

The purpose of the Round 2 Meetings was to:

- Review what a River Conservation Plan is.
- Emphasize the importance of public involvement.
- Provide an update on events since Round 1 Public Meetings.
- Present the Draft River Conservation Plan.
- Determine support and prioritization of the proposed implementation projects.

Round 2 meetings included a 30 minute slide presentation to attendees at each location. The presentation highlighted the different management options that were developed from public input collected during Round 1 meetings, stakeholder surveys and municipal questionnaires. Each meeting was followed by an open discussion on the proposed management options, and information on where copies of the draft plan were available for review and how to provide comments. Meeting attendees were also encouraged to stay after the presentation for an open house to discuss the plan with facilitators and view resource exhibits that displayed conceptual graphics of potential early implementation projects. Lists of early implementation projects and a comment sheet were also provided at each exhibit station.

Copies of the entire draft plan were made available for review at 14 different public locations in the study corridor including public libraries and county planning commission offices. The plan was also made available for review on the Northcentral Pennsylvania Conservancy's website. After a 70-day comment period, approximately 283 individuals provided comments. Comments from the Round 2 Public Meetings and comments on the draft plan are provided in Section 6 of the Technical Document (TD-6). The final plan was revised to reflect public concerns and clarification responses to any misconceptions of the plan were prepared and provided in TD-6.

C. Municipal Surveys

In June 2001, the 47 communities and 46 local planning commissions along the West Branch Susquehanna River were sent a questionnaire to help the planning team understand how the river is used, how people would like to use it, what the concerns are relating to the river, and what opportunities exist. Section 4 of the Technical Document (TD-4) provides a copy of the questionnaire. TD-4 also contains a compilation of all the responses received. Some highlights of the responses are provided below.

The following percentage of municipalities in each county responded to the questionnaire:

Clinton	29%	Lycoming	32%
Northumberland	27%	Union	54%

Does the current access available meet the demands of the residents?

Yes	21
No	5

Walking along or near the river was an idea that many people in March 2001 were interested in pursuing. Municipal officials were asked if walking occurred along or near the river. A later question asked them to rate how important providing connecting paths between communities, communities and the river, recreation facilities, and work and recreation were to their municipality.

Is walking near / along the river available in your community?

Present	12
Planned	0
Desired	8

How effective are your zoning and land use ordinances as tools for River Conservation?

Excellent	3
Good	14
Need Improvement	8

Top three concerns in the river corridor:

Flooding and property damage	23 (77%)
Flooding and public safety	23 (77%)
Loss of fish habitat	12 (40%)

Top three types of economic development the municipal officials would support:

Bed and Breakfasts	24 (80%)
Campgrounds	24 (80%)
Bicycle Rental Shops	21 (70%)

Are these items important in you community:

Maintaining the natural beauty & character of the river	24 (80%)
Improving Water Quality	21 (70%)
Conserving natural habitat areas	18 (60%)
Providing public recreation facilities	18 (60%)
Conserving natural resources	17 (57%)

Does the Lower West Branch of the Susquehanna River have a positive impact on your community?

Yes	20
No	9

Based on the results of the municipal survey, the communities within the study corridor are interested in increasing opportunities for walking and other forms of recreation along the West Branch, addressing the impacts of flooding on their communities and maintaining the natural beauty and character of the river. Conserving natural habitats and resources of the study corridor and improving water quality were also important to municipal officials. While the majority of the municipal officials indicated that the river already has a positive impact on their community, they also indicated that they would support new recreational or tourist type attractions that would help boost the local economy.

D. Stakeholders

For the purpose of the River Conservation Plan, the project team used a three-pronged approach: public meetings, municipal surveys, and stakeholder interviews. Stakeholders are defined as any person, group, or organization that has a vested interest in a project. This interest may be economic, social, or cultural, but it will impact the management alternatives that are pursued within the corridor. For instance, conflicts can arise between landowners who want to maintain their privacy and the public, which often desires more riverfront access. Similarly, neighboring municipalities may realize that they can best serve their interests (and save taxpayer dollars!) by working jointly on regional projects. A well-designed public involvement program will identify such opportunities and constraints and use this information to direct the planning process. Public involvement does not guarantee that all management options will be widely supported.

However, by giving stakeholders an opportunity to document their issues and concerns, it encourages local ownership and validates the plan as a reflection of local interests.

Throughout a two-month period, the project team conducted nearly thirty (30) personal interviews. Interviewees from throughout the four-county region included representatives of municipal and State government, private industry, natural and historic resource organizations, and planning departments. Utilizing an open-ended format to encourage participation, interviewers asked the following series of questions:

- How do you or your employees (if applicable) currently use the River?
- What are the critical issues facing your organizations regarding the River?
- What are the existing assets of the River?
- What aspects of the River do you think will change over the next 5 or 10 years?
- What is your vision for the River's future?
- What do you see as the barriers to reaching this vision?
- What role do you see your organization playing to achieve this vision?
- What role do you see other organizations playing?
- How do you feel your organization can participate in the planning process?
- Any other comments or questions?

By comparing interview responses (Section 5 of the Technical Document), the project team was able to identify consistent themes and outstanding issues. These responses are summarized as follows:

Recreational

Balancing user interests was a common theme throughout the corridor, particularly in Northumberland, Williamsport and Lock Haven. These communities have dams and pool areas that provide public recreation opportunities for a host of user groups, including boaters, jet skiers, fisherman, and swimmers. The growing popularity of these pool areas is viewed as an opportunity to promote economic development within these established growth centers. However, it also presents a challenge to local governments and resource organizations, which must balance user interests against environmental priorities. For instance, many motorboat enthusiasts view submerged timber crib structures – vestiges of the region's lumbering era – as a safety hazard that should be removed from pooled areas. Many anglers, however, value these structures as prime fishing habitat. Similarly, some local governments expressed concern over jet ski use, which has been on the rise in recent years. The noise associated with these watercraft conflicts with the interests of passive recreationists, people who enjoy the river for its beauty and serenity. When multiple groups utilize the same resource, such conflicts are bound to arise. Interviewees differed in their suggestions for mitigating such conflicts, from designating specific user areas to enforcing stricter licensing practices. However, all agreed that balancing user interests would continue to be a challenge for local governments and resource organizations in the future.

The isolated location of existing recreation centers, particularly Milton State Park and Susquehanna State Park, was identified as a barrier to public recreation. Strategies that enhance the visibility of existing recreation areas were recommended, as were projects that link community assets at a regional level. Public development was preferred over private development, which was viewed as having a negative influence on river resources.

Environmental

While some interviewees view the pool areas as assets that should be capitalized upon for economic development purposes, others felt that dam construction has heightened localized flooding activity, inhibited fish migration, and contributed to riverbank degradation within the watershed. They do not want communities to lose site of one fact: that the river corridor is a scenic resource worth protecting. Interviewees value the river for its role in history – as a primary transportation corridor and source of devastating floods. While they wish to protect their community from further loss of human life and property, they wish to protect vestiges of the past – log cribs that have remained submerged since the lumber mills went out of business in the 1800s or old timber crib dams that provide a great habitat for aquatic life. To preserve this heritage and to protect the resource for future generations, interviewees felt that more regulations were needed to mitigate development along ridge tops and within critical viewsheds. In some instances, land use regulations (and their enforcement) were not viewed as stringent enough to reduce pollution and to improve water quality, particularly with regards to riverlot development and motorboating activity.

Economic

Many interviewees view the West Branch as an under utilized asset that can improve the quality of life and stimulate economic development. In a very direct way, the river contributes to the regional economy: by supplying the water that feeds residential and commercial development. Increased user demands threaten the quality and quantity of this resource, particularly during drought periods. Interviewees recognize the need to accommodate future growth without diminishing this resource. The construction of Interstate-99 and the Central Susquehanna Valley Through Way Project are viewed as both an opportunity and a challenge. The highway construction projects will reduce travel times, thus expanding market areas and increasing opportunities for tourism development. However, additional development and population growth could threaten the very resources that make the corridor unique. To manage this resource in a sustainable manner, local governments need the proper tools to protect sensitive natural environments, such a ridge tops, floodways, prime agricultural land, and wildlife habitat. Recommended tools included bond pools to acquire at-risk properties; incentive programs such as Transfer of Development Rights (TDRs) and conservation easements; and land use regulation that restricts future development in these areas.

Over the years, the West Branch has become a tourist attraction in its own right. From the Annual Regatta in Lock Haven to the daily excursions of the Hiawatha in Williamsport, the river attracts a host of outdoor enthusiasts. Although flood control systems inhibit river access at

some locations (e.g. Williamsport, Lock Haven,), these engineering marvels also present an opportunity to heighten public awareness about the river and its role in history. From the lumbering heyday of the 1800s to the more recent flood losses of 1996, the river continues to play an important role in the communities through which it flows. This historic connection to the river is a strong regional asset that could heighten the corridor's role as a tourist destination. Interviewees believe that there are many intangible benefits associated with riverfront development. Quality of life is improved when people have access to the river, either for recreation or contemplation. A rich natural environment can also enhance the corridor's image as a rugged natural area left relatively unscathed by development. The River Conservation Plan presents an opportunity to market the region for its rural character and charm.

'Balancing user interests' became a recurrent theme throughout the stakeholder interviews. Clearly, participants viewed tourism as an important component of the regional economy that could receive a much-needed boost through this project. However, providing greater public access to the river creates the potential for greater user conflict, which will only increase without proper management. In addition to project financing, private land interests were viewed as a sensitive issue that could limit certain implementation projects. By engaging primary landowners early in the process, it is hoped that unnecessary conflicts can be avoided later on.

Historical

Among many interviewees, historic preservation was viewed as a necessary component of a River Conservation Plan. Evidence of the corridor's history is visible everywhere, from downtown historic districts, to old canal/lock remnants to archeological remains of Native American habitation. Through these resources, the community has an opportunity to nurture the public's appreciation for local history and to promote heritage tourism as a viable component of the economy. In addition to promoting National Register Historic Districts as tourist destinations, interviewees also recommended public museums, walking tours, and traveling exhibits that "tell the story" of the corridor from pre-European times to the present. Interpretive signage and historic markers would enrich the experience and provide an opportunity for Tourist Promotion Agencies (TPAs) to effectively market the region as a heritage tourism destination.

Social

The majority of responses emphasized the need for more coordinated local-level planning to protect sensitive environmental areas (e.g. floodplains, prime agricultural land) and to preserve scenic viewsheds. Although a majority of interviewees recommended projects that would improve public access and expand recreation opportunities, acceptable methods for financing these improvements were less certain. Some interviewees noted that residents would resist enhancements if they perceived that these improvements would result in higher taxes or would not directly benefit them in some way. Interviewees also identified a need for ongoing public education to maintain momentum for the conservation plan and to built support for key projects.

VIII. MANAGEMENT OPTIONS

A. Implementation Projects

The recommended projects are provided in Tables VIII-1 through VIII-12: Management Options to Restore, Enhance & Protect the Lower West Branch Corridor. The number of recommended implementation projects for each resource category are as follows:

- Conservation & Natural Resources (40)
- Economic Development (20)
- Education (16)
- Flooding & Floodplain Management (14)
- Historic Preservation (26)
- Planning & Zoning (28)
- Sports & Recreation (44)
- Viewscapes (10)
- Water Quality (31)
- Water Safety (21)
- Water Resource Use (12)

As could be expected, the Sports & Recreation, Conservation & Natural Resources, Water Quality and Historic Preservation resource categories were of most concern to citizens, municipalities and stakeholders in the study corridor and offered the most opportunities for implementation projects. This reflects the general population's appreciation of the historical and cultural heritage of the study corridor's past and their current treasure of natural resources that provide many opportunities for conservation, recreation, and tourism. Of course all of the resource categories are important to the Lower West Branch Susquehanna River Conservation Plan and many of the recommended implementation projects are related to or compliment each other. As such, a list of early implementation projects has been identified and provided in subsection C below. Please note prioritization of projects will not impact future funding of DCNR grants. We will consider any project listed in the management options regardless of their priority.

As seen in Tables VIII-1 through VIII-12, for each Management Option within a resource category there is at least one, or in many cases, several specific implementation projects. The lead partners are also listed in this table. Specific funding sources for financing the projects and achieving the recommended goals are also provided. In some cases, implementation projects may require an act of legislation, planning, rezoning, and updating ordinances while others require implementing better education, tourism or business ideas. The latter require more of a community effort towards reaching the same common goals rather than funding. Buy in and support from citizens, municipalities and stakeholders is crucial to implementing any of the projects or concepts in the River Conservation Plan. Section IX discusses the Greenway

Element, which is one of the larger implementation projects in the Lower West Branch Susquehanna River Conservation Plan. The recommended actions and strategies for implementing the proposed projects are described in greater detail in Subsections B and C below.

INSERT TABLE VIII-1 to VIII-12 (27 PAGES)

B. Recommended Action Steps

Once the Plan has been publicly endorsed and approved by the State Department of Conservation & Natural Resources (DCNR), the Steering Committee should move forward with a handful of priority projects that are guaranteed "success stories" – projects that are popular with the community and funding agencies involved. Demonstrating early results will build credibility for the Conservation Plan and for the stakeholder organizations that have dedicated time and resources to the effort. Other recommended actions are as follows:

1. **Develop an Outreach Program**
   Because an overwhelming majority of land within the study Corridor is under private ownership, the Steering Committee has little *direct* control over plan implementation. In light of this reality, the Steering Committee will need to develop outreach programs that speak to the benefits of individual stewardship. To ensure that conservation initiatives remain a priority at the local level, municipal and county governments should be encouraged to adopt the River Conservation Plan as an amendment to their comprehensive plans. Promotional materials highlighting the economic, environmental, and social benefits of river conservation should be distributed to businesses in the watershed, particularly those that depend upon water for their livelihood.

2. **Prepare an Annual Work Plan**
   Many municipalities utilize Capital Improvement Plans (CIPs) to prioritize public improvements that require multi-year budgetary commitments. Because CIPs reflect community priorities, they provide a mechanism for comprehensive plan implementation. They typically have a long-term time horizon (5-6 years) and are regularly updated to reflect emerging needs and fiscal constraints. The first year of the Capital Improvement Plan (CIP) is referred to as the capital budget and is closely coordinated with a municipality's annual operating budget. Although project priorities may change from year to year, capital improvement programming provides a *formalized* process for decision-making. It avoids a piecemeal approach to community planning that can serve as a model for the River Conservation Plan. It is recommended that the Implementation Committee develop an Annual Work Plan and establish benchmarks to monitor progress.

3. **Formalize Committee Structure**
   To ensure that the issues do not languish on the planning room floor, the Steering Committee needs to establish a framework that supports ongoing public involvement. A permanent committee structure can heighten the River Conservation Plan's visibility within the Corridor. Funding organizations look favorably upon projects that incorporate stakeholder participation and that demonstrate an ability to leverage local funding and in-kind resources. Instead of competing for limited grant dollars to undertake piecemeal projects, partner organizations can undertake larger-scale projects that deliver visible results in the Corridor.

4. Hire a Greenway Coordinator

The first year of project implementation will be a critical time period for the Steering Committee and any newly established committees. To maintain active stakeholder involvement, the Steering Committee must demonstrate that the River Conservation Plan is an action-oriented document that delivers on-the-ground results. To achieve this objective, the Steering Committee must have the time and resources available to focus upon project implementation. Yet, like many non-profit organizations, the Conservancy and the Steering Committee must manage their responsibilities with limited staff and administrative support. Dedicating a staff person to this effort is a luxury many non-profit organizations cannot afford. For this reason, it is recommended that the Conservancy and the Steering Committee seek grant assistance and/or foundational support for a Greenway Coordinator. The Greenway Coordinator would have extensive experience working with river conservation/greenway projects and would be responsible for advancing a handful of early implementation projects.

5. Affiliate the Program with a Local University or College

Because grant funding tends to be project specific and limited in nature, it will be important for the Steering Committee to identify a dedicated funding source that can sustain the Greenway Coordinator position over the long-term. The Steering Committee is encouraged to work with local universities and colleges that can provide office space, staff support, salary, and benefits for the Greenway Coordinator position. This position could be jointly funded by the Conservancy, the Steering Committee and the academic institution to minimize the financial burden placed upon any one agency. This partnership can deliver multiple benefits:

- Reliable Funding

  Most grant programs require applicants to demonstrate how their grant will leverage local resources to sustain the activity in subsequent years. The Steering Committee will need to demonstrate how it intends to maintain the Greenway Coordinator position over the long-term. A university or college partnership can help achieve that goal

- Educational Opportunities

  By affiliating the River Conservation program with a local college or university, the Steering Committee gains access to a network of professionals and students that might benefit from outdoor classroom opportunities, demonstration projects, and internship opportunities.

- Network of Resources

  By affiliating with an academic institution, the Steering Committee may be able to step beyond the funding opportunities currently available. This partnership could provide particularly beneficial for advancing some of the research-oriented projects, such as invasive species management, wildlife studies, and water quality monitoring.

6. Sponsor a Corridor Summit

Upon finalization of the Annual Work Plan, the Implementation Committee should organize a regional conference. Sponsored by various partner agencies, this conference provides an opportunity to raise public awareness and recognize progress. Use this opportunity to acknowledge businesses, communities, and organizations that have demonstrated good stewardship of river resources. Invite keynote speakers to talk about issues that the organization will be focusing upon in the coming year. This 'annual review' keeps the project in the public eye.

7. Consider Establishing a Dedicated Funding Pool

As the Saginaw Case Study demonstrates, a funding pool can enable contributors – large and small – to leverage their resources while supporting projects that meet their strategic objectives. In addition to the region's Community Foundations, there are several private foundations and companies – both regional and national in scope – that support conservation projects (See Table 1-3 of the Technical Document). Businesses with NPDES-permitted facilities, Superfund/CERCLA sites, or businesses that are listed on the Toxic Release Inventory (TRI) should be considered for inclusion in a targeted membership/fundraising campaign.

C. Early Implementation Strategy

The Lower West Branch River Conservation Plan provides a strategic framework for promoting sustainable development within the Corridor. Because the plan was developed with broad-based public input, State and Federal agencies may utilize the document when evaluating requests for funding. The Steering Committee selected these early implementation projects (presented in Table VIII-13) after careful consideration of the following**:** (1) **Public Support** as documented via stakeholder interviews, municipal questionnaires, and public meetings; (2) Commitment of **Lead Partners**; (3) **Funding Availability**; (4) **Political Support**; **and** (5) **Project Readiness**. Additional supporting information on the River Conservation Plan's early implementation strategy can be found in Section 1 of the Technical Document.

INSERT TABLE VIII-13 Early Implementation Strategy

IX. GREENWAY ELEMENT

A. Overview

1. Greenway Definition

A greenway is a corridor of open space. Greenways vary greatly in scale, from narrow ribbons of green that run through urban, suburban, and rural areas to wider corridors that incorporate diverse natural, cultural, and scenic features. They can incorporate both public and private property, and can be land-or water-based. They may follow old railways, canals, or ridge tops; or they may follow stream corridors, shorelines, or wetlands, and include water trails for non-motorized craft. Some greenways are recreational corridors or scenic byways that may accommodate motorized and non-motorized vehicles. Others function almost exclusively for environmental protection and are not designed for human passage. Greenways differ in their location and function; but overall, a greenway will protect natural, cultural, and scenic resources; provide recreational benefits; enhance natural, cultural, and scenic resources; provide recreational benefits; enhance natural beauty and quality of life in neighborhoods and communities; and stimulate economic development opportunities.

- Pennsylvania Greenways Partnership Commission

2. Greenway Vision

The vision for the Lower West Branch Susquehanna River Greenway is to have a continuous greenway along its banks. The communities along the river are connected to the river. A trail system is developed that provides recreation and commuters with a way to travel through a community and from one community to another. There are areas of permanently protected open space between the small communities in the valley. Natural resources are conserved and not wasted. Citizens in the river valley appreciate the resources around them. The viewshed is recognized as a valuable resource to the valley to be conserved.

3. Greenway Goals and Objectives

The Lower West Branch Susquehanna River has many diverse natural, cultural, scenic, and recreational resources that should be preserved and made accessible to the public. The development of greenway linkages between these varied resources is a primary goal of this River Conservation Plan. Goals and objectives for the Greenway include the following:

- Connect existing recreational, cultural, and natural areas within the river corridor with lineal paths for non-motorized transportation and recreation.
- Protect the water quality and natural resources of the Lower West Branch of the Susquehanna River by creating linkages between natural corridors and conserving or enhancing existing vegetation, ecosystems, and wildlife habitats.

- Enhance the quality of life for local communities.
- Stimulate economic development opportunities within the Lower West Branch of the Susquehanna River corridor.
- Enhance and protect the natural resources of the river through projects such as riparian buffer plantings, wetland creation and wildlife habitat conservation and restoration.

4. Why Prepare a Greenway Plan

Greenway development is a key strategy in 'Smart Growth' planning in Pennsylvania as our communities are losing land to development at an increasing rate. In response to recent 'Smart Growth' initiatives, many counties and municipalities are including greenway plans in their comprehensive plans. Inclusion in a comprehensive plan allows greenway projects to be eligible for certain government funding programs for which they may not otherwise be eligible. For this reason, it is recommended that all counties and municipalities begin to include or add greenway plans in their comprehensive plans.

In addition, the Pennsylvania Greenways Partnership Commission (PGPC) published their *Pennsylvania Greenways: An Action Plan for Creating Connections* report in June 2001 in response to Governor Tom Ridge's Executive Order 1998-3. This plan provides goals and strategies for creating greenway connections so that by 2020 every community in the Commonwealth has an established greenway. Pennsylvania's Greenway Vision is:

> *Pennsylvania and its many partners will develop an outstanding network of greenways across the Commonwealth, creating an asset highly valued by Pennsylvanians and enhancing the quality of life for all. This network of greenways will connect Pennsylvania's open space, natural landscape features, scenic, cultural, historic and recreational sites, and urban and rural communities. Greenways will become one of the Commonwealth's most powerful tools to achieve sustainable growth and livable communities.*

The 'Smart Growth' initiative, Statewide Greenway Program and the Susquehanna Greenway Partnership all indicate that the Commonwealth of Pennsylvania greatly supports the creation of greenways. The Lower West Branch Susquehanna River Greenway Plan should utilize this support and coordinate with these statewide projects.

The Lower West Branch Susquehanna River Greenway will become part of the Susquehanna Greenway. The Susquehanna Greenway study focuses on the entire Susquehanna corridor in Pennsylvania – a two-mile wide corridor from New York to Maryland, including the West Branch. Information from this plan will be provided to the Susquehanna Greenway Partnership for incorporation into the larger greenway plan.

5. Types of Greenways

The Lower West Branch Susquehanna River Greenway will be a "Comprehensive Greenway System" based on the natural landforms and opportunistic assembly of greenways and various open spaces within the corridor to create a network of green infrastructure in the region. The various greenways that will make up the system can be categorized in the following four groups: Urban Riverside Greenways, Recreational Greenways, Resource Conservation Greenways, and Scenic and Historic Preservation Greenways. It is important to note that, while a particular greenway segment may primarily serve one of these functions, the types of greenways and their goals are not mutually exclusive.

Urban Riverside Greenways

Urban Riverside Greenways are usually created along urban waterfronts where there is an opportunity to obtain property and/or modify current land use to create open space and connections. Their purpose is to provide re-vitalization, pedestrian access, water quality improvement, and promote tourism.

Recreational Greenways

Recreational Greenways feature paths and trails of various kinds and are intended to provide public access to active and passive recreational opportunities. Often, these greenways are used to link a series of parks or other destinations such as historic sites, schools, libraries, shopping areas, residential areas and employment centers. Trails usually follow natural features, such as a stream or a mountain ridge, as well as canals, abandoned railbeds, and public rights-of-way. In urban areas they can also follow local streets or cut through athletic fields or parks.

Resource Conservation Greenways

Resource Conservation Greenways are intended to protect waterways and their surrounding environment, and sometimes ridgelines. They provide for wildlife migration and species interchange, nature study, and hiking. As a protected corridor, such as a stream valley, a resource conservation greenway can provide nearly uninterrupted corridors where wildlife can flourish and travel between areas of the ecosystem without human intrusion. Resource Conservation Greenways also protect and improve water quality as natural buffer areas.

Scenic and Historic Preservation Greenways

Scenic and Historic Preservation Greenways are used to protect valuable scenic landscapes and places of historical significance. They are important for the visual character and quality of the community because they consist of public and private lands that are protected primarily for the views they possess. Important scenic views may be views of pristine natural landscape or may encompass a nostalgic or historic landscape. These scenic views may be from road corridors,

trails, waterways, or accessible viewing areas. Other Scenic and Historic Preservation Greenways may protect historically significant buildings, either in town or alone in the countryside. These greenways may provide some pedestrian access along the route, a place to alight from a vehicle, or no point of access for people.

B. Background

1. Existing Resource Inventory

Demographics

The population of the municipalities within the study corridor is shown in Appendix B-1. For more information on demographics see Section II, Project Area Characteristics. Some of the more important Greenway planning considerations concerning the study area includes:

- Population centers
- College and university locations. Bucknell University is in Lewisburg, Lycoming College and Pennsylvania College of Technology are located in Williamsport, and Lock Haven University is in Lock Haven.
- Under 18 population. 22% of the study area population falls into this category. This age group has a considerable amount of leisure time.
- Over 65 population. 17 % of the study area population falls into this category. This age group has the most amount of leisure time. There are also special considerations for mobility and facilities. More than 15% of those over 65 in the study area have a factor limiting their mobility.
- Rural nature of the population distribution.
- Use of cars for commuting. Limited capability and low interest in other means of commuting to and from work.

Land Use and Zoning

Appendix A, Map 6 shows the existing land use. Appendix A, Map 7 shows existing zoning. Additional information concerning land use and zoning is provided in Section II. E., Corridor Land Use and Zoning. The existing zoning ordinances provide some means to protect open space and special resources. The use of the Open Space/Conservation/Recreation category is important to the successful implementation and maintenance of a Greenway. Additionally, the protective nature of Floodplain Districts is important to the maintenance of a Greenway.

Archaeological and Historic Resources

The study corridor is rich with archaeological and historic resources. Section VI contains a summary of the myriad archaeological and historic opportunities within the Greenway. Map 9 shows locations for existing and potential locations for historic and archaeological sites.

Parks and Recreation Facilities

A listing of all public parks and recreation facilities is contained in Section VI. Map 8 shows open space and recreation areas within the study corridor.

Wildlife Habitats

Section V contains information concerning the various wildlife and available habitat.

Existing Trails

Loyalsock/Montoursville Bikeway River Mile 39

This is an asphalt surface bikeway and is primarily an independent trail with some shared use roadway sections. This bikeway serves as a recreational trail, as well as a commuter link between Montoursville, Loyalsock and Williamsport. It connects to the Williamsport city bike routes and will connect to the Williamsport River Walk and Bike Trail.

Williamsport City Bike Routes River Mile 39

This is a series of marked bike lane routes that follow the city streets. It connects with the Loyalsock/Montoursville Bikeway at a pedestrian bridge over I-180. It also connects to the Lycoming Creek Bikeway on the western end of the City.

Lycoming Creek Bikeway River Mile 42

This is an asphalt surface, independent bikeway that follows Lycoming Creek. It will connect to the Williamsport River Walk and Bike Trail.

Bicycle PA Route G River Mile 61 to 70

This route is a shared use road signed bike trail. This route follows PA 44 South to PA 150 at river mile 61, and follows PA 150 west through Lock Haven.

Mid-State Trail River Mile 65.5

The Mid State Trail System is a long distance hiking trail and its side trails in central Pennsylvania. The Mid State Trail is a rugged and demanding mountain top trail. The trail

runs from the Pennsylvania Grand Canyon near Blackwell to the Mason-Dixon Line in Maryland. The Mid State Trail can be accessed at Woolrich or in Wayne Township within the study corridor.

Lock Haven River Walk River Mile 69 to 72

This is an asphalt surface, independent walkway on top of the dike/levee.

Donut Hole Trail River Mile 76

The Donut Hole Trail system is a 50-mile, moderate to rugged trail for backpackers. This cross country trail traverses the northern most part of the Sproul State Forest. The Donut Hole Trail can be accessed at Farrandsville within the study corridor.

West Branch Susquehanna Water Trail River Mile 0 to 77

The entire West Branch of the Susquehanna River within the study area is navigable water and designated as a water trail.

Existing Conservation Easements

Merrill Linn Conservancy Conservation Easement River Mile 7

This is a 35 to 50 acre open space easement that protects a riparian buffer.

Agricultural Preservation River Mile 9

Two adjacent farms with a total of 141 acres preserved.

NPC Conservation Easement River Mile 27

This is a 17 acre open space easement that protects a riparian buffer. There is no access associated with this easement.

NPC Conservation Easement River Mile 37

This is a 2 acre open space easement that protects a riparian buffer. There is no access associated with this easement.

NPC Conservation Easement River Mile 63

This is a 17 acre open space easement that protects a natural wetland and riparian buffer. There is no access associated with this easement.

2. Issues, Concerns, and Opportunities

Public Input

Six public meetings were held in March 2001 to gather information on public interests and concerns. Information concerning the conduct of these meetings is contained in Section VII. A list of issues and potential actions for the Lower West Branch Susquehanna River Corridor was developed from this input. Issues and proposed actions that should be considered in development of the Greenway are presented in the Public Meetings subsection of Section VII.

Municipal Officials Questionnaire Results

A survey of municipal officials and planning commissions was conducted during the summer of 2001. The actual results and a summary of those results are contained in Section 4 of the Technical Document. The following are some of the highlights from that survey that are of consideration to Greenway planning:

- 60% of the municipal respondents indicated that they currently have biking and walking/hiking facilities in their communities. 27% of them desire more such facilities.
- Municipalities listed existing canal tow paths, recreational areas, parks and natural areas, and scenic views as special places that they suggest should be included in the River Conservation Plan for future maintenance and protection funding. The Greenway plan should include improvement of and links between these places.
- The main areas of concern were flooding and public safety (90%), flooding and property damage (90%), erosion of stream banks (84%), loss of native vegetation (60%), loss of vegetation along streambanks (60%), and loss of wildlife habitat (60%).
- 83% of the respondents agreed that special areas along the River should be protected, and 80% agreed that significant scenic views in the corridor should be protected. To supplement this response, 50% of the respondents agree that scenic buffers should be required to protect views from on the river.
- 70% of the respondents indicated the current means of river access meet the needs of the community. Various municipalities and locations had specific needs to address including:

    - The river between Montoursville and Muncy is very pristine because it is closed to public access, and they hope to keep it that way.

- Trail to connect various locations near the river.
- Better pedestrian access to the river.
- Public access ramps on Pine Creek to access the river.
- Better paths/steps over the dike and walkways on top of dike to allow greater access to and awareness of the resources.

- Economic Development option support includes: development of bed and breakfasts (80%), boat/canoe rental shops (80%), and bicycle rental shops (70%). In addition, bait and tackle shops (67%), industrial developments (63%), and campgrounds (60%) received significant support. Riverbank restaurants (43%) and river lots (40%) received less support, with river lots receiving an equal amount of opposition.
- The Central Susquehanna Valley Transportation Project and the Susquehanna Beltway highway improvement projects are currently being proposed within the study area. These projects address upgrading Route 15 and expanding Interstate 99, respectively. The construction of these projects has potential to impact the corridor by increasing traffic noise, detracting from scenic viewsheds, and affecting water quality or the River relative to stormwater runoff from the highway surfaces and construction.
- Providing connecting paths is very important between Work and Recreation (53%), Recreation Facilities (50%), Communities and the River (43%), and Communities (33%).
- A majority of the respondents believe that it is very important to maintain the natural beauty and character of the river (80%), improve water quality (70%), conserve natural habitat areas (60%), and provide public recreation facilities (60%).
- Sixty-seven percent (67%) of the respondents believe the Lower West Branch of the Susquehanna River has a positive impact on their community. Some of the specific comments that impact a Greenway plan include:

  - "A number of activities on/along the river draw people to the area. All visitors have a beneficial impact on the economy. The quality of life for residents is improved by recreational opportunities."
  - "The river has enabled the community to have a large area of historic, scenic, underdeveloped land that is very unique."

- When asked about a riverfront revitalization plan, 67% of the respondents indicated that it is at least somewhat important to create an overall revitalization plan for the Lower West Branch of the Susquehanna River corridor. The Greenway plans could act as a starting point for this revitalization plan.
- <u>Planning suggestions that can be addressed by a Greenway master plan include:</u>

  - "Provide funds for further development of existing recreation areas and provide funds for downtown revitalization as the downtown is in close proximity to

potential and existing recreation areas, thereby enhancing the experience of visitors to the Lower West Branch of the Susquehanna River."

- "River improvements are a must towards attracting boating and tourism."
- "… identify the importance of outdoor recreation in our area…"
- "Educate citizens to appreciate what we have and to protect it for the future."
- "Keep areas as natural as possible."

Stakeholder Interviews

Thirty personal interviews were conducted by the project team during the summer of 2001. Stakeholders interviewed included persons, groups, and organizations with a vested interest in the River Conservation Plan. Information concerning these interviews and significant items that should be considered in development of the Greenway can be found in Section VII.

3. Analysis of Project Area

Areas of Interest

Areas of interest are nodes throughout the corridor that should be connected in some manner. These areas may include recreation areas, parks, historical places, education opportunities, and scenic views. The key areas of interest within the study area, starting from the southern end of the study corridor at the Main Branch of the Susquehanna River, are:

Northumberland Borough River Mile 0 to 1

This area is at the junction of the West Branch and the Main Branch. There are recreation, camping, and boating access facilities, within the Borough and surrounding area. There are also historical sites. A scenic overlook at Shikellamy State Park is located across the West Branch from the Borough.

Lewisburg River Mile 5 to 10

This area has recreation, camping, and boating access facilities. There are also historical sites and a visitors bureau. Bucknell University, with its' recreation facilities and 18 hole golf course, is located within this area of interest. Montandon Marsh, located outside the Borough on the east side of the River, is also within this area of interest.

Milton River Mile 11 to 12

This community has historic architecture, quaint restaurants and unique stores. The area offers opportunities for golfing, fishing, and boating and other recreation.

Milton State Park River Mile 11 to 12

Milton State Park area has picnicking, recreation fields, and boat access facilities.

Watsontown River Mile 15 to 17

This area of interest has boat access, recreation areas, and historical sites.

Great Stream Commons, Allenwood River Mile 18.5 to 21.5

This area of interest has boating access, historical sites and a scenic vista site. There are planned education and recreation facilities.

Montgomery River Mile 22 to 23

This area of interest includes boating access, camping, and recreation areas.

Muncy River Mile 27 to 31

This area of interest has boating access and historical sites.

Riverfront Park, Loyalsock Township River Mile 37

This area has boat access, recreation, and historical sites.

Williamsport River Walk and Bike Trail River Mile 39 to 43

This area of interest includes the area to be developed adjacent to the river on both the Williamsport and South Williamsport sides. This area may include an elevated plaza, multi-use trails and other economic development projects. A Multi-Use Trail is in design phase for the Williamsport side, which will connect the Loyalsock/Montoursville Bikeway, Williamsport city bike routes, Market Street Bridge, Maynard Street Bridge, Lycoming Creek Bikeway and Susquehanna State Park. This Multi-Use Trail will be on the top of the dike/levee where possible and tie into the downtown area.

Susquehanna State Park, Williamsport River Mile 43

The Susquehanna State Park has recreation facilities, boating access and is the home to the Hiawatha River Boat.

Jersey Shore River Mile 59

This area provides an important link to the Pine Creek Rail Trail and is a significant point along the Lower West Branch Susquehanna Greenway.

Lock Haven River Mile 69 to 72

This area of interest contains boating access, recreation, education and historical sites. The existing walking trail along the dike/levee connects Canal Park and Hanna Park.

Potential Trail Linkages

Potential trail linkages for the Greenway plan can be areas of interest, trails within the corridor, and trails or places outside the corridor. Some areas cannot be linked by using a trail system. The use of automobile routes to make some linkages is required.

Potential Auto Links

Auto Links to PPL Montour Preserve River Mile 23 and 28

PA 54 provides an automotive link to the PPL Montour Preserve, an excellent recreation and educational area.

I-180 to PA 54 provides an automotive link to the PPL Montour Preserve, an excellent recreation and educational area.

Auto Link to Loyalsock Creek Corridor River Mile 37

PA 87 provides an automotive link to the many recreation opportunities along the Loyalsock Creek corridor, to include World's End State Park and Rider Park.

Auto Link to Farrandsville River Mile 70

SR 1001 provides an automotive link to Lock Haven University athletic fields and on to Farrandsville. There is a link to the Donut Hole Trail at Farrandsville.

Auto Link to Peddie Park River Mile 71

PA 120 provides an automotive link to Peddie Park on the south side of the river. This park is an excellent location as a trailhead for water trails, and hiking/biking trails to the west.

Potential Links to Outside the Study Area

Link to Lewisburg to Mifflinburg Rail Trail River Mile 8.

A link should be provided to the proposed Rail Trail from Lewisburg to Mifflinburg along the PA 45 corridor.

Link to Williamsport Municipal Water Authority River Mile 43

A link should be provided to land of the Williamsport Municipal Water Authority, which provides excellent opportunities for hiking, birding, and cross country skiing.

Link to Pine Creek Rail Trail River Mile 59.5

A link or links to a Jersey Shore Trail Head and continuing to the Pine Creek Rail Trail should be established. A link that follows along Pine Creek is desirable.

Link to Bicycle PA Route G River Mile 69

Lower West Branch Susquehanna River Multi-Use Trail should link to Bicycle PA Route G and further link to the Spring-Eagle Greenway.

Potential Greenway Users

Potential greenway users can be divided into two main categories: local residents and visitors. Local residents include permanent residents within the corridor, temporary residents such as students attending the colleges and universities, and seasonal residents. Visitors include outdoor enthusiasts visiting State Game Lands, State Parks, or the numerous cultural and recreational attractions in the area. Some specific groups within one or both of these categories are listed below:

- Recreation/sports organization, both adult and youth
- Senior citizens
- Families
- College students
- Seasonal residents (6.4% of housing units in the study area are seasonally occupied)
- Outdoor enthusiasts
- Bird watchers
- Boaters, canoers, kayakers
- Equestrian enthusiasts

- Anglers, hunters
- Walkers/Hikers – range of easy to strenuous trails
- In-line skaters
- Cross-country skiers
- History enthusiasts
- Bicyclists – advanced, basic, beginner, and children levels
- Persons with disabilities (trails must comply with the Americans with Disabilities Act)
- School groups

For the purpose of planning the Greenway and associated tourism and economic development opportunities, a few of these potential users should be identified as target user groups, groups that will use the Greenway most frequently and in the most volumes. These target user groups may include bicyclists, walkers/hikers, and boaters because these activities are very common in the Lower West Branch of the Susquehanna River corridor.

D. Greenway Development Considerations and Options

1. Development Considerations

Tourism

According to the Office of Travel and Tourism, Pennsylvania's second largest industry is tourism, and outdoor recreation is the prime motivating factor for 20% of all visitors to the Commonwealth. Greenways can attract more visitors to an area and support jobs for local residents. There is also a growing interest in Heritage Tourism throughout Pennsylvania. Clinton and Lycoming Counties are located in the Lumber Heritage Region of the state. The Greenway plan should include links to the cultural resources associated with this region.

Design Challenges for Multipurpose Trails

When designing the Greenway, the differences between recreational and functional (commuting) users and ways to accommodate both should be identified and addressed in the master plan. The recreational walker or biker may enjoy longer 'scenic' routes; whereas, the commuter is interested in time efficiency. Site-specific design should accommodate both needs when appropriate. Also, the differences between active and passive recreational use should be addressed. Each group of users has different, equally legitimate priorities for the Greenway trails, and some parts of the Greenway may have to be designed for specific uses, including areas that limit or restrict use to preserve important plant communities or wildlife habitats.

Potential Impacts to Adjacent Property Owners

One of the most important aspects of planning and implementing a Greenway plan is respecting property owners' rights. The biggest public concern for Greenway planning is the taking of private property by municipal governments. The Lower West Branch Susquehanna River Conservation Plan will respect the rights of private property owners. Projects will only be implemented with voluntary landowner consent.

Implementing a greenway plan is dependent on the establishment of connections to the areas of interest. Public land is not always available to make these connections, or may significantly increase the length and make the link undesirable to the user. Conservation easements and rights-of-way become a key to the successful implementation of the plan. To say that partnerships with private landowners are vital, is an understatement of the obvious. Alignment and design approach can alleviate many issues and impact to adjacent properties. Involving all adjacent property owners early in the planning process is very helpful in identifying those things that could be a detrimental impact. Often, the solutions present themselves and conflict is avoided. Planners and designers must use procedures that minimize impact on adjacent properties. Trail alignment, screening, and buffers should all be considered to ensure the Greenway does not affect the character and nature of adjacent land.

Citizen benefits

The benefits of a Greenway in the Lower West Branch of the Susquehanna River corridor are numerous and include:

- Exercise opportunities – improved health of users
- Commuting opportunities – reduced costs, better health, cleaner air
- Family recreation opportunities
- Conservation and protection of open space and natural areas
- Preservation of scenic views
- Organized entertainment opportunities (fun runs, boat races, etc.)
- Increased property values along Greenway
- Increased revenue to the area from tourists
- Environmental education opportunities
- Social interaction opportunities
- Uninterrupted and safe pedestrian movement between parks, throughout community, and between communities
- Increased access to and appreciation of the river

Depending upon the facilities included with the greenway, many other benefits to the community are possible. If the Greenway leads to development of recreation-related or public service businesses, new jobs could be created in the area. In addition, the Greenway could become an easily accessible and safe location for organized activities to take place and create an increased sense of community in the area.

2. Greenway Ownership Options

At the outset of any Greenway planning study, a major issue that needs to be addressed is who will own any trails and facilities. Also, it is not likely that a trail alignment will traverse only public land, so the issue of public access to private land will be raised. There are several options to address both of these issues. The following options can be employed separately or in combination with each other.

a. Creation of a Greenway Joint Organization (multi-municipal) – oversee Greenway operations on a regional scale; raise money separate from municipal taxes; use money for planning, acquisition of land, and management of the Greenway; appoint rather than elect board members so no political pressure (Examples include: the Lewisburg Area Recreation Authority, which serves residents of three participating municipalities (PSATS, November 2001); and the SEDA-COG Joint Rail Authority)
b. Creation of several smaller Greenway Authorities (by municipality) – oversee Greenway operations on a municipal scale; raise money separate from taxes; appoint rather than elect board members

In June 2001, the Commonwealth of Pennsylvania enacted the *Conservation and Preservation Easements Act* to better define the points of law related to conservation easements. The formal purpose of this Act states:

> *The General Assembly recognizes the importance and significant public and economic benefit of conservation and preservation easements in its ongoing efforts to protect, conserve or manage the use of natural, historic, agricultural, open-space and scenic resources of this Commonwealth.*

The *Conservation and Preservation Easements Act* may reduce potential legal costs associated with enforcing easement restrictions and makes challenging these restrictions more difficult.

3. Opportunities and Threats to Greenway Development

Managing Greenway Threats

Along with all of the benefits and positive results associated with greenway development, there are a few actual and perceived threats that need to be considered when planning and designing the Greenway. It is common for community members living near a proposed greenway to be concerned about crime and vandalism that may result from such a public facility. The Greenway design should include measures to discourage crime; however, it is well documented that there has not been an increase in crime or vandalism associated with existing greenways. Opening a trail to public use may discourage crime and illegal activities in the surrounding area because of increased public exposure. Crime and vandalism can especially be discouraged if the Greenway is actively patrolled. It is highly recommended that the Greenway master plan include provisions for trail patrol by either a professional security officer or by a trained group of trail monitoring volunteers.

To further discourage crime and vandalism and minimize some of the perceived threats associated with a greenway, the Greenway master plan should also include the following interrelated components:

- Safety Program
- Emergency Response Plan
- Trail User Ordinance
- Maintenance Plan

As a first step in creating a safe public resource, the Greenway facilities should be designed for the user group that has the most safety needs. For example, the safety needs of bikers and children should be accommodated over the needs of walkers and adults. In addition to adding safety features to the Greenway design, the Greenway plan should include a Safety Program with the following components:

- Designated coordinator or coordinating committee
- Safety brochures for users
- Trailhead and trail signage
- Greenway rules and regulations posted at entrances and along Greenway
- Emergency procedures
- Security/patrol plan
- Inspection schedule and check list
- User response process for tracking damage or maintenance needs

- Accident reporting process

The Emergency Response Plan should include items such as local police and hospital phone numbers, a greenway map with defined points of access and efficient routes for emergency vehicles, and calculated distances in minutes and miles from greenway access points to local medical facilities and police stations. All of these items should be part of a formal Emergency Response Plan and should be illustrated and posted on signs at each greenway entrance. Emergency response details should also be considered in the design of the greenway trails. For example, the trails should be constructed to accommodate the size and weight of an ambulance. Also, mile markers placed along the trail at ¼ or ½ mile intervals would be useful to trail users and helpful in an emergency situation.

The rules and regulations created as part of the Safety Program should be further developed into an enforceable Trail User Ordinance. Depending on the ownership and management plan chosen for the Greenway, the ordinance could be enforced by the municipalities or counties in which the Greenway is located. The ordinance will be important to ensure the safety and welfare of all users and will help resolve any user conflicts that arise. The rules and regulations included in the ordinance should consider: bike speed limits, traffic patterns, pet regulations, food regulations, permitted and non-permitted activities, and littering regulations. (The Conservation Fund, 1993, page 283)

Maintenance

The guidelines for developing the Greenway Maintenance Plan are described later in this section. The Maintenance Plan is a very important component to ensuring the safety and minimizing the threats of the Greenway and should be developed in conjunction with the components described above.

Liability

Even with the best safety and maintenance plans, accidents are still likely to happen. In the event of an accident, the issue of liability could become a threat to the Greenway. For this reason, the Greenway plan should include provisions for liability insurance for the Greenway owner. To further define and limit the landowner liability associated with public recreational facilities, most states have what is referred to as a Recreational Use Statute (RUS). Pennsylvania's RUS is the Recreation Use of Land and Water Act (RULWA) of February 2, 1966, P.L. (1965) 1860, No. 586, as amended, 68 P.S. § 477-1 *et seq*. The RULWA was enacted to encourage landowners to make land and water areas available to the public for recreational purposes. The Act basically states that as long as the landowner does not willfully act in a malicious manner and does not charge the user to enter or use the land, he/she does not assume responsibility of or incur liability for any injury to persons or property caused by an act of omission of the user.

4. Leisure, Exercise, and Commuter Opportunities

Using existing corridors

In an ideal world, independent paths for pedestrians would be used for all routes connecting residential areas, commercial and industrial areas, recreation areas, and parks and open space. However, this is neither practical nor financially feasible. Independent trails should be used when other alternatives are not available and to improve safety of the pedestrians. Planners and designers must take advantage of existing routes and facilities to provide an overall network of independent trails and shared use trails.

Alignments must consider who the users will be. Requirements for commuters and persons engaged in leisure activity greatly differ. Commuters will not follow trails that take them out of their way or are not designed with their needs in mind; the design and alignment must consider commuter efficiency. In contrast, the recreation user enjoys more indirect routes that provide opportunity to enjoy the natural beauty of the surroundings. Considering this, alternative routes between points are often necessary.

Observing the habits and patterns of local citizens is a good method to use in establishing initial alignments for trails. Over time people will find the routes they prefer and those with the least number of hazards. They follow more direct routes when commuting or on errands and follow a route that hits the scenic sites and areas of interest when out for a leisure ride or evening stroll. Establishing connecting trail alignments that consider these patterns is more likely to produce a system that is embraced and used by the public.

Existing transportation corridors should be studied to identify opportunities to share right-of-way and/or facilities. Utility rights-of-way and railroads often provide direct routes between points and can provide a safe, independent alignment. The existing road network should be analyzed to identify routes with lower volumes of traffic and sufficient right-of-way and shoulder width to add or designate a pedestrian or bicycle lane. The inclusion of trails should be considered during planning for major road re-alignment or upgrade.

Public Safety

Connecting trails should be designed by experienced and qualified professionals. Often times proposed trail alignments follow unauthorized or unofficial routes currently being used by pedestrians. A properly designed trail will eliminate many existing unsafe conditions. See the previous section concerning the creation of a safety program.

Guidelines and recommendations contained in the "Guide for the Development of Bicycle Facilities", American Association of State Highway and Transportation Officials (AASHTO), 1999 and the "Bicycle Guidelines - Statewide Bicycle & Pedestrian Master Plan", Commonwealth of Pennsylvania Department of Transportation, April 1996, should be used in

the development of multiuse trails. These guides also provide excellent criteria for safety for other trails, such as hiking and walking trails in built up areas and cities.

Greenway Phasing and Prioritization

Potential funding, planned highway construction, and needs and desire of the communities should be considered when developing trail section priorities and phasing the implementation plan.

Design and construction of connecting trails in the sections where new highway construction is proposed should be coordinated with PennDOT schedules. The sections along the proposed new alignment of US 15 in Union and Northumberland County and the future alignment of I-99 through Lycoming County will be considered in prioritization.

Based on public input from municipalities, the priority for establishing trails is for connecting paths between work and recreation, recreation facilities, communities and the river, and communities. This should be considered in prioritizing projects for funding and development of the phasing plan.

A greenway can create effective commuter opportunities for bikers and walkers if it is well designed for commuter purposes. In order to improve commuter potential, the Greenway network should first expand into existing towns and villages via improved roads and walkways with designated bike lanes. If designed correctly, the Greenway can provide a safer alternative transportation route and uninterrupted access between residential and commercial/industrial areas while encouraging people to use healthier, less-polluting modes of transportation.

Given the priority from the municipalities and potential for commuter opportunities, Greenway development should be prioritized near the population density areas and around commercial or industrial centers.

Although connection between communities was not seen as a high priority by the municipalities, it is an important consideration for tourism. Connection between communities also fits into statewide consideration for continuous trail corridors. Designations of shared use along existing low volume, low use local roads should be made where possible to establish a continuous alignment as soon as possible. As funding and priorities permit, sections can be re-routed to preferred, new independent trails.

5. Development Compatibility Issues

Complete implementation of the Greenway Plan will take many years. It is not practical to purchase all the property or obtain all the easements required during the early phases of implementation. The Greenway Plan must consider the effects that future development may have on the Greenway Plan and provide a method to ensure that key linkages and open space are not lost before they can be implemented.

6. Greenway Maintenance Plan

Management

In connection with the Greenway ownership plan, the organization that will manage and maintain the Greenway also needs to be defined. Greenway management options include:

- Municipal Park and Recreation Agency – local agency that takes possession of greenway facilities as they are built and has the staff and equipment to maintain them
- Federal or State Agency – larger agency that may manage multiple recreational facilities and greenways
- Joint Agency – coordinating effort between two or more agencies (i.e. recreation and nature groups or multiple municipalities) to share expertise and resources
- Greenway Authority – separate organization that focuses only on greenway management and has the power to generate revenue
- Non-profit/citizen group – organized group of trained personnel and volunteers such as an Adopt-a-Trail program, could assign river segments to different groups
- Private property owners – group of landowners agree on a management plan among themselves (i.e. home owners association uses some of its budget money to maintain the portion of the greenway that goes through its neighborhood)
- Community volunteers – community members or organizations with time and interest in maintaining the greenway

A current resource that defines greenway management strategies being used on existing greenways is the National Park Service's *Managing Greenways: A Look at Six Case Studies*, April 2000. The six greenways are located in Pennsylvania, New York, New Jersey, and Ohio. *Managing Greenways* lists eight factors for successfully managing a greenway:

- An effective partner builder coupled with strong leadership must lead the managing entity, particularly since public-private partnerships among many organizations and agencies are vital to successful greenway development.
- A single organization effectively coordinates regional projects.
- The most successful greenway management systems include all major stakeholders, particularly citizens and others who have been involved in the early planning stages.
- Corporations can be important participants in a management plan.
- Local jurisdictions will not make a regional greenway plan a high priority unless they formally adopt the plan.

- The management planning process should lead to a clear identification of roles for the managing organization(s) and partners.
- The management system should include an effective advocate at the state level.
- Undertake demonstration projects, build strong citizen support, and involve local governments in helping to decide management structure long before greenway plan completion.

Regardless of which management option is chosen, an attempt to involve community volunteers in routine maintenance activities is recommended. Volunteers from greenway user groups and community organizations should be willing help and will gain a sense of ownership and greater connection with the Greenway.

Maintenance

First and foremost, the condition of the Greenway begins with proper planning and design and the use of quality materials and workmanship during construction. Once the Greenway is designed and the facilities and intended uses are defined, a maintenance plan for each type of space and facility should be developed. A multipurpose trail has many different uses and each use has different maintenance needs to be addressed. For example, it is recommended that a separate plan for maintaining the waterway be developed to include activities; such as erosion control, fish habitat care, and water quality monitoring; that do not relate to non-water facilities.

The overall objective of the maintenance plan should be to eliminate avoidable risks and hazards and clearly mark unavoidable risks and hazards. Eliminating avoidable risks is the focus of maintenance planning and takes a continual effort. Unavoidable risks and hazards include conditions associated with river access points such as the potential danger of moving water and slippery surfaces. Also, a natural depression or sinkhole located near the Greenway is an unavoidable risk. Areas containing potentially dangerous features such as these should be clearly marked with warning signs during greenway construction. These signs should be monitored for damage and immediately replaced if needed. Also, greenway conditions should be monitored for the development of additional unavoidable risks or hazards over time.

Both routine and remedial maintenance activities need to be included in the maintenance plan. Routine activities include regularly scheduled tasks such as vegetation control and trash removal. Remedial activities include larger projects that are not easily scheduled, such as removing a fallen tree or repairing a trail after a flood event. In addition to scheduling, the cost difference between routine and remedial activities needs to be considered. Routine activities typically have known costs over a known period of time and need to be budgeted for on a continuous basis. Remedial activities tend to have larger, somewhat unknown costs that have to be paid in a short period of time. These costs need to be part of a capital improvements plan for the Greenway.

The following table is provided as an example of what elements need to be included in the Greenway maintenance plan. This list is not intended to be exhaustive. When the Greenway

design is complete, care will need to be taken in identifying all maintenance needs of the system and individual facilities.

TABLE IX-1 GREENWAY MAINTENANCE NEEDS

Greenway Facility	Maintenance Activity	Maintenance Type
Trails, Paths, and Paved Spaces	• cleaning and sweeping • asphalt patching • railings/bridge/signs repair • vegetation pruning** • snow and ice removal • clearing drainage structures • trash removal • graffiti removal	• routine • routine • routine and remedial • routine • routine • routine • routine • routine
Vegetated Open Spaces	• mowing and pruning • weed control • dead tree removal • trash removal • fertilize	• routine • routine • remedial • routine • routine
Boating Facilities	• channel stabilization • dam and boat chute clearing • water quality monitoring • fish habitat care • trash removal	• routine and remedial • routine and remedial • routine • routine • routine

** Vegetation clearing requirements: pedestrian and bike access routes need minimum 8' 6" clearing; equestrian access routes need minimum 12' clearing.

The most important aspect of the Greenway maintenance plan is an inventory and schedule of activities. The Conservation Fund provides a sample maintenance schedule on pages 298-299 of its guide to greenway planning. (The Conservation Fund, 1993) The inventory and schedule should include a checklist of all activities, frequency of activity, annual cost of each activity, and person or group responsible for each activity. In addition, it is recommended that the plan have a method of recording resolutions to all reported problems associated with the Greenway.

The following are additional specific recommendations that could be included in the overall Greenway maintenance plan.

- Include detour routes in the Greenway layout in case of need to close part of the Greenway for repair.

- Plan for graffiti and vandalism cleanup and control. The best way to control these actions is to discourage continued degradation by cleaning up the damage immediately.
- Use low-maintenance, native landscaping plants and minimum amount of turf grass in open spaces. This will enhance biodiversity and wildlife habitat while reducing maintenance costs.
- Maintain open lines of sight along trails, and avoid dense thickets close to the trail.
- Explore creative solutions to minimize maintenance costs including the use of volunteers, public / private partnerships and community service and work release programs.

7. Land Use Methods

Regulatory planning and zoning techniques will be required to ensure successful greenway and river conservation development. These techniques include preserving agricultural land, open space dedication, cluster development, transfer development rights, overlay zoning, and green design.

Agricultural Preservation

Agriculture helps preserve green space and is a compatible adjacent land use for many of the areas of interest for a Greenway. Two important programs to consider are designation of Agricultural Security Areas and purchase of conservation easements.

Agricultural Security Areas are a legally recognized geographic area formed by one or more landowners and approved by one or more government agencies, designed to keep land in agriculture. Key features of the program are:

- The program is voluntary for farmers. Petitions are submitted to township supervisors by the farmers.
- They are reviewed every seven years; however, new parcels of farmland may be added to an established Agricultural Security Area at any time.
- An Agricultural Security Area is a minimum of 250 acres.
- Participants receive special consideration regarding:
    - Local ordinances affecting farming activities
    - Nuisance complaints
    - Review of farmland condemnation by state and local government agencies

The Pennsylvania Agricultural Conservation Easement Purchase Program was developed in 1988 to help slow the loss of prime farmland to non-agricultural uses. The program enables state, county and local governments to purchase conservation easements from owners of quality farmland. Properties must be located in an Agricultural Security Area of at least 500 acres to qualify. The first easements were purchased in 1989. Counties participating in the program have

appointed agricultural land preservation boards with a state board created to oversee this program.

Conservation Design / Open Space Development

Conservation design permits higher concentration of buildings in one or more areas of a site, while allowing the remaining portion of the site to be protected as open space. The open space is protected with a conservation easement or dedication.

Green Design

Green Design is the attempt to make and use new products and procedures that are more environmentally friendly. The approach is to direct attention and focus to an environmental problem or desire and implement use of materials and techniques to address the problem. Some green design considerations for Greenway trail development include: grading and clearing standards, use of screenings and buffers, using alternative pavement structures, reducing pavement widths, and using storm water BMPs.

Open Space Dedication

If they prepare a Comprehensive Recreation and Open Space Plan in accordance with the mandatory dedication provision of the Municipalities Planning Code, municipalities can require developers to dedicate or sell land for trails, paths and open space at the time development occurs. Municipalities can require a certain percentage of space to be dedicated for approval of the subdivision or land development.

Overlay Zoning

Overlay zoning can be used to protect sensitive environmental areas, historical areas, or other areas requiring special protection. The intent of overlay zones is to provide special criteria to protect a resource while retaining the general character and purpose of the underlying zones. Floodplain zones are examples where an overlay zone provides protection needed for the areas that frequently flood, while preserving the existing development and character of the underlining zoning district. Overlay zones can be established to protect other resources; the criteria of the overlay zone is dependent on the resource being protected.

Riparian Buffers

Riparian Buffers are vegetated strips of land that line the banks of streams, rivers, ponds and other water bodies and play an essential role in protecting water quality and preventing erosion. Natural buffers between land and water are highly productive and diverse systems that perform many functions and provide many benefits. Riparian Buffers also provide much-needed habitat for wildlife.

Transfer Development Rights

The ownership of land includes rights pertaining to minerals, timber, agriculture, riparian rights, surface and ground water, air, and development, to name the most common. Use of these rights is not absolute. Governments do have the right to constrain, to a certain extent, a property owner's use of these rights and thus the economic value that the property owner can derive from the property. The most common restraint has been on the exercise of the individual's use of development rights through zoning. Transfer of Development Rights (TDR's) have been used in other areas of the country for the conservation or protection of open space, natural resources, farmland, and urban areas of historical importance.

TDR programs are used to focus development in areas that can withstand more aggressive densities than normal zoning permits and to protect areas of interest. The concept is to establish sending and receiving areas:

> **Sending areas** are designated where the community desires preservation or development limitations, such as productive farmland, environmentally sensitive areas, scenic areas, open spaces, or historic buildings and districts. TDR programs allow the transfer of future development potential from properties in sending areas. Land owners in sending areas are restricted from making maximum economic use of their properties through zoning or other regulations. The sending area land owner sells development rights and development of that property is prevented through a deed restriction or conservation easement. All other rights remain with the sending area property. Thus the sending area owners achieve some of the economic gain, which could otherwise be realized through development, through the sale of development rights.
>
> **Receiving area** landowners may purchase development rights from sending area land owners. Receiving areas are designated as mapped overlays identified in land use plans as appropriate for new or additional concentrated development. They are usually in areas well served by transportation networks and public sewer and water systems. However, the mapping of receiving areas in rural development areas or larger areas up to nearly an entire town is also possible.

Two general types of TDR programs are used. The most common TDR program allows the sending area landowner to sell the development rights to a developer who then uses those development rights to increase the density of houses on another piece of property in a receiving area. The second program type allows a local government to establish a TDR Bank to transfer development rights. Developers who wish to develop at a higher density than current zoning allows, purchase development rights from the local government. The local government then uses these funds to purchase development rights of properties in areas that it wants to protect.

D. Greenway Development Projects

The elements of the Greenway Plan to include connecting trails are shown in Appendix A, Maps 10-1 through 10-5. The main elements of the plan are open space areas, recreation areas and parks, natural areas, riparian buffers, education sites, historical sites, links, and connecting trails. The types of trails that serve as links include multi-use trails, hiking/walking trails, historic trails and water trails. The following list and discussion of potential Greenway development projects is not intended to be all inclusive or restrictive, but rather represents potential projects that have a degree of public and government support.

1. Riparian Buffer and Habitat Enhancement

The purpose of these projects is to enhance the riparian corridor of the lower West Branch and its numerous tributaries. Benefits of enhanced riparian buffers and wildlife habitats will be aesthetic, environmental and economic. Some potential riparian buffer and habitat enhancement projects include:

0 to 2	This popular recreational area offers high visibility for riparian buffer and wildlife habitat enhancement, including in-stream fish habitat.
7 to 8	W. Branch and Buffalo Creek - - Lewisburg river walk offers opportunity for riparian buffer enhancements, project to clean up the river, control invasive species and plant adapted, native plants. Opportunity is here for local schools to use the West Branch and Buffalo Creek for environmental education / outdoor classrooms.
8	Montandon Marsh – establish a management plan for the marsh that determines how to protect this unique habitat. An enhancement project to buffer the marsh or to remove invasive plants that threaten the marsh plant community is recommended.
8 to 10	Riparian buffer and wildlife habitat enhancements to meet the needs of species that utilize the site including migratory birds such as whistling swans. Determine carrying capacity (human use limits) to maintain as a good birding area.
11 to 12	Milton State Park offers excellent riparian buffer and habitat enhancement opportunities. Accessibility makes the island / park a great place of outdoor education classroom for local schools.
13 to 16	Greenway alignment along PA 405 or old canal offers opportunity for complimentary riparian buffer and habitat enhancement projects.
16	Parks (PA Fish and Boat Access, Watsontown Park, Public and Private Community Parks) on the West Branch and White Deer Creek offer riparian buffer and habitat improvement project opportunities. Address erosion problem at the mouth of White Deer Creek with appropriate techniques that are complemented with plantings of adapted native plants.

20	Wetland habitat enhancement and protections. Establish management plan to enhance area as a nesting habitat.
20	Clean up and reclaim old dump sites.
21 to 22	Enhance river corridor for passive recreational uses.
23	Montgomery Municipal Park – riparian buffer and wildlife habitat enhancement projects.
23 to 37	Remote River Corridor – implement projects to maintain or improve this popular canoe and kayaking stretch of river.
31 to 35	Wetland / Wildlife Habitat enhancement projects.
37.5	Riverfront Park – enhancements to riparian buffers and expand use of natural landscaping for water quality and wildlife habitat.
39 to 43	Williamsport River Walk – Enhance river corridor with invasive plant control, enhanced riparian buffer plantings and wildlife habitat enhancement projects. Identify areas that can be converted from traditional landscaping to natural area using adapted native plants.
40	Fish Ladder – Enhance public viewing opportunities of migratory fish passage. Educational information on migratory fishes and the historic impact dams along with current efforts to restore these fish runs.
44 to 46	Enhanced Riparian Buffer plantings along river corridor.
53 to 54	Wetland and Wildlife habitat enhancement projects.
59.5	Environmental enhancements at the Pine Creek confluence.
60	Riparian Buffer and Fishery Habitat enhancement opportunities.
60 to 62	Industrial clean up opportunities to improve water quality.
65.5 to 67	Stream clean up along West Branch to remove tires and other garbage.
67 to 69.5	Riparian buffer and wildlife habitat improvements to accompany any greenway corridor along West Branch.
69.5	Greenway Trail Head Development – incorporate riparian buffer enhancement and wildlife habitat improvements.
69.5 to 73	Woodward Township Shore – Enhance river corridor with riparian buffer plantings and wildlife habitat enhancement projects. Identify areas that can be converted from traditional landscaping to natural area using adapted native plants. Encourage local schools to use the river corridor / River Park as an outdoor classroom.
76	Bucktail Park – Provide natural landscaping for biodiversity, wildlife habitat, and water quality improvements.

Management Options References:

Conservation & Natural Resources (CN):	CN2A, CN2B, CN3D, CN4C, CN4D, CN4E, CN4G, CN7C
Economic Development (EC):	EC2C
Education (ED):	ED3D
Flooding and Floodplain Management (FM):	FM3A, FM4B, FM5A
Planning and Zoning (PZ):	PZ1A, PZ1B, PZ7C
Sports & Recreation (SR):	SR4E

2. Floodplain Management

Throughout the study corridor projects are needed to allow the floodplains of the Lower West Branch and its tributaries to function in their natural manner. Projects entail removal of obstructions, including structures currently located within the floodplain; areas that contain a high density of structures should be given priority.

- Develop an education and management program for recreational lots and seasonal residences in the floodplain. Work with municipalities to promote adoption of such programs in their local ordinances.
- Incorporate streambank stabilization practices on streams to prevent erosion.
- Purchase flood prone properties from willing landowners.
- Secure floodplain properties along West Branch in pristine and sensitive areas.
- Encourage proper floodplain management for current and future campgrounds/ camping areas.

Management Options References:

Conservation & Natural Resources (CN):	CN4C, CN4D, CN4E
Economic Development (EC):	EC2D
Education (ED):	ED3D
Flooding and Floodplain Management (FM):	FM2C, FM3A, FM5A, FM5B, FM6A
Planning and Zoning (PZ):	PZ1A, PZ1B, PZ7C

3. Historic Preservation

The greenway alignment passes by or near many significant historic features. The experience of greenway users can be greatly enhanced by celebrating the areas rich history.

The heritage tourism potential of the greenway should be optimized by interpretive signage and other self-guided information on historic interpretation of the corridor.

0	Trail Link to the Joseph Priestly House
5.5	Trail Link to the old canal near Chillisquaque
8	Trail Link to cross cut canal, Packwood House Museum and information on local Native American culture.
11.5	Trail Link to canal through the town of Milton.
11.5 to 16	Greenway Corridor could utilize canal alignment.
14	Native American (heritage tourism) information.
16	Trail Link to river front walking tow path and other canal remnants.
16 to 17	Greenway spur could continue along canal alignment.
18.5 to 21	This area has potential for development associated with planned education facilities and historical sites.
19	Native American (heritage tourism) information.
19.5	Canal (heritage tourism) information.
17 to 26	Greenway follows abandoned rail line. Provide heritage tourism information on the history of the rail line and note key features along the way.
20.5	Old Ordinance Works Dam (heritage tourism) information.
25 to 26	Preserve canal features such as tow path, canal home and mule barn.
27	Last Raft Crash Site – Heritage Tourism information on the last raft and general Lumber Heritage information. This area has potential for public and commercial development for tourism generated through implementation of the River Conservation Plan, particularly parking and overnight facilities
29 to 30	Preserve remaining canal features.
37 to 46	Lumber Heritage Area – Interpretive trail system explaining the importance of the lumber to the development of Williamsport and the region.
58.5	Lumber Heritage Area – Jersey Shore Boom location with information on the lumber industry impacts on the history of the town and region.
59	Tiadaghton Elm – Heritage Tourism historic site information.
63	Fort Horn and Native American Village – Heritage Tourism information and displays. This area has potential for public and commercial development for tourism generated through implementation of the River Conservation Plan, particularly parking, overnight facilities, comfort facilities, and a historical and education center
65	Canal House and Bridge – Heritage Tourism Information.

69 Canal – Old Locks – Heritage Tourism Information.

70 Canal - Lock House and Old Canal.

71.5 Boom Island - Lumber Heritage Tourism site for Lock Haven.

73 Preserve Crib – Lumber Heritage Tourism site for Lock Haven.

Management Options References:

Economic Development (EC):	EC1B
Education (ED):	ED3D
Historic Preservation (HP):	HP3B, HP5A, HP5B, HP5D, HP7A
Sports and Recreation (SR):	SR4D

4. Land Use Management

As stewards of the land, all people owe it to future generations to protect the earth's natural resources. As elected representatives of the citizens, municipal officials have a responsibility to control how development occurs in order to maintain healthy socio-economic communities and protect natural resources for future generations. The proposed Greenway offers a regional effort to protect these resources while providing communities with potential economic development opportunities. Resources that need to be protected include environmentally sensitive areas such as wetlands, steep slopes, etc., scenic areas, floodplains and agricultural lands. Zoning and subdivision ordinances are tools for controlling where, how and what types of development can occur, but many current ordinances have not been updated to take advantage of planning techniques for promoting resource sensitive development. In order to encourage this type of land use planning, the following recommendations should be implemented.

a. Provide municipalities with examples of ordinances, tools and technology available to aid them in the protection of their resources and assets. Objectives recommended to protect and preserve open space follow. Existing zoning maps and development ordinances should be further reviewed and updated as necessary with the following:

- Identify environmentally sensitive areas such as steep slopes, wetlands, floodplains, scenic areas and ridgetops. Use overlay zoning techniques to identify the areas and characteristics that need to be protected.
- Modify zoning maps and ordinances to include the environmentally sensitive areas into conservation (overlay) zones, and ensure that these zones have provisions to appropriately restrict development to protect the resources.
- Incorporate wetland protection measures in subdivision and zoning ordinances.

- Protect existing riparian buffers, and require conservation of streamside riparian buffers and forested steep slopes for new developments. Revise ordinances regarding maintenance of property to discourage / restrict mowing of vegetation to the water's edge.
- Consider the rezoning of flood prone areas as open space / conservation and utilization of these areas for recreational purposes.
- Adopt conservation zoning to limit development adjacent to the river.
- Amend ordinances to strengthen regulations for river lot usage – and enforce them.
- Adopt Transfer of Development Rights (TDR) provisions within the ordinances.
- Develop provisions for cluster development - including incentives for developers such as reduced street paving widths, increased density bonuses, etc.
- Promote sound timber harvesting practices.
- Promote sound agricultural land uses.
- Require the use of stormwater management controls and Best Management Practices (BMP's) for developing lands.

b. Encourage municipalities to consider the following recommendations when reviewing and approving proposed land developments.

- Discourage the approval of zoning variances that permit the development or rezoning of sensitive open space or resource areas.
- Encourage ridge top conservation within the corridor, and where possible acquire ridge top development rights through conservation easements.

c. Encourage the planting of trees and shrubs in riparian buffer strips on all county and municipal owned lands.

d. Encourage municipalities to realize the economic development potential associated with the varied natural resources that exist within the corridor. Examples of these opportunities include the following:

- Promote the economic gains available to both corridor landowners (senders) and urban landowners/developers (receivers) for selling and buying TDR credits.
- Promote native fish restoration (such as shad and walleye) to river and streams. Provide observation areas for the public. Plan community events associated with the fishing season.
- Promote downtown revitalization for community hubs.

- Develop a plan for riverfront development in corridor communities – to enhance the quality of life in the community and provide recreation tourism opportunities.
- Form regional planning partnerships to protect and enhance the natural, cultural, historical and recreational resources and tourism opportunities in the corridor.

Management Options References:

Conservation & Natural Resources (CN):	CN3C, CN3E, CN7G
Economic Development (EC):	EC1C, EC1D, EC2A, EC2E, EC2F, EC2G
Education (ED):	ED3D
Flooding and Floodplain Management (FM):	FM3A, FM4B
Planning and Zoning (PZ):	PZ1A, PZ2A, PZ5C, PZ5D, PZ6A, PZ6B, PZ7A, PZ7C, PZ8B
Sports and Recreation (SR):	SR4D

5. Open Space and Recreation Planning

The purpose of these projects is to improve existing facilities to meet the expressed needs of the public, and to provide new and future opportunities for outdoor recreation in and along the Lower West Branch of the Susquehanna River. Recreational activities have potential to provide economic benefits for communities and can improve the general quality of life.

Recreation facilities within this corridor conserve open space for ecological values such as groundwater recharge and flood water storage areas. These parks also provide linkages that provide destinations for day trips between communities. By connecting these parks with the Greenway trail, amenities such as picnic areas, pavilions, restrooms and parking could serve both park and trail users without the need for additional development within the corridor. These shared facilities would be valuable for organizing maintenance and clean up events along the greenway trail.

This region is rich with existing recreation facilities, but improved access to the river is needed throughout the corridor to realize the valley's full recreation potential. Improvements to existing and development of new facilities are recommended to improve access, enhance recreational experiences and provide communities with opportunities for economic development. The following implementation projects are recommended to address these issues:

3 Develop a soft launch for canoes at Winfield.

7 Provide opportunity to rent paddle boats, canoes and bicycles.

7-8 Improve public pedestrian river access and expand river viewing area. Expansion projects could include walkways, trails, bike trails, fishing docks, campsites, launching areas, picnic areas, play areas and wildflower and butterfly gardens.

19 Connect future trails and recreation facilities of Great Stream Commons to the Lower West Branch Susquehanna River Multi-Use Trail. Construct a public boat access facility and provide opportunity to rent paddle boats, canoes and bicycles.

27-30 Improve public pedestrian river access and expand river viewing area. Expansion projects could include walkways, trails, bike trails, fishing docks, campsites, launching areas, picnic areas, play areas and wildflower and butterfly gardens.

28 Provide opportunity to rent paddle boats, canoes and bicycles. This area has potential for pubic and commercial development for tourism generated through implementation of the River Conservation Plan, particularly parking and overnight facilities associated with recreation.

39-43 Improve public pedestrian river access with walkways and trails. Construct seasonal, removable floating stages. These stages could host special events such as concerts, canoe races, tube floats and water skiing events. Develop public marina locations in the dam pool area, and provide opportunities to rent paddle boats, canoes and bicycles. These facilities could provide boat storage, dock slips, rentals, picnic areas, restrooms, and parking.

40 Enhance public viewing opportunities of migratory fish passage at the Fish Ladder. Provide parking facilities.

50 to 52 Develop river access and comfort facilities. Provide parking facilities.

58 Improve public pedestrian river access with walkways and trails.

59 Improve canoe launch. Develop a trailhead with improved parking and construct comfort facilities. This area provides an important link to the Pine Creek Rail Trail and is a significant point along the Lower West Branch Susquehanna Greenway.

63 Develop parking and comfort facilities, and a historical / education center. This area has potential for public and commercial development for tourism generated through implementation of the River Conservation Plan, particularly overnight facilities associated with recreation uses.

70 Provide educational information on migratory fishes and the historic impact of dams along the river. Enhance public viewing opportunities in conjunction with current efforts to restore migratory fish runs. Improve parking facilities.

69-73 Develop public marina locations in the dam pool area, and provide opportunities to rent paddle boats, canoes and bicycles. Provide boat storage, dock slips, rentals, picnic areas, restrooms, and parking. Improve public pedestrian river access and expand river viewing area with walkways, trails, bike trails, fishing docks, picnic areas, play areas and wildflower and butterfly gardens. This area is also important as potential trailhead with links to areas outside the area of study.

70.5 Improve canoe launch. Access to river and parking facilities should be improved.

72.5 Improve canoe launch. Access to river and parking facilities should be improved.

To provide Greenway users with a safe and pleasurable recreation experience the following administrative recommendations should be implemented.

a. Develop signage standards for walkways, trails, and bikeways to provide helpful safety information throughout the diverse character of the corridor.
b. Work with the Pennsylvania Fish and Boat Commission to study the river and determine the appropriateness of special use or no wake zones. Also work with the Pennsylvania Fish and Boat Commission to enhance recreation opportunities and accommodate areas for camping, canoeing and fishing.
c. Establish a Greenway Trails Management Association to insure the continued development, improvement and maintenance of the greenway.
d. Develop maintenance plans for recreational facilities in the study corridor.
e. Prepare a greenway maintenance plan and policing responsibilities.
f. Organize regular cleanup events; involve citizens, community service organizations, and local businesses. Consider starting an "Adopt a River" program – with municipalities assisting to provide trucks and labor to haul collected material.

Management Options References:

Economic Development (EC):	EC1F, EC1I
Education (ED):	ED3D
Sports and Recreation (SR):	SR1B, SR1E, SR1G, SR2A, SR2B, SR3A, SR3D, SR3E, SR4D, SR5B, SR6I, SR6J

6. Connecting Trails

Proposed Multi-use Trails

Lower West Branch Susquehanna River Multi-Use Trail River Mile 0 to 69.5

This is a proposed multi-use trail that links the areas of interest and open space along the entire greenway corridor, and provides links to other trails that extend outside the River Conservation Plan area. The generally proposed alignment for the trail is shown on the Greenway Maps.

0 to 3 Follow the alignment of PA 147 from US 11 on the river side.

3 to 13 Coordinate with PennDOT to establish an independent multi-use trail to be designed and constructed with the new alignment for US 15. The alignment should be on the river side. Links should be provided for:

Shikellamy State Park	River Mile 3
Lewisburg and Lewisburg to Mifflinburg Rail Trail	River Mile 8
Milton State Park	River Mile 11.5

13 to 14 Follow an alignment to PA 405.

14 to 16 Follow an alignment along PA 405. Independent sections along the old canal alignment are desirable. Coordinate with PennDOT to incorporate multi-use trail lanes in the design for upgrade / replacement of the bridge over the Susquehanna River at Watsontown.

16 to 23 Follow an alignment along railroad right-of-way, rail bank property, and/or River Road on the west side of the River. Links should be provided for:

Great Streams Commons	River Mile 17 to 21
Pennsylvania College of Technology	River Mile 21

23 to 26 Follow an alignment along railroad right-of-way. A link to Muncy should follow the railroad right of way from this point and cross the Susquehanna River on the railroad bridge.

26 to 31 Follow an alignment along existing secondary roads.

31 to 36 Follow an alignment along an old forest road to the south of the rail road line.

36 to 39 Follow an alignment along secondary roads.

39 to 43 South Williamsport River Walk and Bike Trail. This section includes connections across both Market Street Bridge and Maynard Street Bridge. A connection to view fish passage at the dam is desired.

39 to 43 Williamsport River Walk and Bike Trail. This section includes connections across both Market Street Bridge and Maynard Street Bridge.

43 to 55 Follow an alignment along the river. Coordinate with PennDOT to establish an independent multi-use trail to be designed and constructed with the new alignment for I-99. The alignment should be on the river side and provide links to the sections of trail immediately adjacent to the river.

49.5 to 52 This area along the river has potential for development of comfort facilities.

55 to 59.5 Follow an alignment along secondary roads and streets. This section should provide a link or links to a Jersey Shore Trail Head. A link that follows along Pine Creek is desirable.

59 This is an area of interest for development of a trailhead with parking and comfort facilities

59.5 to 63 Follow an alignment along secondary roads. Coordinate with PennDOT to establish an independent multi-use trail to be designed and constructed with the new access road from the US 220 interchange at Avis. Cross Susquehanna River on rail road bridge. Ramp will be required on southern side.

63 to 65.5 Follow an alignment along secondary road. Cross Susquehanna River on existing bridge.

66 to 70 There is a potential alternate or additional alignment on the south side of the River between McElhattan and Castanea. This alignment would follow an old railroad alignment that is a combination of rail bank, private, and public ownership.

65.5 to 69 Follow an alignment along secondary road. Link to the Bicycle PA Route G and the Lock Haven River Walk.

69 to 72 This area has for a potential trailhead with links to areas outside the area of study.

Union County Susquehanna River Multi-Use Trail River Mile 0 to 16

The alignment of the Lower West Branch Susquehanna River Multi-Use Trail on the east side of the river does not provide adequate linkage to the population, open space, and recreation nodes of the Union County area of the River Conservation Plan. The property along the old railroad alignment should be investigated to establish a multi-use trail along the entire trace, or at a minimum, sections of multi-use trail should be established and linked to the Lower West Branch Susquehanna River Multi-Use Trail. This property is a combination of rail bank, private, and public ownership.

Proposed Hiking / Walking Trails

There are many opportunities for hiking or walking trails to link special places, provide education, or provide recreation opportunities. Some of the potential hiking or walking trails include:

Armstrong Road River Mile 31

This road is closed to motorized traffic throughout most of the year. This alignment through State Forest Land provides an excellent hiking trail with tremendous views. It could also be used for mountain biking and cross country skiing. This trail would provide a link to Skyline Drive and Summit Trail.

Jersey Shore River Walk River Mile 56 to 59.5

This Jersey Shore Chamber of Commerce is proposing walking trail along privately owned property immediately adjacent to the river. This walking trail could potentially include a section along the old canal route, which is also privately owned.

McElhattan Run Reservoir Loop River Mile 65.5

This proposed walking trail is along McElhattan Drive to the reservoir site. It is linked to the Mid-State Trail and the proposed Lower West Branch Susquehanna River Multi-Use Trail. It could link to the Great Island River Walk as well.

Proposed Historic Trails

The corridor is rich with historical sites of interest to tourists and residents as well. There are opportunities for trails to link historical places to provide an educational, as well as recreational opportunity. Trails can also link sites that would not otherwise be accessible. Some of the potential historic trails include:

Watsontown River Mile 15 to 20

An historic trail is proposed to include the Watsontown Historic District, the old canal alignment and other historic sites in this vicinity.

Trail Mapping and Signage

Mapping will be a key element in promoting tourism for this area. A map or series of maps should be created that show the corridor attractions, such as viewscapes, historic sites, recreation facilities, and trails. This mapping should also provide information about access points, trailheads, boating access, and campgrounds.

Kiosks should be located at each access point to the Greenway. These kiosks should provide information about the Greenway, such as habitat areas, viewing locations, trails, and educational opportunities. The kiosks should also include information about the local area, such as local museums, recreation areas, shopping, restaurants, and lodging locations.

Management Options References:

Conservation & Natural Resources (CN):	CN6D
Economic Development (EC):	EC1E
Historic Preservation (HP):	HP3D, HP5B, HP7B
Education (ED):	ED3D
Sports and Recreation (SR):	SR1A, SR1D, SR1F, SR4A, SR4B, SR4D, SR4E, SR4F, SR4G, SR6B, SR6E, SR8A
Water Safety (WS):	WS1A, WS1B, WS1F, WS2A, WS2B, WS2C, WS4C

7. Viewscapes

The image of a community - and citizens' view of their community - is to a large part formed by the visual setting that surrounds them. The landscape of this region is characterized by communities surrounded by lush green mountains, rolling farmland, and freshwater streams. The views throughout the river corridor offer scenic beauty, tranquility and solace, but these blessings to daily life are often taken for granted by river valley inhabitants.

People from outside this area recognize and value this resource because it is lacking in their daily lives – and this provides opportunity for economic development associated with recreation tourism. However, if this economic development potential is to be realized, the following recommendations should be implemented.

a. Develop improved public awareness of how visual environments impact the quality of life.
b. Develop criteria for selecting and prioritizing land for protection. Identify areas, map them, and circulate to municipal and county planning agencies for their use in land development reviews.
c. Identify and prioritize significant scenic vista areas within the river corridor. (Such as Bald Eagle Mountain and the stretch of river corridor between Montoursville and Muncy.) Utilize the resources of regional colleges and universities including the Lock Haven, Lycoming and Bucknell Biology and Environmental Studies Departments, and the Penn State Landscape Architecture Department.
d. Encourage municipalities and private property owners to protect these vistas to maintain visual beauty to enhance economic development potential within the corridor. Provide guidance and educational material regarding TDR's and conservation easements.
e. Provide municipalities examples of zoning and land development ordinances that promote the protection of scenic areas.

Management Options References:

Economic Development (EC):	EC2B
Education (ED):	ED3D
Sports and Recreation (SR):	SR4D
Viewscapes (VS):	VS2A, VS2B

E. Greenway Implementation Plan

The previous section contains more than 100 specific projects or recommendations for implementing the Greenway Element of this River Conservation Plan. Additionally, there are more than 90 miles of proposed multi-use trails, with recommendations for additional connecting trails. Although this is a formidable undertaking, these projects and recommendations are only a starting point, as projects and recommendations will undoubtedly be added as implementation progresses and priorities change. Section VIII provides a guide for implementing the River Conservation Plan. It provides an organizational framework, procedures to address threats and concerns, strategies for obtaining funding, roles for public and private sectors, and recommended action steps. The longest and most arduous journey begins with a single step forward. Our first step is to identify the organization that will make the Greenway Element a reality.

Greenway Element Coordinator

The RCP Steering Committee should initially assume the role as the Greenway Element Coordinator until a permanent organization can be put into place and responsibilities are shifted. The initial role of the Steering Committee shall include the following:

- Develop an Annual Work Plan.
- Encourage and assist counties, municipalities and lead partners in initiating early implementation projects.
- Provide letters of support for grant applications.
- Create a Joint Greenway Organization.

Establishing the Joint Greenway Authority to coordinate implementation of the Greenway Element should be a high priority. The first year or two of project implementation will be crucial in maintaining momentum. The Steering Committee will quickly find itself overwhelmed as the magnitude of implementation projects grows. Consideration should be given to establish a Joint Greenway Authority. A Greenway Coordinator should be hired to provide executive and administrative support for the Authority.

Annual Work Plan

It is important to remember that the Greenway Element will take a long time to be fully implemented -- perhaps a generation or longer. The recommendations and development projects in the preceding section represent the long range plan. Many of these projects are very general. Projects that are of higher priority and can be implemented in a reasonable period of time move into the short range plan and become more specific. The Annual Work Plan consists of those projects that are expected to be continued or initiated within the next year. Each project should have a lead agency, partners, identified funding, a specific and measurable scope, and a schedule.

Early Implementation Projects

The early implementation projects are the recommendations and projects that could be included in the initial Annual Work Plan. The Steering Committee selected these projects after consideration of public input from public meetings, municipal questionnaires and stakeholder interviews. In addition, the following factors were considered in selecting early implementation projects.

- High priority with broad support.
- Can be completed within a reasonable timeframe.
- High probability of funding support.
- Diversity of projects and implementing agencies.
- Representation throughout the corridor.
- Consistent with Comprehensive Master Plans.

1. Conduct river and stream cleanups.

Lead Partners: Counties and Municipalities

Implementation Projects:

- Establish an Adopt-A-Stream Program using PennDOT's Adopt-A-Highway Program. as a pattern. (VS3A)
- Encourage local clean-ups throughout the corridor. (VS4A)
- Participate in National River Cleanup Week during May. (CN1C)
- Participate in the Annual River Sweep in June. (CN1C)

2. Install riparian buffer plantings.

Lead Partners: Conservation Districts

Implementation Projects:

- Identify areas that are lacking riparian buffers and identify what tree and shrub species should be planted. (CN4B, CN4D)
- Provide education on riparian buffers to property owners. (CN4D)
- Encourage property owners to install riparian buffer best management practices. (CN4C)
- Provide technical and financial assistance to property owners. (CN4F)

3. Initiate County Greenway Plans.

Lead Partners: County Planning Commissions

Implementation Projects:

- Initiate preparation of County Greenway Plans according to the Pennsylvania Greenway Action Plan. (SR6A)
- Incorporate appropriate components of the Greenway Element into the County Greenway Plans. (SR6A)

4. Improve public access to the River.

Lead Partners: Municipalities, Counties, Northcentral Pennsylvania Conservancy, Merrill Linn Conservancy

Implementation Projects:

- Develop soft launches for canoes at Winfield, Lewisburg, South Williamsport, Lock Haven, and Loyalsock Township. (SR3A, SR3D, SR3E)
- Enhance the accessibility and attractiveness of the Jersey Shore Riverwalk/Boardwalk. (SR3A, SR3B, SR3D, SR3E)
- Develop river access for canoes and small fishing watercraft on the Great Stream Commons property. (SR3D)

5. Develop a boardwalk at Montandon Marsh.

Lead Partners: County, Municipality, Merrill Linn Conservancy

Implementation Projects:

- Develop an education trail and boardwalk system at the Montandon Marsh property in Northumberland County. (SR4C)

6. Obtain conservation easements for key open space.

Lead Partners: Northcentral Pennsylvania Conservancy, Merrill Linn Conservancy

Implementation Projects:

- Identify and prioritize key open spaces within the corridor. (CN4A, CN7A, VS1A,)
- Encourage landowners with key open space to place their land under a conservation easement. (CN4G, CN7I, VS5A)
- Use conservation easements to protect floodplains. (FM5A, FM5B)

7. Coordinate with PennDOT for multi-use trails.

Lead Partners: County Planning Commissions

Implementation Projects:

- Identify opportunities to establish the multi-use trail alignments through new road construction projects and repair projects. (SR2C, SR2D)
- Encourage PennDOT to include pedestrian access and multi-use trails within project scopes and designs for through new road construction projects, and repair projects. (SR2C, SR2D)
- Provide specific recommendations to PennDOT for pedestrian access and multi-use trails for projects currently in planning. (SR2C, SR2D)

Letters Of Support

There are limited funds available to support development projects. State and Federal Grant programs are becoming increasingly competitive and matching funds are limited. Section VIII provides information relative to securing funding and prioritizing projects. Because the River

Conservation Plan was developed with broad-based public input, State and Federal agencies may consider the document when evaluating and ranking potential projects for funding. The Steering Committee can have a significant impact on this process by providing consistent letters of support. Letters of support should refer to the River Conservation Plan, document the need, and identify the priority. In doing this, the Steering Committee can ensure that those projects that are most deserving of funding and meet the most pressing needs of the implementation plan are funded.