River Conservation Plan

for the Upper Chartiers Creek Watershed

In Accordance With

The Pennsylvania Department of Conservation and Natural Resources

Mark Schweiker, Governor John C. Oliver, Secretary

Prepared by:

Washington County Watershed Alliance
and Chartiers Creek Watershed Association

January 2003

Welcome!

Purpose

The Purpose of the River Conservation Plan

The Upper Chartiers Creek River Conservation Plan is an essential first step toward improving and protecting the resources of this area of Washington County. It should not be considered as an end in itself, but as a tool for local and multi-municipal planning to address the problems that are identified. It will be an asset to municipalities and organizations that are seeking funds for projects to implement the recommendations of the plan.

The objective of the planning process: complete a plan that is accepted on the Pennsylvania Rivers Conservation Registry. Once the plan is placed on the Registry, implementation activities outlined in the plan are eligible for Keystone Funds, which are administered by the Department of Conservation and Natural Resources. This makes the plan a conduit for funding numerous implementation activities, whether for more detailed planning or for construction.

Once the plan is on the Registry, all the communities that lie within the Upper Chartiers Creek Watershed are eligible for the granting dollars made available through the Keystone Grant Program. Additionally, other grant programs will be more receptive to funding implementation projects.

With an accepted plan approved and placed on the Registry, municipal officials and staff, government agencies, politicians, non-profit organizations, and/or partnerships of these entities can work together to make improvements to the items discussed in the plan.

About the River Conservation Plan

The River Conservation Plan is a reference guide for decision makers in the Upper Chartiers Creek Watershed. Municipal officials and staff, conservation organizations, businesses, planners, governmental agencies, are among those who will find this report to be an invaluable resource for their efforts to improve and protect the water resources of this area.

Critical information about the Upper Chartiers Creek Watershed and suggested strategies for implementation are combined here in a single document that can bring together all interested groups and individuals.

This Plan will be coordinated with the completed plan for the Lower Chartiers Creek Watershed, the two together providing a holistic plan for the entire watershed.

In the Report

The River Conservation Plan is comprised of information about the characteristics of the Upper Chartiers Creek Watershed, along with its natural, physical and cultural resources. Socio-economic information is provided to show how the resources relate to each other. Numerous maps and appendices will help the reader understand the process that produced this document and provide a visual guide to resources within the Upper Chartiers Creek Watershed. The report identifies potential planning and project activities, as well as model codes and ordinances to assist communities in protecting resources and aid in improving developmental activities. Finally, the report identifies potential technical and funding sources to assist individuals, organizations, and municipalities to implement specific projects.

The Upper Chartiers Creek RCP is structured according to the following format:

1. Introduction
2. Project Area Characteristics
3. Land Resources
4. Water Resources
5. Biological Resources
6. Cultural Resources
7. Issues, Constraints, and Opportunities
8. Management Options
    - Management Recommendation Matrix
    - Potential Assistance Sources for Watershed Projects
    - Maps
    - References
    - Glossary
    - Appendices

Section 1 Introduction: Describes the project's history, the planning process, and the project's purpose; describes also the project's overall goals for the plan.

Section 2 Project Area Characteristics: This section covers the general project area characteristics and sets the stage for Sections 3 through 6, which include more detail on the differing resources.

Sections 3 through 6: These sections provide an inventory of the resources evaluated in the River Conservation Planning process. Section 3, Land Resources, inventories and describes issues such as geology and soils, property ownership, critical areas, landfills, and hazard areas (i.e., waste sites and abandoned mines); Section 4, Water Resources, inventories and describes issues such as stream characteristics, major tributaries, wetlands, floodplains, lakes and ponds, water quality (i.e., point and non-point source[s]), and water supply; Section 5, Biological Resources, inventories and describes issues such as wildlife (terrestrial and aquatic), vegetation, Pennsylvania Natural Diversity Index Species listings, important habitats, and Natural Heritage Areas; and Section 6, Cultural Resources, inventories and describes issues such as recreation (i.e., parks, rail-to-trails, and greenways) and archaeological/historical sites.

Section 7 Issues, Constraints, and Opportunities: In this section, the main issues, constraints, and opportunities for the resources that were inventoried in Sections III through VI are clearly and concisely identified for each resource category. This provides the reader with the foundation for management options that are discussed in Section VIII. Topics discussed in Section VII include items that may be considered as both areas of concern (i.e., sewage and abandoned mine drainage), and areas of community enlightenment (i.e., adult and youth education, land conservation, and rail-to-trails). The purpose is to move the watershed study from the resource inventory stage to future implementation.

Section 8 Management Options: Here each item is given a recommended implementation strategy in an attempt to solve, correct, and/or improve the item discussed. In addition, a schedule is provided for implementation of each specific item.

Section 8 is where most users of the RCP will go initially to look for action items.

Management Recommendations Matrix is a simple tool that can be used for planning and implementing the RCP.

Potential Assistance Sources for Watershed Projects: Includes a comprehensive list of technical and funding programs available within Pennsylvania and from the National level. **After the Management Recommendations Matrix, this section may be the next most valuable resource and utilized portion of the plan**.

Throughout these sections, references are provided to help the reader navigate between the text of the main plan, the appendices, and maps.

Maps and Appendices - What Can Be Found Here

The Maps and Appendices follow the body of the text.

Maps

The Maps (see index for listing) illustrate the characteristics and the resources of the region.

Appendices

Appendix 1, Public Participation: Includes public responses and input to the survey, stakeholder visioning activities, and public meetings.

Appendix 2, Model Ordinances, Overlay Districts, and Guidelines/ Standards: A number of examples of municipal planning ordinances, overly districts, and guidelines that can promote better land use, land development, and improve water quality in receiving streams can be found here.

Appendix 3, PADEP: Environmental Good Samaritan Project Proposal: This tool can be used by landowners and conservation groups in assisting efforts to remediate land and streams impacted by abandoned mine conditions.

Appendix 4, "Paying for Growth, Prospering from Development" (Kinsley and Lovins, 1998): This article serves as an educational tool for community planning. It deals with issues concerning sustainable development such as: 1) development and growth, 2) community encouragement of growth, 3) how communities get trapped by growth, and 4) the reasons why more development isn't always better.

Appendix 5, PADEP Fact Sheets: The Fact Sheets can give stakeholders direction and assistance concerning the specific issues found in this appendix (i.e., septic systems,, sewage planning requirements,, sewage management programs,, stormwater permits, and concentrated animal feeding operations).

Appendix 6, Conceptual Conservation Planning Areas: The information in this appendix can assist stakeholders (i.e., municipal and county planners, developers, etc.) in understanding various ways development of an area can be accomplished to minimize impacts to community resources and enhancing the surrounding area.

Closing Remarks

As the grant recipient for this project, Washington County Watershed Alliance will be provided with the following deliverable products:

- The Upper Chartiers Creek RCP;
- The Executive Summary of the RCP;
- CD ROM disks containing the digital Geographic Information System (GIS) files that were prepared for the RCP (These files contain the digital copies of the Maps found in the RCP); and
- Hard copy maps of the figures found in the plan.

The various types of information and data that were collected and utilized to assemble the plan can be found in the technical file that has been maintained by Skelly and Loy, Inc., 240 Scott Road, Suite 1, Morgantown, WV 26508 / (304) 296-6500. Additional copies of the River Conservation Plan can be purchased by contacting Skelly and Loy.

This Welcome is intended to act as a guide for the efficient access and application of this plan by local municipal officials and organizations.

List of Acronyms

ACPD	Allegheny County Planning Department
ALD	Anoxic Limestone Drains
AMD	Abandoned Mine Drainage
AML	Abandoned Mine Land
Bbl	Barrels
BDA	Biological Diversity Area
BMP	Best Management Practice
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
ChCWA	Chartiers Creek Watershed Association
CVI	Canaan Valley Institute
CWA	Clean Water Act
DA	Dedicated Area
DOT	Department of Transportation
EAC	Environmental Advisory Council
EASI	Citizens Volunteer Monitoring Program
EP	Extraction Procedure
EPA	Environmental Protection Agency
ESA	Environmental Site Assessment
FEMA	Federal Emergency Management Agency
FGM	Fluvial Geomorphology
FHWA	Federal Highway Administration
GIS	Geographic Information System
IWL	Isaac Walton League
LDW	Limestone Diversion Well
LID	Low Impact Development
LWV	League of Women Voters
LTSM	Long Term Surveillance and Maintenance Program
MCF	Thousand Cubic Feet
MCL	Maximum Concentration Limit
MDE	Maryland Department of Environment
ML	Managed Land
MPC	Pennsylvania Municipalities Planning Code
NEPA	National Environmental Policy Act
NFRAP	No Further Remedial Action Planned
NHI	Natural Heritage Inventory
NPL	National Priority List
NPS	Non-Point Source
NRCS	Natural Resources Conservation Service
NRC	Nuclear Regulatory Commission
NWI	National Wetland Inventory
OHA	Other Heritage Area
OLC	Open Limestone Channel
PADCED	Pennsylvania Department of Community and Economic Development
PADCNR	Pennsylvania Department of Conservation and Natural Resources
PADE	Pennsylvania Department of Education
PADEP	Pennsylvania Department of Environmental Protection
PADER	Pennsylvania Department of Environmental Resources
PADMMI	Pennsylvania Department of Mines and Mineral Industries
PASDC	Pennsylvania State Data Center
PAWC	Pennsylvania American Water Company
PCB	Polychlorinated biphenyls
PENNDOT	Pennsylvania Department of Transportation

PFBC	Pennsylvania Fish & Boat Commission

List of Acronyms (continued)

PGC	Pennsylvania Game Commission
PHMC	Pennsylvania Historic and Museum Commission
PIRR	Pittsburgh Industrial Rail Road
P.L.	Public Law
PNDI	Pennsylvania Natural Diversity Inventory
POWR	Pennsylvania Organization of Watersheds and Rivers
PRD	Planned Residential Development
PTC	Pennsylvania Turnpike Commission
PU	Planning Units
PWWCT	Penn's Woods West Charitable Trust
RCP	Rivers Conservation Plan
RCRA	Resource Conservation Recovery Act
SAPS	Successive Alkalinity Producing System
SGL	State Game Land
SPC	Southwestern Pennsylvania Commission
SPL	State Priority List
SR	State Route
SWRC	Stroud Water Research Center
TDR	Transferable Development Rights
TEA	Transportation Equity Act
TIP	Transportation Improvement Plan
TMDL	Total Maximum Daily Load
UMTRCA	Uranium Mill Tailings Radiation Control Act
USACOE	United States Army Corps of Engineers
USAEC	United States Atomic Energy Commission
USDOE	United States Department of Energy
USDA	United States Department of Agriculture
USGS	United States Geological Survey
WCPC	Washington County Planning Commission
WCWA	Washington County Watershed Alliance
WPCAMR	Western Pennsylvania Coalition for Abandoned Mine Reclamation
WPWPP	Western Pennsylvania Watershed Protection Program

Acknowledgments

Watershed Planning:
A grassroots movement

The Upper Chartiers Creek River Conservation Planning (RCP) effort was initiated by the Washington County Watershed Alliance to help the community better understand the natural, physical, and cultural resources of the Upper Chartiers Creek Watershed, and how these resources are impacted by various factors. This information will enable stakeholders to make conscious decisions regarding potential improvements, and the protection of important features within the watershed.

In 2000, the Washington County Watershed Alliance (WCWA) was awarded a River Conservation Planning Grant for the Upper Chartiers Creek Watershed from the Pennsylvania Department of Conservation and Natural Resources (DCNR). Because the River Conservation Planning process had already been initiated in the lower portion of the watershed, a planning grant was completed for only the upper portion of the Chartiers Creek Watershed. The area for the current study includes the area upstream of the confluence of Little Chartiers Creek and Chartiers Creek in Washington County (approximately 139 square miles in size). The completion of the grant process for the lower portion of the watershed helped to generate interest within the Washington County portion of the watershed. The steering committee was formed and assisted in reviewing the draft Request for Proposal prior to its distribution to potential consultants. In April 2001, the WCWA on the advice of the steering committee hired Skelly and Loy, Inc. as the project's consultant. Skelly and Loy was hired to prepare the RCP, perform the needed public participation activities, and to ensure that the RCP is approved by DCNR and listed on the Pennsylvania Rivers Conservation Registry.

Funding for this project was provided by:

Pennsylvania Department of Conservation and Natural Resources (DCNR) Keystone Recreation, Park, and Conservation Fund

and

- Chartiers Creek Watershed Association,
- Washington County Conservation District,
- Pennsylvania Department of Environmental Protection,
- Duquesne Light Company, and
- Chartiers Creek Water Quality Improvement Corporation.
- League of Women Voters Education Fund – Water Resources Education Network

The project was directed by the Project Steering Committee, which is an informal group of community-oriented individuals, and organizations that are concerned about the future of the Upper Chartiers Creek Watershed.

- Chartiers Creek Watershed Association
- North Franklin Township
- Washington County Watershed Alliance
- Washington County Conservation District
- Lower Chartiers Creek Watershed Rivers Conservation Plan Steering Committee
- Washington County Planning Department
- Washington County Parks and Recreation Department

The Washington County Watershed Alliance was the administering organization for the project.

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- Buffalo Township
- Canonsburg Township
- Canton Township
- Cecil Township
- Chartiers Township
- East Washington Borough
- Green Hills Borough
- Houston Borough
- McDonald Borough
- Mt. Pleasant Township
- North Bethlehem Township
- North Franklin Township
- North Strabane Township
- Peters Township
- Somerset Township
- South Franklin
- South Strabane
- Washington City

and

The numerous volunteers that assisted in developing this plan.

Their participation in the public process facilitated and enabled completion of this vital step in the restoration of the Upper Chartiers Creek Watershed.

Table of Contents

List of Tables

List of Figures

Management Recommendations Matrixes

Potential Assistance Sources for Watershed Projects Matrixes

List of Maps

Annotated Bibliography

Glossary

Appendices

1 Introduction

1.1 Planning Process

The Steering Committee and the consultant initiated the planning process in April 2001 in order to prepare the RCP. The approach for this plan involved collecting, analyzing, and evaluating data for natural, physical, cultural, and socio-economic resources in the Upper Chartiers Creek Watershed, and correlating their impacts to land development activities and trends. This approach has been further analyzed at the sub-basin level to assist in ranking implementation recommendations/goals/strategies. This gives the plan the flexibility to specifically direct improvements.

Natural, physical, cultural, and socio-economic resource data collected includes information in hard copy and digital formats. This information has been collected from citizens groups, water/sanitary authorities, planning commissions, school districts, colleges, historical societies, and local, county, state, and federal governmental agencies. Data collected includes, but is not limited to: water quality sampling, aquatic surveys, soil surveys, biological studies, flood protection projects, geographical information systems data, surface and deep mining surveys/reports, regulations and laws, natural heritage inventories, park master plans, utility mapping/data, and zoning/ordinance information.

After the data were collected, this information was analyzed and evaluated based on its importance in the planning process. The information was then evaluated to determine which specific resource items, activities, and/or processes correlated into issues, concerns, constraints, and opportunities to be addressed by this plan.

1.2 Project Purpose

The purpose of this project and the River Conservation Planning process is to complete a comprehensive review of the watershed in a holistic manner. Through the planning process, pathways for implementing improvements to its resources (natural, physical, and cultural) were delineated. The intent of this planning process is to provide the needed information to develop an effective River Conservation Plan for the Upper Chartiers Creek Watershed; provide resource improvement recommendations that can be implemented (short-term and long-term); and to have a plan that is placed onto the Pennsylvania Rivers Conservation Registry. Once on the Registry, communities that lie within the watershed are eligible for granting dollars made available through the Keystone Grant Program. The overall goals of the project in no specific order are to:

- Improve water quality
- Promote land development that is compatible with a sustainable environment
- Enhance the recreational opportunities of the watershed
- Protect the natural resources, historic landscape and scenic beauty within the watershed
- Provide an environmental education program for adults and enhance existing school-based environmental education
- Encourage compatible and sustainable economic development
- Prepare for future growth

2 Project Area Characteristics

2.1 Location

The Chartiers Creek is located in southwestern Pennsylvania and flows north and east through Washington and Allegheny Counties. Chartiers Creek discharges into the Ohio River at McKee Rocks, PA. Chartiers Creek is considered a navigable waterway by the U.S. Army Corps of Engineers (USACOE, 1995) from its mouth at McKees Rocks on the Ohio River upstream 1.9 miles. The portion of Chartiers Creek found within the Upper Chartiers Creek Watershed project area is not considered to be a navigable waterway of the United States.

2.2 Size

The size of the Upper Chartiers Creek Watershed is approximately 139 square miles (approx. 88,886 acres). The length of Chartiers Creek in the study area is 38.5 miles (PADER, 1984). There are an estimated total of 282 stream miles in the Upper Chartiers Creek Watershed.

2.3 Topography

The project area has a mixture of topographic features. The upper and western reaches of the watershed have mild slopes, wide valleys, and rolling hills. By comparison, the lower and eastern portion of the watershed has narrow valleys, high hills, and steep to moderate slopes (PADER, 1984). The highest land elevation is located approximately ¾ mile west of State Route 18 northwest of Gretna, PA. The lowest elevation in the project area is located at the confluence of Chartiers Creek and Little Chartiers Creek. Other topographic features can be seen at the sub-basin level (USGS, 1953 – 1993). Portions of Chartiers Run, Chartiers Creek and Little Chartiers Creek have a steeper gradient when compared to the gradient of other sub-basins located in the Upper Chartiers Creek Watershed (Refer to Maps 1 and 8).

2.4 Major Sub-basins and Tributaries

There are ten major sub-basins of the Upper Chartiers Creek Watershed Refer to Map 2).

Table 2-A

Stream Sub-basins

Sub-basin	Acres
1. Chartiers Creek	31,701
2. Little Chartiers Creek	29, 316
3. Chartiers Run	7,344
4. Georges Run	4,592
5. Brush Run	3,919
6. Westland Run	3,678
7. Catfish Run	3,141
8. Plum Run	2,880
9. Morganza Run	1,598
10. Opossum Run	717
Total	**88,886**

These sub-basins were delineated by the Southwestern Pennsylvania Commission (SPC). The method used by the SPC in delineating the sub-basins was by identifying those which are named perennial streams by the United State Geological Survey (USGS).

2.5 Land Use / Land Cover

Land Use / Land Cover in the watershed is dominated by agricultural and forest land use. Residential land use is concentrated in several population centers across the watershed. The most heavily densely developed areas include the boroughs of Canonsburg and Houston, and Washington City, primarily. Throughout much of the watershed, however, residential land use occurs in small populations across a mostly agrarian landscape. Wetlands are found in both forested and non-forested form throughout the watershed and comprise 144.37 acres of the project area (Refer to Map 3).

Table 2-B
Major Land Use Types

Land Use	Sq. Miles	Total Acres	Percentage
Agriculture	61.3	39,218.4	44.1%
Forest	56.5	36,128.4	40.6%
Residential	13.4	8,575.2	9.6%
Non-Residential	4.5	2,869.5	3.2%
Transportation	2.0	1301.8	1.5%
Lakes or Ponds	0.5	321.2	0.4%
Maintained Grass	0.3	197.0	0.2%
Strip Mines	0.2	130.3	0.2%
Wetlands (Forested)	0.2	116.0	0.1%
Wetlands (Non-Forested)	0.1	28.4	0.1%
TOTAL	**139.0**	**88,886.2**	**100%**

Source: *Landsat TM, 1992 after SPC, 2000.*

Residential (i.e., homes, townhouses, trailers, etc.) and non-residential (i.e., small business, shops, etc.) land uses are concentrated in four areas in the watershed. The residential and non-residential land uses are located in the boroughs of Canonsburg and Houston, and Washington City and East Washington Borough. These communities consist of a mixture of single-family housing units and small businesses (i.e., gas stations, general stores, restaurants, etc.).

Industrial and commercial land uses are found in the watershed and are concentrated in the boroughs of Canonsburg and Houston, and Washington City and East Washington Borough. The industrial and commercial development is concentrated along Interstate 70 and 79, U.S. Routes 19 and 40, and State Routes 18, 136, 519, 844, and 980. However, recently commercial development has started to expand along U.S. Route 19 in North Strabane, Peters, and South Strabane Townships.

The watershed's major transportation corridors are Interstates 70 and 79, and U.S. Route 19. These transportation corridors serve to transport people and goods in an east-west and north-south direction. Existing roadway corridors, providing easy access to markets along the east coast and interior portion of the United States, allow urban sprawl to occur easily. As the watershed's transportation facilities evolve (Southern Beltway), additional areas will develop (and possibly observe sprawl) if adequate planning is not completed in good time. For transportation land uses please refer to 2. Project Area Characteristics, F. Socioeconomic Profile, 4 Transportation Facilities.

Agricultural land use is the largest category of land use in the watershed (44.1%). Agricultural land is located throughout the project area, but more specifically around the edges of the watershed rather than in the middle near Chartiers Creek and the major transportation facilities. Transportation facilities can impact farms by dividing land (fields and pastures) and making

farming more difficult to accomplish. Agricultural land use is protected by numerous laws in Pennsylvania (i.e., PA Act 319 – Clean and Green, PA Act 515, Pennsylvania Municipalities Planning Code [Act of 1968, P.L. 805, No. 247 as reenacted and amended], and the Conservation and Preservation Easements Act of 2001). As future development activities continue to encroach upon agricultural land, these laws will assist in protecting agricultural resources.

Forestland use is the second major land use in the watershed (40.6%). Forestland can be found throughout the watershed in a patchwork network (Refer to Map 3). Forests help to maintain the environmental health of terrestrial (land) and aquatic (water) habitats besides improving the aesthetics of an area (Refer to Section 5.5.2 Important Habitats and Natural Heritage Areas - Forest)

Land use identified as strip mines involve both reclaimed and un-reclaimed properties. These sites are located along and to the west of Chartiers Creek (Refer to Maps 3 and 8).

Traditionally, land use activities have been encouraged by older and out-dated zoning codes. Thus, urban sprawl will develop under these type of conditions. Additionally, as transportation facilities have been built or planned, development/urbanization is taking place in areas of the project area that have historically not observed these types of pressures. Areas of the watershed that are near the Allegheny County line and the Southern Beltway need to be prepared (with community planning and zoning) to attempt to protect those communities from the impact of sprawl. Recent amendments to the Municipalities Planning Code (Acts 67, 68, and 127, 2000 authorized) encourage municipalities, including counties, to work together in planning and implementation. These bills (Municipal Planning Code[s]) assist communities in working together in regards to planning activities (Inter-Municipal Framework). This can assist in improving the environment, reducing infrastructure expenditures, and in facilitating activities (i.e., reducing the development impact of road widths). Without safeguards in place (sound zoning, planning, inter-community communication) to protect the area's resources, degradation of land and then the subsequent degradation of water quality will result.

2.6 Climate

The Chartiers Creek watershed has a humid continental climate. The average maximum winter temperature is 38.6° Fahrenheit (F) and the average minimum winter temperature is 17.0° F. The average maximum summer temperature is 84.7° F and the average minimum summer temperature is 57.1° F. Total average annual precipitation is 37.6 inches, of which approximately 56 percent falls between April and September. The average annual snowfall is approximately 40 inches, but is variable from the northern to southern portions of the watershed (USDA, 1983).

2.7 Land Use Planning and Controls

Planning activities can be accomplished by municipalities, multi-municipal cooperative regions, counties, and regions (i.e., SPC). However, zoning can only be adopted by municipalities, multi-municipal cooperative regions and counties. Land use planning is implemented on local, multimunicipal, and county levels through adopted and enforced zoning codes and ordinances. The Pennsylvania Municipalities Planning Code (MPC) of 1968, (P.L. 805, No. 247 as enacted and amended) provides the authority for municipalities to manage land use through the enactment of zoning ordinances (Refer to Appendix 2). (Pennsylvania Municipal Planning Code, 2001)

2.7.1 *Zoning Ordnances*

Zoning Ordinances manage development by determining the type of uses (i.e., residential, industrial, commercial, etc.) that will be allowed in any given area within a municipality. This includes the specialized requirements of the development (i.e., number of buildings/density, height of structures, setback distances from property lines, amount of development/intensity of use, and open space provisions). As noted in *A Watershed Primer for Pennsylvania*, "…zoning power represents the real power of municipalities over land use" (Novak and Woodwell, 1999). The MPC denotes other key components that are important to community planning and land use development. These key provisions are discussed below.

2.7.2 *Who Has Zoning?*

Zoning is intended to regulate land use development for the best interests of the community. Data compiled by the Southwestern Pennsylvania Commission (SPC) generally identifies the zoning classifications of each of the nineteen communities of the watershed (SPC, 2000): The municipalities in the watershed have various levels of zoning enforcement and implementation (Refer to Table 2-C).

Table 2-C
Upper Chartiers Creek Watershed Municipal Zoning Matrix

Municipality	ZO	CP	SL	Date of Most Recent Zoning Amendment
Amwell Township				October 8, 2001
Buffalo Township	X			September 12, 2001
Canonsburg Borough	X		X	January 1, 1997
Canton Township	X	X	X	November 8, 2000
Cecil Township	X	X		June 18, 2001
Chartiers Township	X		X	April 1, 2001
East Washington Borough				1968
Green Hills Borough				No Zoning
Houston Borough	X		X	November 12, 1997
Mt. Pleasant Township	X		X	September 5, 2000
North Bethlehem Township				No Zoning
North Strabane Township	X		X	November 22, 1994
North Franklin Township	X	X		November 21, 2000
Nottingham Township	X			October 4, 1999
Peters Township	X	X	X	May 26, 1998
Somerset Township	X			May 2001
South Franklin Township	X			June 28, 2001
South Strabane Township	X	X	X	November 10, 1998
Washington City	X			March 25, 1993

ZO=Zoning Ordinance *SL=Subdivision and Land Development Ordinance*
CP=Comprehensive Plan

2.7.3 *Comprehensive Plan*

While a Comprehensive Plan is not required to enforce or implement zoning ordinances, it is the best way to establish community concensus on future land use planning objectives. A comprehensive plan must include by law, the community development objectives statement. This statement sets the stage for sound and reasonable zoning and establishes the goals to protect and enhance the community resources.

There are a number of regulatory and nonregulatory ways to implement plans. Among the regulatory tools are zoning, an official map, and subdivision and land development regulations.

2.7.4 *Official Map*

An official map is not required to enforce or implement zoning ordinances, but the official map is an important tool, which can be used to implement a comprehensive plan. It is used to reserve land for proposed streets, public lands (i.e., parks, trails etc.), streams/waterways, and other public rights-of-way. It

notifies landowners of plans for public facilities and protects an area from development for a limited time until a purchase can be arranged.

2.7.5 *Subdivisions and Land Development*

Subdivision and land development ordinances apply whenever a tract of land is planned to be divided into smaller tracts or developed for non-residential uses. Subdivision and land development governs activities at property level and sets standards for property plats, street design, water and sewer, and open space dedications. According to *A Watershed Primer for Pennsylvania*, nearly half of the municipalities of the Commonwealth only rely on subdivision ordinances and have not enacted zoning (Novak and Woodwell, 1999). This does not appear to apply to the communities in the Upper Chartiers Creek Watershed (Refer to Table 2-C). Communities may rely upon the ordinances too heavily in order to achieve land use objectives, but without the designation of where specific land uses are to be located.

2.8 Analysis of Comprehensive Plans and Municipal Zoning Ordinances

The Upper Chartiers Creek Watershed includes all or portions of nineteen communities with various levels of zoning ordinances for growth management. Zoning within these communities shapes the quality of life for residents and watershed stakeholders alike. An analysis of the zoning ordinances and comprehensive plans was completed involving 15 of the 19 municipalities in the Upper Chartiers Creek Watershed (municipal documents provided by the Washington County Planning Commission). Two of the 19 municipalities have no zoning ordinances. The zoning ordinances and comprehensive plans for municipalities, located in the Upper Chartiers Creek Watershed, were examined for minimal acceptable levels of protection for natural, physical, cultural, recreational, and educational resources (Refer to Table 2-C). Washington County Planning Commission has initiated the county comprehensive planning process recently. However, this process is in its infancy and no document(s) have yet been developed. The MPC was utilized in this analysis as the criteria for determining the level of minimal acceptable levels of protection. The MPC mandates in MPC 603 (g)(1) that zoning ordinances shall protect prime agricultural land and may promote the establishment of agricultural security areas. Further, MPC 603 (g)(2) states that zoning ordinances shall provide for protection of natural and historic resources.

In general, the zoning ordinances were very vague in their description of policies dealing with natural resource protection. Often, aspects of the ordinance, like sewage treatment, indirectly suggest a positive impact on natural resources. Few statements were given in the ordinances, however, addressing direct methods and regulations that would result in the protection of natural resources. The comprehensive plans were more in depth when describing community actions that could be taken to increase the protection of the local resources. Nevertheless, these plans could be improved by adding further information into the plan (i.e., model ordinances). Some of these additions might include: stream buffer zones, good forestry management practices in the area, the need for an increased awareness of best agricultural management practices by local farmers, and other guidelines or reference materials for managing industrial waste facilities.

When considering the protection and enhancement of natural resources, there is a level of detail and clarification that should be used in order to care for those resources. Many of the considered zoning ordinances (Refer to Table 2-C) addressed natural resources, but did not go into enough detail to confirm the protection of natural resources. Most of the zoning ordinances included provisions for:

- Erosion and sedimentation control
- Sewage ordinances
- Stormwater management

Some of the zoning ordinances, however, have ideal environmental protection sections. The municipalities that have these sections are South Franklin, Canton, and North Franklin. North Franklin Township has put most of its natural resource information in a comprehensive plan. Some of the items in these municipalities' ordinances and comprehensive plans include:

- Regulation of excavation that could create environmental problems, including, erosion considerations, watercourse changes, air and water pollution, or vegetative loss.
- Governmental agencies that deal with a specific issue have jurisdiction over excavation permits.

Although these townships have good models for natural resources protection, much more information and detail could be added to all zoning ordinances if a municipality wanted to increase the standards for environmental protection in their community. **Please review the Code and Ordinance Worksheet found at the end of this chapter for guidance in comparing your municipality's local development rules against model development concepts. This document can assist in improving your municipal standards, ordinances, and codes**. Other environmental ordinances that could be added include:

- Model buffer protection and management of natural resources (stream and riparian areas).
- Model forest resource ordinances
- Conservation easements
- Best management practices in agricultural resources
- These ordinances could be added by way of a comprehensive land management plan.

Some municipalities also have subdivision and land development ordinances (Refer to Table 2-C). These ordinances give some small detail on the protection of natural resources.

When considering educational resources in the area, the zoning ordinances only elaborate on where educational facilities can be built. The comprehensive plans describe already existing school systems. The comprehensive plans should also include possible areas where educational facilities are needed or would be most beneficial to the community.

Recreational resources are addressed in most plans and ordinances in moderate detail. They describe current facilities, as well as, recreational space that could be utilized in the future. The attentions to recreational resources are very advantageous to each community and should be used as an example for assessing other resources and how to institute similar protective or restrictive measures.

Some of the ordinances discussed the protection and preservation of the areas cultural resources. The factors that should be included concerning cultural resources include:

- Identifying current historical and archaeological sites.
- Protecting archaeological and historic sites.
- Contacting the Pennsylvania Historical and Museum Commission (PHMC) if a site is known or suspected to have historic or archaeological features.

In order to standardize the content in these comprehensive plans, a countywide plan should be developed. This will help to address all of the resource issues that concern both the

municipalities and the general public. This will also help to create a system of prioritizing natural resource issues countywide.

The level of detail, specifically relating to environmental sensitivity, varies greatly among the established municipal zoning ordinances. Additionally, beyond the actual zoning ordinances, the level of enforcement can vary greatly. Environmentally sound development practices can be provided through the development of **strong conservation zoning ordinances and encouraging proper enforcement**. While determining what is being accomplished through zoning by the municipalities is important, it can be a difficult process. It is even more critical to assist in developing a process for future growth and vision, such as an inter-municipal framework. This is the key to sensible development.

2.9 Socioeconomic Profile

2.9.1 *Political Districts*

Political Districts in the Upper Chartiers Creek watershed include the following:

US Congress

- 20th Federal Legislative District (Frank R. Mascara [D])

PA Senate

- 46th PA Senatorial District (Barry J. Stout [D])
- 37th PA Senatorial District (Timothy F. Murphy [R])

PA House

- 46th PA Legislative District (Victor John Lescovitz [D])
- 40th PA Legislative District (John A. Maher [R])
- 48th PA Legislative District (Timothy Solobay [D])
- 47th PA Legislative District (Leo J. Trich, Jr. [D])

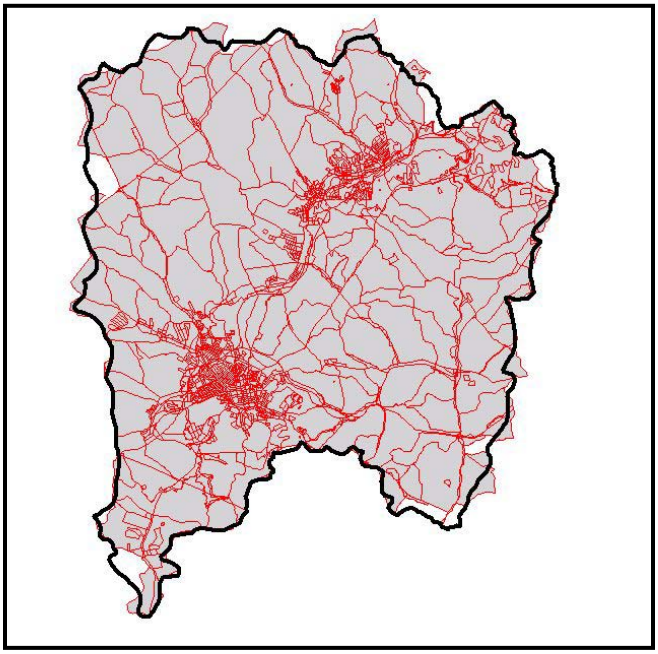
2.9.2 *Method for Using Census Data in Watershed Analysis*

Census Block Data

The US Bureau of the Census has demarked census blocks for the purposes of organizing population and housing data. Census blocks are areas bounded on all sides by visible features, such as streets, roads, county limits, property lines, and short, imaginary extensions of streets and roads. Generally, census blocks are small in area; for example, a block bounded by city streets. However, census blocks in remote areas may be large and irregular and contain many square miles.

There are 1,978 census blocks that have their center in the study area (see below). The combined area of these census blocks is 137 square miles (87,680 acres).

Figure 1. Census Blocks of Upper Chartiers Creek Watershed



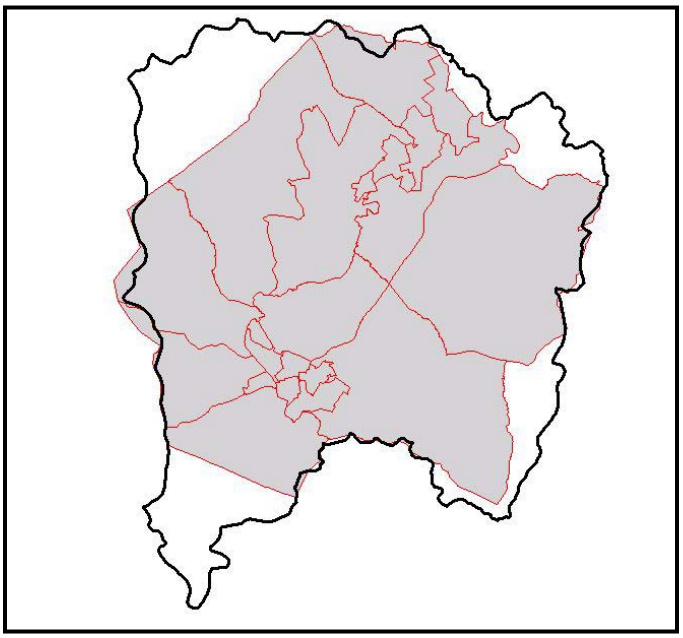
The gray area represents the 1,978 census blocks that have their center in the study area.

Census Tract Data

Census tracts are also established by the Census Bureau for purposes of organizing information on population and housing and typically include many blocks and several block groups. Census tracts are small, relatively permanent statistical subdivisions of a county delineated by local participants as part of the U.S. Census Bureau's Participant Statistical Areas Program. The U.S. Census Bureau delineated census tracts in situations where no local participant existed or where local or tribal governments declined to participate. The primary purpose of census tracts is to provide a stable set of geographic units for the presentation of decennial census data.

While relatively permanent, census tract boundaries do change somewhat over time. Only two of the tracts changed shape from the 1990 to the 2000 Census', which did not result in any significant change in land area. There are thirty-one (31) census tracts in or intersecting the Upper Chartiers Creek Watershed. Of these thirty-one tracts, twenty-one (21) tracts make up 80% of the land area (70,688-acres/110.5 sq. mi. of the total 88,886 acres /139 sq. mi.).

Figure 2. Census Tracts of Upper Chartiers Creek Watershed



The gray area represents the 21-census tract area that covers 80% of the total watershed area.

Municipal Census Data

The municipal divisions included in the watershed are shown in Figure 7 and Table 2-C. The Upper Chartiers Creek Watershed is centrally located in Washington County. There are nineteen (19) municipalities that are associated with the watershed.

Of these nineteen municipalities, 10 municipalities are located between 90 – 100% within the watershed boundary. (Refer to Figure 3, Map 7, Table 2-D) These 10 municipalities make up approximately 74% of the municipal land area within the watershed. These municipalities are:

- Canonsburg Borough (1.7%)
- Canton Township (9.8%)
- Chartiers Township (17.7%)
- East Washington Borough (0.3%)
- Green Hills Borough (0.7%)
- Houston Borough (0.3%)
- North Franklin Township (5.4%)
- North Strabane Township (19.6%)
- South Strabane Township (16.6%)
- Washington City (2.1%)

Of these ten municipalities, four municipalities make up 64% of the municipal land area within the watershed. These municipalities are:

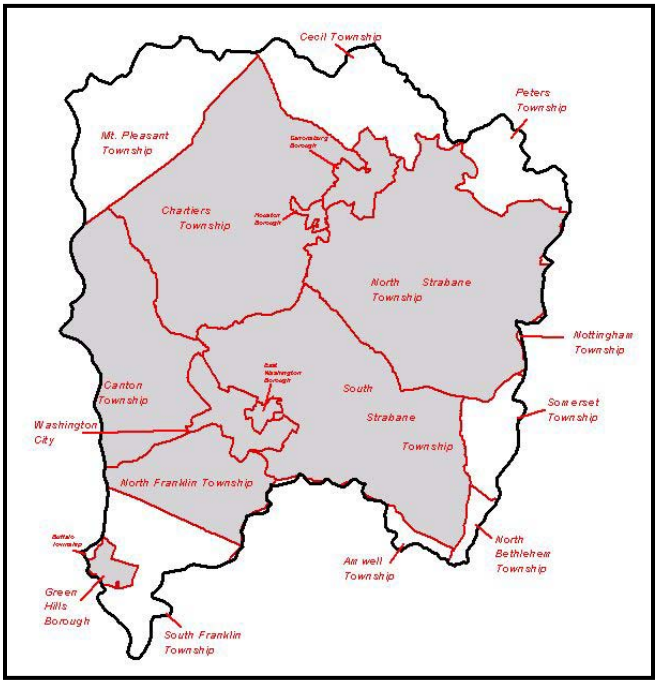
- Canton Township (9.9%)
- Chartiers Township (17.7%)
- North Strabane Township (19.6%)
- South Strabane Township (16.6%)

The four municipalities listed above make up 64% of the municipal land area in the watershed (est. 77,900 of the approx. 88,8886 acres). The following 7 municipalities combined consist of less than 3% of the municipal land area within the watershed (est. 1,360 of the approx. 88,886 acres):

- Amwell Township
- Buffalo Township
- East Washington Borough
- Green Hills Borough
- Houston Borough
- North Bethlehem Township
- Nottingham Township

Noting the geographic dominance of the 10 municipalities that make up nearly 75% of the watershed area *and* the fact that all of these 10 municipalities are 90-100% contained within the watershed area, *the analysis of the municipal data for this socio-economic profile will be conducted using only these ten municipalities* (Refer to Figure 3, Map 7, Table 2-D). These 10 municipalities are underlined in Table 2-D with their respected percentage of municipal acreage within the watershed is highlighted in gray in column 2. Column 3 lists the percentage of the watershed's 88,886 acres that are in each municipality.

Figure 3. 10-Municipality Area of the Upper Chartiers Watershed



The gray area represents the 10-municipality area that covers 74% of the total watershed area.

The boundaries of the municipalities shown in Table 2-D are either partially or entirely within the watershed. Column 2 of Table 2-D lists the percentage of land area of each municipality that lies within the watershed. For example, 2% of Amwell Township lies within the watershed. Column 3 of Table 2-D lists the percentage of the watershed that exists in each municipality. Again, using Amwell Township as an example, 0.8% of Amwell Township is part of the total watershed land area.

Table 2-D
Watershed and Municipality Area Comparisons

Column	1	2	3
Municipality	Number of acres in Watershed	% of munic. in Watershed	% of watershed in Munic.
Amwell Township	683	2%	0.8%
Buffalo Township	73	1%	0.1%
Canonsburg Borough	1,488	100%	1.7 %
Canton Township	8,678	91%	9.8 %
Cecil Township	5,354	32%	6.0%
Chartiers Township	15,695	100%	17.0%
East Washington Borough	286	100%	0.3%
Green Hills Borough	579	97%	0.7%
Houston Borough	256	100%	0.3%
Mount Pleasant Township	7,365	32%	8.3%
North Bethlehem Township	558	4%	0.6%
North Franklin Township	4,757	100%	5.4%
North Strabane Township	17,414	99%	19.6%
Nottingham Township	100	1%	0.1%
Peters Township	2,609	21%	2.9%
Somerset Township	2,135	10%	2.4%
South Franklin Township	4,204	32%	4.7%
South Strabane Township	14,754	100%	16.6%
Washington City	1,888	100%	2.1%
Total	**88,886**		**100%**

2.9.3 *Population*

Census Block Data

There are 1,978 census blocks that have their center in the Upper Chartiers Creek Watershed (See Fig. 1). The combined area of these census blocks is 137 square miles (87,680 acres). The total population of these 1,978 census blocks is 77,122 people (2000).

Census Tract Data

There are thirty-one (31) census tracts in or intersecting the Upper Chartiers Creek Watershed (See Fig. 2). Of these thirty-one tracts, twenty-one (21) tracts make up 80% of the land area (70,688-acres/110.5 sq. mi. of the total 88,886 acres /139 sq. mi.) (Please refer to Table 2-F below).

Municipal Census Data

There are nineteen (19) municipalities that are associated with the watershed. Of these nineteen municipalities, 10 municipalities are located between 90 – 100% within the watershed boundary. (Refer to Figure 3, Map 7, Table 2-D). These 10 municipalities make up approximately 74% of the municipal land area within the watershed.

The median age of these ten municipalities is 41 years. The percentage of the population of the total 10-municipality area that is under the age of 18 is 22%. The percentage of the population of the same area that is over age 65 is 20%.

The 10-municipality area experienced an extremely slight loss in population between 1990 and 2000. The 10-municipality area's population in 1990 was 66,345 in 1990 and the 2000 population was 65,979, resulting in a population loss of only 366 individuals, or 0.6%. Population density also remained relatively unchanged during the same time period. Persons per square mile in 1990 were 635 and in 2000 it dropped slightly to 631 persons per square mile (please refer to Table 2-E, below).

Table 2-E
Municipal Population and Population Densities of the Upper Chartiers Creek Watershed

Column	1	2	3	4	5	6
Municipality	1990 Population	2000 Population	Change 1990-2000	Percentage Change 1990-2000	Persons per square mile 1990	Persons per square mile 2000
Canonsburg Township	9,200	8,607	-593	-6.4%	3957	3702
Canton Township	9,256	8,826	-430	-4.6%	621	592
Chartiers Township	7,603	7,154	-449	-5.9%	310	291
East Washington Borough	2,126	1,930	-196	-9.2%	4761	43322
Green Hills Borough	21	18	-3	-14.3%	22.5	19.3
Houston Borough	1,445	1,314	-131	-9.1%	3491	3174
North Franklin Township	4,997	4,818	-179	-3.6%	670	646
North Strabane Township	8,157	10,057	1,900	23.3%	297	367
South Strabane Township	7,676	7,987	311	4.1%	332	345
Washington City	15,864	15,268	-596	-3.8%	5378	5176
Total	**66,345**	**65,979**	**-366**	**-0.6%**	**635**	**631**

Table 2-F
Census Tracts (2000) in the Upper Chartiers Creek Watershed

Column	1	2	3	5	4	6
Census Tract	Total Area (Sq. mi.) 2000	Total Population of tract 1990	Total Population of tract 2000	Total Pop. Change 1990-2000	% Pop. Change 1990-2000	Population Densities (per sq. mi.) 2000
7412	4.1	1646	1961	315	19.1%	478
7422	14.7	1935	1839	-96	-5.0%	125
7414	2.9	427	498	71	16.6%	175
7421	9.9	5567	5315	-252	-4.5%	539
7441	1.4	5598	5289	-309	-5.5%	3,729
7451	6.4	4560	6424	1864	40.9%	1,012
7442	0.9	3602	3318	-284	-7.9%	3,662
7452	21.0	3566	3633	67	1.9%	173
7437	0.4	1532	1314	-218	-14.2%	3,581
7511	9.7	5370	5391	21	0.4%	558
7551	5.7	3319	3280	-39	-1.2%	575
7552	17.4	4232	4707	475	11.2%	270
7512	5.2	3886	3435	-451	-11.6%	656
7546	0.3	1714	1735	39	2.3%	5,961
7545	0.6	3156	2855	-301	-9.5%	5,168
7543	0.5	3941	3879	-62	-1.6%	8,557
7537	0.5	2126	1930	-196	-9.2%	4,225
7544	0.3	2380	2195	-185	-7.8%	7,336
7542	1.0	3056	3212	156	5.1%	3,257
7041	0.4	1742	1374	-368	-21.1%	3,907
7527	7.5	4997	4818	-179	-3.6%	662
	110.5	**68,420**	**68,352**	**68**	**0.1%**	**619**

Note: Between 1990 and 2000, the geographic boundaries of these tracts changed only slightly and the tract numbers remained the same.

2.9.4 *Housing*

There are 29,284 housing units in the 10-municipality area, of which 27,244 are occupied (93%). Housing is 70% (18,936) owner-occupied with the average median value of the homes in the study area estimated at $134,130.00 (See Figures 3 and 4 below).

The state median value of owner-occupied housing in the same year was $69,000 (PASDC, 2001). Therefore, median values of the owner-occupied homes within the 10-municipality area are approximately 51% above the state median. Renter-occupancy is 28% (8,308) of the units in the 10-municipality area, which have a median rental value of $403.00 per month.

Figure 3 (below) illustrates the values of houses within the 10-municipality area. Each bar in the bar graph indicates the percentage of the housing stock in relation to the value of housing stock for each of the municipalities within the 10-municipality area.

Figure 4. House Value by Municipality (10-Municipality Area)

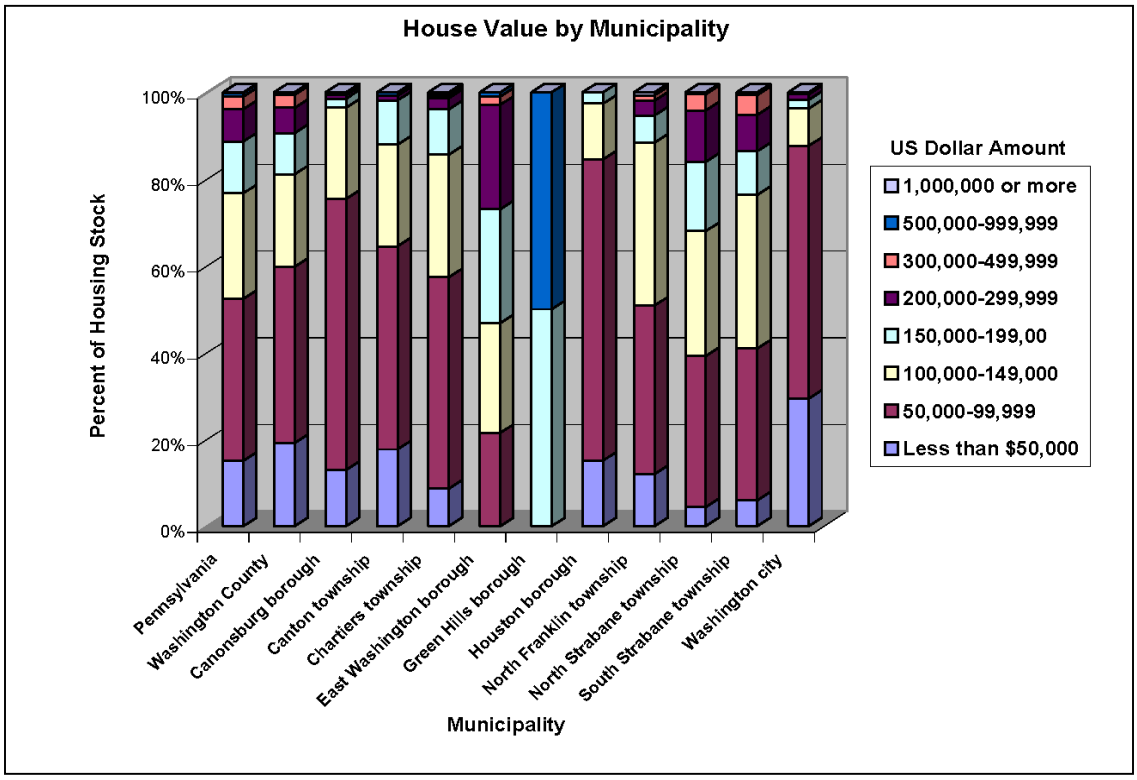


Figure 5. Housing Value Comparison (10-Munic. Area, WA County & PA)

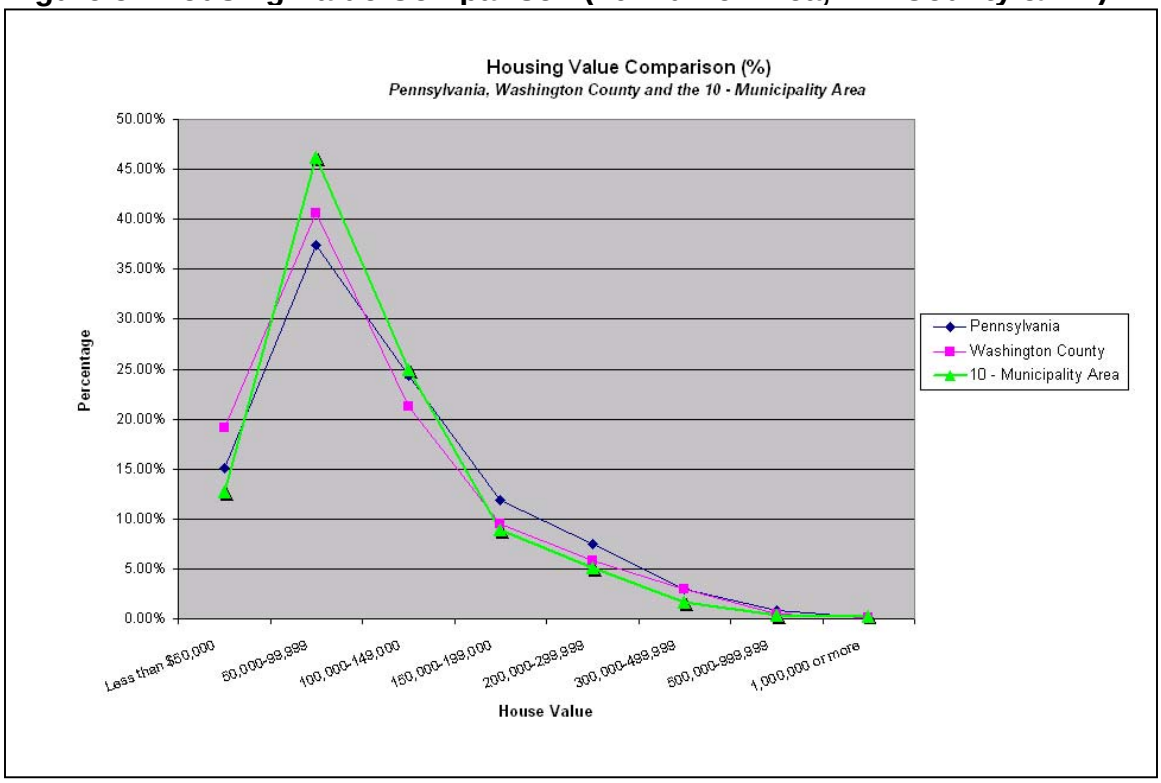


Figure 4 (above) illustrates the values of houses within the 10-municipality area against the values of houses within Washington County as a whole and all of Pennsylvania. Each line in Figure 4 indicates the percentage of the housing stock in relation to the value of housing stock for each of the three geographic units (10-municipality area, Washington County and Pennsylvania).

2.9.5 *Educational Attainment*

There are 46,941 residents age 25 and over in the 10-municipality area. The educational attainment of these residents in the 10-municipality area is as follows:

Less than a High School Diploma	*20%*
High School graduate	*41%*
College graduate (BA and Assoc.)	*47% of H.S. grads*

(US Census, 2002)

2.9.6 *Income*

The per capita income (1999) for the Commonwealth of Pennsylvania was $20,880 and the per capita income (1990) for Washington County was $19,935. The 10-municipality area per capita income for the same period was $30,889. However, if we remove Green Hills Borough (which has a total population of 18 and a average per capita income of $124,279) from the equation, the 9-municipality area per capita income drops to $18,462 per year (Census of Population and Housing, 2000).

Household income in the 10-municipality area averaged $42,344 per year. Again, if we remove Green Hills Borough (where 5 households average income was $94,239) from the equation, the household income in the 9-municipality area averaged %37,155 (Census of Population and Housing, 2000).

2.9.7 *Poverty*

Individual residents in the 10-municipality area living at poverty status in the year 1999 was 7,141, meaning over 10.8% of the population lives below the state poverty level. The percentage of individuals living under the poverty level statewide is 10.6%.

Averages of poverty rates for the 10-municipality area are as follows:

Individuals	*10.8%*
Family Households	*8%*
Families w/ children < 18 yrs.	*6%*
Individuals 18 yrs. and younger	*1.3%*
Seniors 65 yrs. and older	*1.8%*

(Census of Population and Housing, 2002).

2.9.8 *Transportation Facilities*

Roads

The Upper Chartiers Creek Watershed has an extensive roadway network. This network includes a full range of roadways from major interstate highways to small, rural, dirt roads. The study area is nearly bisected by Interstate 79, which runs the length of the watershed in a southwest - northeast direction. This roadway serves as a major route for residents traveling north and south within the watershed. Additionally, Interstate Route 70 traverses the southern portion of

the study area running east and west. Other major roads within the Upper Chartiers Creek Watershed include State Route (SR) 19 that runs north and south in the eastern portion of the watershed, SR 980 that connects I-79 at Canonsburg to SR 22 to the north, and SR 18 that runs north – south through the western portion of the project area. In addition to these roadways, the overall existing travel network (smaller state routes and township roads) provides access to almost any area within the watershed (Refer to Maps 2, 7, and 8).

While the existing roadway network provides access to almost all areas of the watershed, expanding development and growth within the western and northern portion of the project area continues to necessitate improvements to the transportation system. The present Pennsylvania Department of Transportation (PENNDOT) Transportation Improvement Plan (TIP) includes a large number of projects anticipated for study, design, and construction over the next four-year period, and several projects for the next fourteen-year period. These projects are shown in Table 2-G and 2-H. In addition, numerous roads under state control are slated for upgrades and widening (SPC, 1996). While these improvements are necessary to provide safe travel for the general public, they also increase access to areas that are prone to developmental pressure. The need to develop a strong conservation plan, as well as working with PENNDOT during development of their transportation plans, becomes essential in the long-term health of both the socioeconomic features and ecological aspects of the watershed. *While these projects are presently being planned, because of the extensive political and bureaucratic nature of roadway development, it is extremely difficult to detail exactly when or if these projects or others will actually be constructed.*

Table 2-G

Transportation Improvement Program Projects within the Upper Chartiers Creek Watershed (2001-2004)

State Route	Project Name	Project Description	Township
Route 18	PA 18/SR 3013 Int.	Intersection Improvement	North Franklin
Route 19	Donaldson's Crossroads	Intersection Improvement	Peters
Route 19	Wash & Jeff Coll. Area	Restoration	Washington City
Route 40	Rt. 40 Safety Corridor	Widen/Add Lane	Washington City
Route 40	US 40/SR 3013 Int.	Intersection Improvement	North Franklin
Route 70	I-70 over SR 519	Bridge Rehab.	Somerset
Route 70	I-70 Prevent. Maint.	Preventative Maintenance	Buffalo
Route 70	I-70 Turnback Rd Bridge	Bridge Replacement	South Strabane
Route 70	I-70/PA 136 Beau St.	Park & Ride Facilities	South Strabane
Route 79	I-79 Meadowlands Int.	Add 2 Ramps-Improvement	Chartiers
Route 79	I-79 Reconstruction	Reconstruction	South Strabane
Route 79	I-79/I-70 Interchange	Reconstruct Interchange	South Strabane
Route 519	SR 519/1055 Int.	Intersection Improvement	North Strabane
Route 519	SR 519@ SR 980/US 19	Improve Signal/Channelize	North Strabane
Route 519	SR 519/1009 Int.	Intersection Improvements	Houston Borough
Route 980	980 Approach to 50	Intersection Improvements	Cecil
Route 980	Canonsburg	Bridge Replacement	Canonsburg
Route 1009	Pike/Allison Hollow	Intersection Improvement	Chartiers
Route 1047	Manifold Bridge	Bridge Replacement	South Strabane
Route 4049	Arden Bridge #1	Bridge Replacement	Chartiers/South Strabane
Route 4049	SR 4049 @ Humbert Ln.	Intersection Improvement	South Strabane
Route 9900	Bebout Rd. Intersection	Intersection Improvement	Peters
Route 9900	Chartiers Creek #58	Bridge Replacement	Washington City
Route 9900	Gateshead/Hidden Valley	Intersection Improvement	Peters
Route 9900	McConnells Mills #41	Bridge Rehabilitation	Chartiers
Route 9900	South Wade Ave #61	Bridge Replacement	Washington City
Route 9900	T-771 Bridge	Bridge Removal	Mt. Pleasant
Route 9900	West Maiden St. #59	Bridge Replacement	Washington City

Source: Southwestern Pennsylvania Commission, 2001-2004 Transportation Improvement Program for the Pittsburgh Transportation Management Area. (October 2001)

Note: The State Route Numbers listed in Table 2-G are the SR numbers listed in TIP. These numbers may differ from locally known State Route numbers. The Route "9900" designation is for a project that is locally sponsored.

Table 2-H
Long Range Transportation Plan Projects in the Upper Chartiers Creek Watershed (1994-2015)

State Route	Section Limits	Miles	Project Description
I-70	I-79 to WECO Line	20.0	Maintain/Upgrade
Rt. 18	I-70 to Rt. 22	20.7	Maintain/Upgrade
Rt. 19	I-70/79 to ALCO Line	11.6	Maintain/Upgrade
Rt. 40	I-79 to Mon/Fayette Exp.	18.4	Maintain/Upgrade
Rt. 519	I-70 to Rt. 19	7.5	Maintain/Upgrade

Source: Southwestern Pennsylvania Regional Planning Commission, A Region on the Move: A Transportation Investment Strategy for Growth and Renewal in Southwestern Pennsylvania, 2015 Long Range Transportation Plan (November 1994)

A major transportation improvement project is the proposed Southern Beltway Project. This project being administered by the Pennsylvania Turnpike Commission, proposes a four-lane, limited access highway between the Pittsburgh Airport to I-79 and the Mon-Fayette Expressway (PTC, 1997 and PTC, 2000). The project is being advanced in several sections with connections at other roadways. Portions of the project run through and adjacent to the Upper Chartiers Creek Watershed, with alternatives proposed in the Canonsburg-Houston area, Cecil Township, North Strabane Township, and Peters Township. This project is both a major threat and opportunity in the project area. One of the main objectives of the project is to provide improved access for economic development through a corridor east of the airport and south of the City of Pittsburgh. While economic development is needed through this corridor, planning to provide this development in an environmentally conscious manner is important. Working with the transportation agency can reduce impacts of the roadway construction, properly direct mitigation efforts, and can assist in working with local governmental entities to ensure long-term, conservation-minded development. Nine potential interchanges are currently being reviewed for the proposed Southern Beltway Project in and adjacent to the Upper Chartiers Creek Watershed project area (PTC, 1997 and PTC, 2000).

Other nearby communities may be indirectly affected by this proposed project. Currently, an Environmental Impact Statement is being developed. When it is completed, the number and location of proposed interchanges may change. Until then, it is not possible to say which communities will be affected.

Rails
Wheeling & Lake Erie, CSX, and Pittsburgh Industrial Rail Road (PIRR) rail facilities and right-of-ways exist along various waterways and bisect in the project area (SPC, 2000). PIRR has an active rail line that follows along Chartiers Creek. CSX has an active line that enters the Chartiers Creek watershed near Sugar Hill, PA, proceeds through Washington, PA and then exits into the Peters Creek Watershed in North Strabane, PA. The Wheeling & Lake Erie rail facilities are located along the western edge of the Upper Chartiers Creek Watershed near Hickory PA (Refer to Map 7).

Rails-to-trails
Refer to Section 6. Cultural Resources, Rail-to-Trails.

Public Transportation

Public transportation in the project area involves local and national private charter/transportation providers (e.g., Central Cab Co., Schweinebraten Bus Co., GG&C Bus Co., Inc., Washington Charters, and Greyhound Bus Lines). Buses and taxicabs operate throughout the project area in Washington County, connecting users to downtown Pittsburgh, the Pittsburgh International Airport, and other local (e.g., shopping malls, commercial districts, industrial parks, etc.) and national (e.g., east coast and mid-western cities) destinations. Park-n-Ride facilities assist the public commute in southwestern Pennsylvania via carpooling. Park-n-Ride locations assist in reducing the amount of vehicles that need to utilize the transportation system, reduce the need for parking, and also assist in reducing air pollution. As the Southern Expressway is constructed and more development activities occur in the northern project area, more of a need will develop for public transportation here.

3 Land Resources

3.1 Section Purpose

Available data regarding land resources in the Upper Chartiers Creek Watershed were compiled and interpreted to formulate the following resource inventory. This inventory represents a snapshot of general and specific conditions occurring in the Chartiers Creek Watershed. Resources inventoried included Geology and Soils, Property Ownership, Critical Areas, Oil and Gas, and Mining Activities. By examining the resources and their limitations within the watershed, one can get a better perspective of the problems and opportunities that exist therein.

3.2 Geology and Soils

Geology

The watershed is located in the Pittsburgh Low Plateaus section of the Appalachian Plateaus Physiographic Province. The Casselman, Greene, Monongahela, Washington, and Waynesburg Formations lie within the project area (Refer to Map 4). Cyclic sequences of sandstone, shale, claystone, limestone, dolomite, and coal are the exposed components of these geologic formations. The plateaus is noted for its narrow and dissected, steep-sided valleys. These rocks are from the Permian and Pennsylvanian Age of the Paleozoic era. The headwaters of Chartiers Creek originate in rocks of the Greene Formation of the Permian Age, and then flow on the rocks of the Washington and Waynesburg Formations. From Washington, PA north, Chartiers Creek traverses rocks of the Monongahela Formation. In the Canonsburg, PA area the watershed's streams flow on the Casselman Formation (PADMMI, 1968).

The Washington, Waynesburg "A", Waynesburg, Redstone, and Pittsburgh coal seams are the principal coal seams in Washington County (PADER, 1987). The Pittsburgh Coal seam underlies nearly the entire watershed and is of regional importance as a source for bituminous coal (Washington County Natural Heritage Inventory, 1994). This seam has been extensively exploited due to its "persistence, thickness, and uniformity" (PADMMI, 1968).

Soils

The project area has numerous soils and soil associations as noted in the Soil Survey of Greene and Washington Counties, Pennsylvania. Soil associations in the watershed include (USDA, 1983):

Washington County:

- Dormont-Culleoka, This association consists of hills with benches and ridges. The hills generally have long slopes that commonly have slips. Small streams that form drainageways between the hills drain most areas of this unit. Slopes range from 3 to 50 percent. The association is about 40% Dormont soils, 30% Culleoka soils, and 30% minor soils. The soils are deep and moderately well drained and have a seasonal high water table to 24 to 30 inches.

- Guernsey-Dormont-Culleoka, This association consists of rolling hills and ridges. Small streams between the hills drain these areas. The association in Washington County is one of the better farming areas. Slopes range from 3 to 25 percent. The association is about 35% Guernsey soils, 25% Dormont soils, 20% Culleoka, and 20% minor soils. The soils are deep and moderately well drained and have a seasonal high water table to 18 to 20 inches.

- Dormont-Culleoka-Newark, This association consists of hills and floodplains. The hills generally have long slopes that are benched and commonly have slips. The floodplains are between the hills and adjacent to larger streams. Slopes range from 0 to 50 percent. The association is about 27% Dormont soils, 22% Culleoka soils, 21% Newark soils, and 30% minor soils. The soils are deep and moderately well drained and have a seasonal high water table to 24 to 30 inches.

- Udorthents-Culleoka-Dormont. This association consists of hills and areas disturbed by strip mining activities. The hills that have not been disturbed by mining activities have long, smooth slopes. Slopes range from 3 to 50 percent. The association is about 30% Udorthents soils, 25% Culleoka soils, 15% Dormont soils, and 30% minor soils. The soils are very shallow to deep and are well to somewhat poorly drained and have a seasonal high water table to 6 to 36 inches.

The prime farmland soils in the project area include (Refer to Map 8):

- Washington County:
- Allegheny silt loam (AgB),
- Brooke silty clay loam (BoB),
- Culleoka silt loam (CaB),
- Culleoka-Upshur complex (CkB),
- Glenford silt loam (GdA and GdB), and
- Huntington silt loam (Hu).

The soil associations are well drained to somewhat poorly drained, very shallow to deep, and nearly level to very steep soils. These soils are found on floodplains, hilltops, ridges, benches, and hillsides. These soils were formed in residuum (residual soil material) of weathered sandstone, shale, siltstone, limestone, and colluvium (soil material, rock fragments, or both moved by creep, slide, or local wash deposited at the base of a steep slope) (USDA, 1983). Some of the limitations of the soils and the parent rock in the Chartiers Creek Watershed are that the soils are derived from very landslide prone rock. When the soils and parent rock material are found on steep slopes, landslides can be and often are a by-product of developmental activities. Another limitation is that some of the soils located in valley bottoms have previously been altered by man and are located adjacent to floodplains. This has increased the limitation of these and associated soils by reducing their ability to allow water to effectively drain an area with little or no flood related impacts. An additional limitation to some soils is that in general, septic systems do not work effectively here, which lead to some of the water quality pollution issues in the watershed. For specific site conditions, and soil uses and limitations (in regards to engineering, planning, recreation, wildlife [conservation applications], and crop estimated yields) please review the county soil survey.

3.3 Ownership

3.3.1 *Public Property*

The Washington County Airport, U.S. Military Facility at the County Airport, and the numerous other municipal, state, and federal facilities are the only publicly owned facilities in the project area. The public owns approximately 9.6% of the land in the watershed. Presently, the Commonwealth of Pennsylvania owns the Western Center property located in Canonsburg, PA. This 275 to 325 acre former state hospital facility is in the process of being sold. The Pennsylvania Department of General Services has gathered proposals from local communities and organizations concerning their needs with regard to potential redevelopment

activities. Of the total acreage at this facility, all but 75 acres is to be sold by the Commonwealth (WCPC, 1998).

3.3.2 *Private Property*

The majority of the property in the project area is privately held as residential, agricultural, forested, and open space. Private citizens own approximately 90.4% of the land in the watershed (USDA, 2000).

3.4 Critical Areas

Critical areas in the project area include 1) riparian forest buffers, 2) wetlands, 3) forests, 4) stream access points, and 5) stream visibility areas (Refer to Section 5 Biological Resources, 5.5, Important Habitats and Natural Heritage Areas for Nos. 1 through 3).

3.4.1 *Stream Access*

Stream Access points and accessibility to these areas are critical. Having access to the watershed's streams is the main way people can interact with the natural and physical resources of the watershed. Without this accessibility to the streams, the watershed inhabitants become uninvolved and unconcerned about its resources and thus its health. Stream access could involve boat launch facilities, a greenway or trail along a stream, constructed observation decks, or other means of permitting people access to the streams of the watershed.

3.4.2 *Stream Visibility Areas*

Another opportunity for increasing accessibility is through re-orienting how areas are developed near the watershed's streams. By re-orienting how structures and sites are planned for future development, we can reestablish the link between people and the local environment. This establishes that these areas have value in our lives. It also provides a focal point for the structure or site that can act as a buffer for the stream or natural resource. These areas can then be linked via trails and the stream.

3.4.3 *Landfills*

The William H. Harris, Inc. (Arden) sanitary landfill is located in the Upper portion of the Chartiers Creek Watershed in Chartiers Township. Currently, there are no demolition landfills located within the project area.

3.4.4 *Hazard Areas*

What is Hazardous Waste?

A hazardous waste is any solid, liquid, or contained gaseous material that is no longer in use and must be either discarded, recycled or stored until proper treatment or disposal can be conducted. A waste is considered hazardous if it appears on any one of the four hazardous waste lists appearing in the Resource Conservation Recovery Act (RCRA) regulations. Even if a waste is not listed, it is considered hazardous if it is ignitable, corrosive, reactive, and/or is found to be toxic through Extraction Procedure (EP) or Toxicity Characteristic Leaching Procedure (TCLP) toxicity testing. Examples include solvents, acids/bases, heavy metals, inorganic waste, pesticides, ignitable waste, reactives, formaldehyde, dry cleaning residues, and cyanide waste (Environmental Institute, 1991).

The RCRA program identifies and tracks hazardous waste from the point of generation to the point of disposal. The RCRA database is a compilation by EPA of reporting facilities that generate, store, transport, treat, or dispose of hazardous waste. The Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) list is a compilation by EPA of the sites which EPA has investigated or is currently investigating for a release or threatened release of hazardous substances pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 commonly called the Superfund Act (Vista Environmental Information, Inc., 1992).

3.4.5 *Waste Sites*

The National Priorities (Superfund) List (NPL) is EPA's database of uncontrolled or abandoned hazardous waste sites identified for priority remediation under the Superfund program (Environmental Institute, 1991). There are no NPL sites within the boundaries of the Chartiers Creek watershed in Washington County (EPA-Superfund website, 2001). The National Granulating Tire Fire was a recent hazardous waste issue in the project area. The site located in East Washington, PA was set on fire by an arsonist. This site has been cleaned up under the Hazardous Sites Cleanup Act and received Act 2 release. Act 2 release indicates that the property owner has met the clean up standards as defined by Act 2 and the PADEP has agreed that no further action is required.

The industrial/commercial sites in the project area can be locations for historic or abandoned waste site locations. Historic or abandoned waste sites may never have been under any regulatory statues depending upon a site's age and date of operation. Some of the industrial facilities along mainstream Chartiers Creek are currently not operating and could contain hazardous or non-hazardous industrial waste issues such as asbestos, lead based paint, under or above ground storage tanks, polychlorinated biphenyls (PCBs), and pesticides. However, none of these facilities have been identified by the Pennsylvania Department of Environmental Protection (PADEP) as being waste sites.

Captive processing facilities perform waste processing at their facilities (e.g., boilers, incinerators, waste water treatment, etc.) thereby not delivering a waste product to be disposed of or controlled at a landfill. The following are the waste handling facilities located in the project area that are listed in PADEP's document, Waste Management Program Permitted Sites for the Southwestern Region (PADEP, 2000):

- One Sanitary Landfill (Arden landfill – Chartiers Township)
- One Residual Waste Processing Facility (Blacktop Paving Residual Waste Processing Facility, Amwell Township)
- No Demolition Landfills
- No Fly Ash/Industrial Waste Sites
- No Municipal Waste Processing Facilities
- No Commercial Hazardous Waste Facilities
- No Captive Hazardous Waste Facilities
- No Processing Facilities
- No Transfer Stations [Infectious Waste]

The Solid Waste Management Act of 1980 in Pennsylvania, also known as Act 97, regulates solid waste issues. This enabling legislation gives PADEP control to take corrective actions when needed. However, there is no permitting of

unregulated waste sites such as junkyards per se by PADEP. Municipalities, through zoning and ordinances, control unregulated waste sites at the local level. Numerous unregulated waste sites (i.e., dumps and junkyards) exist within the project area. However, PADEP does not maintain a database of such facilities. These unregulated facilities can be a major source of various types of water quality pollution and if controlled at the local municipal level, can have beneficial impact on water quality of local receiving streams.

Numerous communities in the study area have zoning ordinances in place to control the locations of where these facilities can be placed. Through inter-municipal cooperative planning activities, junkyard facilities can be located strategically so as to promote these businesses and to limit potential environmental degradation to community resources. Some sub-basins in the study area may be more suited to have such facilities, where other areas may be less so.

Gob (Refuse & Spoil) piles are wastes resulting from coal mining activities. These sites have been separated from other types of waste sites (Refer to Tables 3-A, 3-C and Map 8). Gob piles are often located near streams. The project area has some examples of barren land/gob piles associated with riparian zones and streams (e.g., Brush Run, Chartiers Run, Plum Run, and two tributaries to Chartiers Creek). The chemistry of gob piles, as well as their location, can be a significant cause of degraded water, due to AMD, sedimentation, suspended solids, and other pollutants.

There are no sewage sludge (bio-solids) land application sites located within the Washington County portions of the watershed (PADEP, 2001).

There is one site located in the Upper Chartiers Creek Watershed that is regulated by the Uranium Mill Tailings Radiation Control Act (UMTRCA). The UMTRCA controls any activity that involves the mining and milling of radioactive materials. The site operated and milled radioactive materials between 1911 and 1966. At the time, materials were cleaned up and disposed of to the standards of the day (PADEP, October 2000). The following is a description of the UMTRCA site:

Canonsburg Site: This site has been cleaned up and the radioactive materials have been disposed of on site in an engineered disposal cell. This facility is owned, operated, and inspected by the United States Department of Energy (USDOE) as part of their Long Term Surveillance and Maintenance Program (LTSM). The 1999 compliance report states that the facility is in excellent condition and met all compliance requirements, as per the LTSM. The LTSM is required when a facility is licensed by the Nuclear Regulatory Commission (NRC). This report also states that groundwater monitoring is continuing at the six wells on site as well as the surface water in Chartiers Creek. The report states that the LTSM requires water sampling of the six wells and three surface sampling locations two years following licensing of the site by the NRC. The site was licensed in January of 1996. This two year monitoring requirement was met, however, due to the concentration of uranium in some wells being above the EPA Maximum Concentration Limit (MCL), USDOE continues to monitor the wells on an annual basis. It was found that…"Uranium was detected above the MCL at two down gradient wells, however it dropped below the MCL at the cross gradient well." Additionally…"USDOE considers the risk associated with the uranium in groundwater to be negligible and insignificant in that groundwater 1) is institutionally controlled, and 2) has no detectable effect on the chemistry of

water in the creek (USDOE, 1999)." More information on this issue can be found by contacting the PADEP and the USDOE.

Additionally, the US Department of Energy–Grand Junction Office has instituted a two-phase streambank stabilization project along Chartiers Creek in the vicinity of the UMTRCA regulated disposal site. Phase I of this project was completed in December 2000. This phase of the project involved the placement of rip-rap control blankets at the streambank base for added erosion control. Phase II of the stabilization project was scheduled to begin in April 2001. This phase involved the excavation and reconstruction of the streambank to include geo-textile materials. This geo-textile material will add strength to the streambank and provide a drainage layer for precipitation. Also included in Phase II of the project is planting of willow saplings and native grasses for stabilization along 490 feet of streambank (DOE, 2001).

Canton Township – Molycorp, Inc. Site: The Molycorp, Inc. Washington Facility is located in Canton Township near the outskirts of Washington, PA. Molybdenum oxide was manufactured starting in the 1920's and ending in 1991. Additionally, this facility produced ferrocolumbium and ferroalloys. Waste slags from the ferroalloy operations, some of which contained natural thorium, were retained on the plant site, along with the larger quantity of ferromolybdenum slags that were normally used as landfill on the plant property. In 1972 some of the thoriated material from the site was disposed of at the West Valley, New York burial site. Molycorp, Inc. performed cleanup operations to segregate and stabilize some of the thoriated slag and soil. In the 1960's, eight surface impoundments and a large thickener were built. In 1978 one of two molybdenum-roasting furnaces was shut down as part of a consent decree with PADER due to exceedances with SO_2 air standards. In the early to mid-1970s ferrocolumbium slag cleanup occurred and since then numerous investigations, studies, and surveys have been performed to comply with regulatory requirements of the National Regulatory Commission (NRC) (Radiological Services, Inc., 1999). The decommissioning of the Molycorp site is being performed under the Atomic Energy Act, 42 U.S.C. and regulations under 10 C.F.R.

Field investigations and long term monitoring have been performed to "Characterize" the site's condition. These studies were completed to address changing United States Atomic Energy Commission (USAEC) requirements. The processing of certain types of ore concentrates for ferrocolumbium (FeCb) necessitated a Source Materials License. This process uses ore concentrates of materials containing 0.05 percent (or greater) by weight of uranium, thorium or a combination of both. The slag that resulted from the aluminothermic production of ferrocolumbium alloys was in a refractory glass/ceramic form containing an average of 1.2 percent thorium (Radiological Services, Inc., 1999). The studies that have been completed indicate that the radioactive materials were fixed and would not leach into the groundwater in excess of prescribed limits. No action was taken by PADER or USAEC on the request for an on-site burial permit. A study in 1990 by Radiation Surveillance Associates, Inc., revealed that in general, the subsurface concentrations of thorium were above those in the surface soils. Additionally, a general pattern was that underground radiation levels decreased to background levels at a depth of about ten feet (Radiological Services, Inc., 1999).

In the 1994 site investigation by Foster Wheeler Environmental Corporation, samples of groundwater, surface water, and soils were taken to assess the level

and type of contamination. Radium (Ra-228) was detected in measurable quantities, although considerably below the prevailing NRC standards. Thorium-232, the radionuclide of primary concern does not exceed 5 pCi/l in either ground or surface water (Chartiers Creek). Soil samples had elevated total Thorium concentrations exceeding 10 pCi/l in areas generally in the surficial soil near the impound area, near the thickener, the thorium pile, and the center of Unit 2 (Radiological Services, Inc., 1999). This site is to be decommissioned in the future as per the Decommissioning Plan Part 1 and Part 2. A detailed schedule of the excavation and transport activities will be provided in the Decommissioning Plan Part 2 [Projected Date of October 2002] (Radiological Services, Inc., 1999). The projected October 2002 decommissioning date most likely will not be met. Therefore, the NRC and Molycorp, Inc. are currently in the process of determining a revised schedule to move the decommissioning of this site forward.

3.5 Oil and Gas

The study area has 203 known oil and gas wells (Refer to Map 10). The abandoned and orphaned wells are an issue in the study area. As of December 10, 1997, 131 orphan wells have been identified in Washington County. One of those has been plugged since the program began. Many more abandoned wells are known to exist but have yet to be identified. These historic wells date back to when no records were required. The PADEP plans to plug 13 additional wells in the near future (PADEP, 1999). (http://www.dep.state.pa.us/dep/deputate/polycomm/update/10-22-99/10229910.htm). Table 3-A illustrates the number of oil and gas wells per sub-basin in the watershed.

The Oil and Gas Act became effective on April 18, 1985, establishing an Abandoned Well Restricted Revenue Account so that the PADEP could have funds to use for the plugging of abandoned oil and gas wells. Wells deemed qualified for funding from this account are wells that pose health, safety, and environmental risks.

On August 1, 1992, Act 78 amended the Oil and Gas Act. Act 78 created another category of abandoned wells: orphan wells. These wells were abandoned before April 18, 1985 and so did not fall under the jurisdiction of the original Oil and Gas Act. In Pennsylvania about 550 orphan wells are known to be causing health, safety, or environmental problems. These wells are a high priority for both the orphan well plugging fund and the abandoned well plugging fund. Counting these “high priority” wells, there are 7,563 wells that have been identified as orphans. Only 94 of these have been plugged since 1988.

Natural gas and crude oil production in Pennsylvania counties is reported on an annual basis. Gas production in Washington County has steadily decreased from 1994-1998 from 10,344,162 thousand cubic feet (MCF) to 296,652 MCF. Oil production in Washington County decreased, although less dramatically, from 29,778 barrels (Bbl) in 1994 to 21,123 Bbl in 1998. The oil and gas fields in Washington County are shallow fields, producing from Upper Devonian and younger formations. There are also some gas storage areas (PADCNR, 2002) (http://www.dcnr.state.pa.us/topogeo/wis/productionstats.htm).

The cost of plugging all of Pennsylvania’s orphan wells would cost more than $64,000,000, which makes it unlikely that they can be plugged in a reasonable period of time. Even by using money from permits and fines, fees and penalties, the funding is very slow in coming. Other sources of financing should be considered to help speed along the process of plugging these abandoned wells (PADCNR, 2002).

Table 3-A
Oil &Gas Wells of the Upper Chartiers Creek Watershed (Refer to Map 10)

		Well Status					
Sub-basin	**Municipality**	***Abandoned***	***Active***	***Inactive***	***Plugged***	***Unknown****	**TOTAL**
Brush Run	Canonsburg					1	29
	Cecil	6	8		12	1	
	Chartiers	1					
Catfish Run	Canton					1	3
	North Franklin		1				
	South Strabane				1		
Chartiers Creek	Canonsburg					1	118
	Canton	1	5	3	19	7	
	Chartiers	3	22			3	
	North Franklin		7			1	
	North Strabane	1	2	1	1		
	South Franklin	2	9	3	5	7	
	South Strabane	2	3		3	5	
	Washington	1			1		
Chartiers Run	Chartiers	5	28			2	49
	Houston		1				
	Mount Pleasant		10			3	
Georges Run	Canton		3		7	1	16
	Chartiers		2		1		
	Mount Pleasant				1	1	
Little Chartiers Creek	North Strabane	10	34	2	18	4	119
	Peters	3	2		2		
	South Strabane	3	9	2	20	10	
Morganza Run	Cecil	3	6		1		10
Opossum Run	No wells						0
Plum Run	Chartiers		19				23
	Houston		1				
	Mount Pleasant		3				
Westland Run	Chartiers		6			1	39
	Mount Pleasant	1	29			2	

Source: PAGWIS / Pennsylvania Topographic and Geologic Survey, 2002.
**Wells listed on USGS/PASDA GIS information that are not on list from PATOPOGEO.*

Table 3-A lists all of the known wells in each of the sub-basins of the Upper Chartiers Watershed. In addition, each well is identified as to what municipality within the sub-basin each well is located. The TOTAL column indicates the total amount of wells in each sub-basin.

THE WELLS LISTED IN EACH MUNICIPALITY REPRESENT ONLY THOSE WELLS THAT ARE LOCATED IN THE UPPER CHARTIRES WATERSHED, NOT THE *ENTIRE* MUNICIPALITY.

3.6 Mining Activities

3.6.1 *Deep Mining*

Underground coal mining, like many other human activities, cannot be conducted without some impact on the environment. In June 1999, the PADEP prepared the first report on the surface impacts of underground coal mining, as required by the 1994 amendments to the state Bituminous Mine Subsidence and Land Conservation Act (Act 54). This report, titled *The Effects of Subsidence Resulting from Underground Bituminous Coal Mining on Surface Structures and Features and Water Resources*, investigated underground mining conducted between August 1993 and August 1998 in a 10-county area of western Pennsylvania, including Washington County. Below is a summarization of some of the conclusions reached in this report.

The full report can be accessed on the World Wide Web at.

Potential Impacts of Underground Mining
The impacts of longwall mining on structures, surface features, or the ground surface depend on a number of factors. Primary factors that influence subsidence-induced ground movements include the thickness and physical properties of the overburden, the size and shape of the longwall panel, the thickness and inclination of the coal seam being mined, and the surface topography. If detailed information is available regarding these factors, subsidence profiles can be predicted with a reasonably high degree of accuracy.

Potential Hydrologic Impacts

Wells and Springs
Wells and springs in proximity to room-and-pillar mining have the potential of being adversely impacted. The common mechanism is direct draining of groundwater to the mine. The severity of impacts to groundwater sources above high-extraction workings depends on the distance of the groundwater source above the mine workings, the topographic setting of the water supply, and the overburden lithology

Simply put, aquifers and water supplies are generally partially to totally dewatered within the caved and fractured zones above subsided deep mines. These supplies routinely show no short-term recovery. Supplies located higher in the subsidence profile tend to suffer only partial and temporary water losses (Rauch, 1989).

Surface Waters
The impacts of underground mining on surface waters can range from no noticeable impact to appreciable diminution, ponding, and/or diversion. The formation of subsidence-induced cracks, surface depressions, and/or sinkholes at the bottom of, or adjacent to, surface water bodies, such as streams, ponds, and lakes can lead to complete or partial loss of water due to leakage to the underlying strata. The resultant changes in surface slope can adversely impact drainage along irrigated fields, canals, sewers, and natural streams (Bhattacharya and Singh, 1985).

High-extraction mining can potentially produce profound changes to nearby surface water resources. These impacts generally occur either by direct draining

of groundwater to the mine or by mining-induced groundwater storage increases to near-surface aquifers. The caving, fracturing or bending behavior of the rock mass within a given zone depends on the characteristics of an individual stratum and its location relative to other strata.

From a watershed perspective, there appears to be a relationship between groundwater interception by high-extraction mining and base-flow recharge to streams. Cifelli and Rauch (1986) studied a high-extraction mining operation in north-central West Virginia and concluded that base-flow streams were significantly impacted where at least ten percent of their watershed was undermined and subsided, and had dried up where at least 25 to 30 percent of their watershed was so affected.

Potential Impacts of Longwall Subsidence on Surface Land and Structures

Surface Land Impacts

Following are general observations of the PADEP regarding impacts on surface lands that may be affected by longwall mining:

- Ground cracks are common in the tension zone of the final subsidence basin regardless of the depth of mining.
- Ground cracks parallel to the longwall face are common above shallow mines resulting from the dynamic subsidence, however these cracks tend to close as the face passes beneath and beyond the surface area.
- In areas that are prone to landslides it is common for slips to occur, particularly in areas within the tension zone.
- Drainage of flat-lying areas can be adversely impacted. Changes in surface contours may cause low-gradient streams to pond and flood adjacent surface lands, sometimes creating wetlands or enlarging existing wetlands.

Potential Structure Impacts

Damages to structures are generally classified as cosmetic, functional, or structural. Cosmetic damage refers to slight problems where only the physical appearance of the structure is affected, such as cracking in plaster or drywall. Functional damage refers to situations where the structure's use has been impacted, such as jammed doors or windows. More significant damages that impact structural integrity are classified as structural damage. This would include situations where entire foundations require replacement due to severe cracking of supporting walls and footings.

When considering impacts of longwall mining on structures, the following factors are also relevant:

- Size and shape of the structure
- Orientation of the structure relative to the longwall panel
- Age and current condition of the structure
- Design of the structure
- Quality of construction
- Thickness and type of soils beneath and adjacent to foundations

For information on the effects that undermining has on roads within the study area, please refer to *Effects of Undermining Interstate Route 70 South Strabane Township Washington County, Pennsylvania*, 2000, on the world wide web at http://www.dep.state.pa.us/dep/deputate/minres/Longwall/I-70/I-70home.htm

Active Underground Mining in the Upper Chartiers Watershed

The Upper Chartiers Creek Watershed has experienced a high degree of deep mining activity. Of the watershed's 88,886 acres, 54,194 acres have been undermined for extraction of the Pittsburgh coal seam alone (Refer to Map 10). This results in the watershed being approximately 60% undermined for the Pittsburgh coal seam. This deep mining occurred in most portions of the watershed with the least occurrences near the City of Washington in the southwest portion of the watershed. Only two municipalities have not experienced deep mining in their area, those being East Washington Borough and Green Hills Borough.

There are currently 3 active underground mining operations in the Upper Chartiers Creek Watershed. (Refer to Map 10). Map 10 illustrates the permitted extent of these three mines. These mines are located in eastern portion of the watershed. Overlying these mines are the sub-basins of the Little Chartiers Creek (#2) and Opossum Run (#10).

The land area of the Little Chartiers Creek sub-basin is currently 77% permitted for active underground mining. The Opossum Creek sub-basin is 100% permitted for active underground mining.

The 3 active underground mining operations are:

Eightyfour Mine – The Eightyfour Mine (formerly the Somerset Mine #60) is permitted to underground mine 12,084 acres of the Upper Chartiers Creek Watershed. The Eightyfour Mine is under 100% of the Opossum sub-basin and 41% of the Little Chartiers Creek sub-basin.

Maple Creek Mine – The Maple Creek Mine is permitted to underground mine 407 acres of the Upper Chartiers Creek watershed. The Maple Creek Mine is under less than 2% of the Little Chartiers Creek Watershed.

Mathies Mine – The Mathies Mine is permitted to underground mine 10,420 acres of the Upper Chartiers Creek Watershed. The Mathies Mine is under 35% of the Little Chartiers Creek watershed.

The Eightyfour Mine and the Maple Creek Mine are both longwall mining operations, while the Mathies Mine ceased operation since this river conservation plan process has started.

Abandoned Mines

Abandoned deep mines and abandoned surface mined lands exist throughout the project area (Refer to Maps 2 and 8).

Presently, twenty-five abandoned mine lands (AML) exist in the watershed (i.e., strip mines, gob piles, etc.). Twenty AMLs are abandoned mine point locations (e.g., mine discharges, vertical mine shafts, erosion prone area, etc.) and five are abandoned mine land area locations (e.g., gob piles, refuse piles, etc.)(Refer to Table 3-C). Of these twenty-five locations fifteen are considered problem areas by PADEP. A total of 722 acres are considered "Problem Areas" by PADEP because these areas are negatively impacted by the AMLs. Another way of interpreting this is that for every AML, there are approximately 28.9 acres of problem area created/impacted by the AMLs (Refer to Map 8). The U.S. Department of Interior, Office of Surface Mining has three AML Planning Units in the watershed. They are the Canonsburg (PU-347), East Washington (PU-354), and Washington (PU-353) Planning Units. Table 3-B is a list of the AML projects that have been completed or are currently in the planning design phase. Table 3-C lists the sub-basins in which the AML features are found followed by the municipality in which each is located. This table can assist local communities, conservation organizations, and regulatory agencies in future remediation activities by delineating the political and physical boundaries in which each is located.

Table 3-B
Abandoned Mine Land Reclamation Projects

Project Number	Problem Area Number	Title	Township	Issue
OSM 63(4492)101.1	4492	Muse Road	Cecil	
OSM 63(1842)101.1	1842	Morgan Road	Cecil	S
BF 11-101.1	**0539**	**Mark IV Coal Company**	**North Bethlehem**	**DH**
BF 28-103.1	**1933**	**I.S.C., Inc. (I)**	**Somerset**	**DH, HWB, SA**
OSM 63 (0324)101.1	**0324**	**Cecil**	**Cecil**	**SB**
OSM 63 (1278)101.1	**1278**	**Reissing**	**Cecil**	**VO, P**

Bold = Planned / designed

DH - Dangerous Highwall
HWB - Hazardous Water Body
VO - Vertical Opening
SA – Spoil Area
SB - Surface Burning
S - Subsidence

Table 3-C
Abandoned Mine Land Reclamation Projects Locations

Sub-basin	AML Feature	Municipality
Brush Run	1 Vertical Mine Shafts	Cecil Township
Brush Run	Refuse Pile (62 acres)	Cecil Township
Chartiers Creek	Underground Mine Fire (7 acres)	Houston Borough
Chartiers Creek	1 Vertical Mine Shaft	Chartiers Township
Chartiers Creek	2 Vertical Mine Shafts	Canonsburg
Chartiers Creek	3 Vertical Mine Shafts	South Strabane Township
Chartiers Creek	2 Erosion Prone Areas	Chartiers Township
Chartiers Creek	Subsidence Prone Area (2 acres)	Chartiers Township
Chartiers Creek	1 Dry Strip Mine (6 acres)	Chartiers Township
Chartiers Run	1 Vertical Mine Shaft	Chartiers Township
Chartiers Run	2 AMD Discharge Points	Chartiers Township
Morganza Run	1 Vertical Mine Shaft	Cecil Township
Plum Run	2 Vertical Mine Shafts	Chartiers Township
Plum Run	Spoil Pile (7 acres)	Chartiers Township
Plum Run	3 Open Shafts or Mines	Chartiers Township

Table 3-D
PADEP Permitted Mine Sites

Permit Number	Operator Name	Primary Facility	Status	Municipality
63810907	Lyons Franklin	ICE	Forfeited	Houston
63851702	Consolidation Coal Co.	PMD	Reclaimed	Chartiers
63951601	Vesta Mining Co.	Prep	Reclaimed	North Bethlehem
63743702	Eighty Four Mining Co.	RD	Active	Somerset
63733709	Consolidation Coal Co.	RD	Reclaimed	Chartiers
63820201	PA Coal Reclamation Co.	RR	Reclaimed	South Strabane
63813202	KES Enterprises	RR	Reclaimed	North Bethlehem
63830103	Joseph Rostosky Coal Co.	Surf	Active	Somerset
63990103	Twilight Ind.Div. US Nat	Surf	Active	Somerset
3275SM4	ETNA Equip & Supply Co.	Surf	Forfeited	Somerset
3275SM2	ETNA Equip & Supply Co.	Surf	Forfeited	Somerset
3274SM4	Penn Sherman Corp.	Surf	Forfeited	Somerset
63980101	Twilight Ind. Div.US Nat	Surf	Not Started	Somerset
63743026	Twilight Ind. Div. US Nat	Surf	Proposed	Somerset
63850112	Twilight Ind. Div. US Nat	Surf	Reclaimed	Somerset
63850108	Twilight Ind. Div. US Nat	Surf	Reclaimed	Somerset
63850101	Westmont Coal Co. Inc.	Surf	Reclaimed	Somerset
63860107	Westmont Coal Co. Inc.	Surf	Reclaimed	Somerset
63900102	Chambers	Surf	Reclaimed	Chartiers
63900103	Twilight Ind. Div. US Nat	Surf	Reclaimed	Somerset
63900105	Victor Dosse Contracting	Surf	Reclaimed	Chartiers
63743028	KES Enterprises Inc.	Surf	Reclaimed	North Bethlehem
6379104	Xecol Corp.	Surf	Reclaimed	Chartiers
6379113	Westmont Coal Co. Inc.	Surf	Reclaimed	Somerset
63793031	Twilight Ind. Div. US Nat	Surf	Reclaimed	Somerset
3274SM20	Joseph Rotosky Coal Co.	Surf	Reclaimed	Somerset
3274SM41	Joseph Rotosky Coal Co.	Surf	Reclaimed	Somerset
3274SM43	Nello L. Teer Co.	Surf	Reclaimed	Somerset
3274SM46	Twilight Ind. Div. US Nat	Surf	Reclaimed	Somerset
3274SM49	Twilight Ind. Div. US Nat	Surf	Reclaimed	Somerset
3274SM7	Joseph Rotosky Coal Co.	Surf	Reclaimed	Somerset
3275SM1	Nello L. Teer Co.	Surf	Reclaimed	Somerset
63820104	Tyhonas Coal Co.	Surf	Reclaimed	North Bethlehem
63813041	Fleck Coal Co.	Surf	Reclaimed	Chartiers
63813029	Twilight Ind. Div. US Nat	Surf	Reclaimed	Somerset
63940103	Twilight Ind. Div. US Nat	Surf	Stage 1	Somerset
63930101	Twilight Ind. Div. US Nat	Surf	Stage 1	Somerset
63850111	Twilight Ind. Div. US Nat	Surf	Stage 1	Somerset
63850109	Amer Coal Co.	Surf	Stage 1	Chartiers
63960101	Twilight Ind. Div. US Nat	Surf	Stage 1	Somerset
63831302	Eighty Four Mining Co.	UG	Active	Somerset
63841304	Laurel Run Mining Co.	UG	Operative/ Non-prod.	North Bethlehem
63971301	Hillsboro Coal Co.	UG	Proposed	North Bethlehem
63831301	Victor Dosse Contracting	UG	Stage 2	Chartiers
63832303	Anthony J. Pawlosky	Sm. Surf	Active	Chartiers
SM624	Berardellinelli Excavating	Sm. Surf	Reclaimed	North Bethlehem
63832302	James W. Mondik	Sm. Surf	Reclaimed	Chartiers
63882301	Robert J. Quarture	Sm. Surf	Reclaimed	North Strabane

ICE - Incidental Coal Extraction **RD** - Refuse Disposal **Surf** - Surface Mine Operation
Prep - Preparation Plant **RR** - Refuse Reprocessing **UG** - Underground Mining Operation
Sm. Surf. - Small Surface Operation (<2,000 tons)

4 Water Resources

4.1 Section Purpose

Available data regarding water resources in the Upper Chartiers Creek Watershed were compiled and interpreted to formulate the following resource inventory. This inventory represents a snapshot of general and specific conditions occurring in the Upper Chartiers Creek Watershed. Resources inventoried included Groundwater, Surface Water, and Characteristics. By examining the resources and their limitations within the watershed, one can get a better perspective of the problems and opportunities that exist therein.

4.2 Groundwater

While there are several different types of geological units in Washington County, the Pennsylvania, Monongahela and Conemaugh groups, along with the Permian-Pennsylvania Washington Formation, the Permian Greene Formation, and unconsolidated Quaternary deposits (Refer to Map 4). Some of these units, such as the Monongahela group, do not yield much water.

The greatest yield of groundwater comes from aquifers in the Quaternary deposits. These deposits were formed from generally permeable alluvium (i.e., material deposited from water), which can contain moderate to large stores of water. Water wells and springs from other types of deposits yield smaller amounts and may not provide an adequate supply of water for homes, farms or businesses. In Washington County, water wells occur both in water table conditions (free, unconfined) and artesian conditions (confined and under pressure).

By definition, groundwater is the water in the saturated zone, below the water table. It makes up the base flow of rivers and streams. Groundwater is recharged by infiltration from precipitation and from the beds of lakes, streams and other water bodies. Groundwater moves laterally toward lower elevations and eventually reaches the surface of the ground as a discharge to a water body such as a spring, wetland, lake or stream.

Ground water in Washington County demonstrates a wide range of water quality issues. Poor water quality can be attributed to both human and natural causes. The most severe pollution problem in Washington County is caused by coalmine drainage. Iron and sulfur-bearing minerals (e.g., pyrite) are common in coal and carbonaceous shales. These minerals become soluble (able to be dissolved in water) when exposed to air and water and produce sulfuric acid, better known as acid mine drainage. Oil and gas production has been common in the county (as of the 1973). Thousands of wells have been drilled to depths of 1,000 feet or more, and have not been properly plugged and have been abandoned. In these instances, deeper, briny groundwater may migrate upward through boreholes under artesian pressure, degrading the quality of shallow, potable aquifers.

Government agencies are becoming increasingly active in the prevention of pollution to water supplies. Abandoned and orphaned oil and gas wells are slowly being plugged; their limiting factor is funding for these projects. The Pennsylvania Department of Environmental Protection has established regulations concerning the reclamation of strip mines (the main culprit of AMD). Most pollution inputs into the groundwater system can be attributed to pollution factors on the surface. For this reason, surface water quality monitoring is a valuable tool for indirectly addressing groundwater quality issues.

4.3 Surface Water

4.3.1 *Major Tributaries*

The major tributaries of the Upper Chartiers Creek Watershed compose several sub-basins within the watershed (Refer to Table 4-A). These sub-basins can be utilized as management units for the purpose of identifying water quality issues, addressing potential remediation activities, or merely to evaluate the watershed in smaller more manageable units (Refer to Maps 2 and 5) (SPC, 2000).

Table 4-A

PADEP Major Tributaries to Upper Chartiers Creek Watershed

Major Tributary-Sub-basin	Sub-basin Stream Miles	Protected Use
Chartiers Creek	**105.93**	**WWF – HQWWF***
Little Chartiers Creek	**94.60**	**WWF – HQWWF***
Chartiers Run	**27.13**	**WWF**
Georges Run	**15.26**	**WWF**
Westland Run	**11.35**	**WWF**
Brush Run	**9.49**	**WWF**
Plum Run	**6.08**	**WWF**
Catfish Run	**5.46**	**WWF**
Morganza Run	**3.97**	**WWF**
Opossum Run	**2.14**	**HQ -WWF**
Total	**281.72**	**HQ – WWF**

**These sub-basins have tributaries or segments with more than one protected use.*

4.3.2 *Lakes and Ponds*

There are numerous lakes, ponds, and reservoirs within the Upper Chartiers Creek Watershed including numerous small farm ponds and sedimentation structures that are utilized mainly for cattle water supply, soil conservation practices, and fire insurance protection. Lakes or ponds comprise 320 acres of the project area.

There are seven (7) significant water bodies within the watershed, they are:

Canonsburg Lake - Canonsburg Lake is a 76-acre impoundment owned by the Pennsylvania Fish and Boat Commission (PFBC). The impoundment is located in North Strabane Township and in the Little Chartiers Creek sub-basin. Canonsburg Lake is utilized as a recreational fishery for public use. The largemouth bass (*Micropterus salmoides*) fishery would probably be ranked among the best in Area 8 of the PFBC. Efforts should be continued to inform the public of the excellent largemouth bass fishery in this lake normally known for trout. Crappie (*Pomoxis spp.*) and bluegill (*Lepomis macrochirus*) quality indices for this lake are below guidelines for panfish. This is probably due to heavy competition from gizzard shad (*Dorosoma cepedianum*). The lake is accessible by foot and a boat ramp is located on the eastern shore. Only boats with electric motors are permitted on the lake. The depth of the lake has decreased in the last 57 years due to siltation. Both point and non-point pollution sources in the lake need to be reduced in the future (PFBC, 2000).

Boone Reservoir – Boone Reservoir is located in North Strabane and Peters Townships and in the Little Chartiers Creek sub-basin. This reservoir is privately

owned and is not opened to the public. This reservoir used to be owned by Pennsylvania American Water Company (PAWC) and was utilized as a public water supply.

Washington County Reservoirs (#1, 2, 3, and 4) – These 4 reservoirs are owned by the PAWC. They are located in North Franklin Township and are in the Chartiers Creek sub-basin. These PAWC reservoirs are no longer utilized as public water supplies. There is no public access for any of the 4 reservoirs. Presently, Reservoirs 1 & 2 are to be drained due to water pollution and Reservoirs 3 & 4 are to remain as existing water impoundments.

Maplewood Lake – Maplewood Lake is located in North Strabane Township and in the Little Chartiers Creek sub-basin. Deauville Management is in the process (2002) of completing a housing development that would generally be located adjacent to the lake. This lakeside development is to be managed for the green-space, open-space, and other recreational opportunities residents may wish to participate in.

Grimm Lake – Grimm Lake is located in South Strabane Township and is in the Little Chartiers Creek sub-basin. This lake is a private facility for the private recreational use of its owners.

Lerner Lakes (2) – Lerner Lakes are located partially in North Strabane and Peters Townships and is also in the Little Chartiers Creek sub-basin. The lakes are privately owned and are used for private recreational purposes.

Reservoir #2 – Reservoir #2 is located partially in North Strabane and Peters Townships and is in the Little Chartiers Creek sub-basin. It is a former PAWC reservoir that had been utilized for water supply and is now open for public recreational purposes.

4.3.3 *Wetlands*

The wetlands in the project area vary in size, complexity, and type depending on their location in the watershed. Palustrine wetlands include all nontidal wetlands dominated by trees, shrubs, persistent emergent plants, mosses, or lichens.Lacustrine wetlands include wetlands and deep-water habitats, which are depressional or dammed water bodies that are greater than 20 acres in size. Riverine wetlands include all wetlands and deep-water habitats contained within a channel, with two exceptions: 1. palustrine and 2. wetlands with ocean derived salts. Palustrine, lacustrine, and riverine wetlands are the dominant wetland type found within the project area. In order for an area to be considered a wetland, the area must satisfy three parameters. The area must have wetland hydrology (the presence of water), a dominance of hydrophytic (water-loving) vegetation, and hydric (wet/moist) soils.

The identified wetlands on the Southwestern Pennsylvania Commission's GIS database are taken from the National Wetland Inventory (NWI) mapping and have been classified as forested and non-forested wetlands (Refer to Maps 3 and 8). Natural wetland systems can be found throughout the project area along stream corridors. These wetland systems (both forested and non-forested) compose 1.6% of the total watershed area and encompass 144.37 total acres. Additionally, constructed wetlands have also been built in the project area. Wetlands serve many functions such as the passive treatment of AMD, sediment trapping, nutrient filtering, providing wildlife and aquatic habitat, and controlling

flood flow,s. Before proceeding with projects, please consult the NWI mapping to assist in reviewing a specific property or location.

Three large forested and non-forested wetland systems exist in the Upper Chartiers Creek Watershed. One wetland complex is located along Chartiers Creek near Franklin Farms, PA, another wetland complex is located upstream of Canonsburg Lake along Little Chartiers Creek (and adjacent tributaries), and the last wetland complex is located along Little Chartiers Creek south of Eighty-Four, PA (Refer to Maps 3 and 8).

Protection of these wetland complexes is very important for the reasons listed above. If these wetland complexes were eliminated, the possible results would be increased flooding downstream, increased stream pollution, erosion and sedimentation, and the elimination of fishing and other recreational activities.

4.3.4 *Floodplains*

The streams and waterways of the watershed contain numerous floodplains throughout the project area. These floodplains vary in size (width) and sinuosity (how much the stream and associated floodplain bends, turns, and meanders) as they relate to the specific stream and floodplain. The size and sinuosity of a floodplain is dependent on its relative location and proximity to the streams beginning, or headwaters. As a rule, the farther one travels up a streambed the smaller the size of the floodplain.

Floodplains are an important resource because they hold back storm flows, thus reducing destructive flooding downstream (Refer to Map 8, and Appendix 2). If development were to be restricted or eliminated from occurring within the floodplains, taxing capital investment costs due to expanding infrastructure (i.e., flood channels, levees, etc.) could be reduced or eliminated. This would also reduce the financial burden of maintaining the present structures located on the floodplains. Additionally, floodplains are the areas along a stream where rich alluvial (stream placed) soils are to be found. Nutrients and organic matter are recycled and transformed into food by bacteria, fungi, and plants that then are passed on to animals. This is one reason why farmers utilize these floodplains as cropland. Floodplains also serve as fringe or buffer areas that transition from streams and rivers to upland areas. Floodplains provide important shading to stream habitat and connect these areas to wetland and upland areas. Much diversity in plant and animal life can be found here due to the amount of nutrient recycling. Floodplains are very fertile areas, thus, are an important resource to enhance and protect.

The Chartiers Creek valley floodplain area has been utilized over the years as the location for commercial and industrial development. This is due to the easily developable land (less steep slopes) adjacent to Chartiers Creek. To protect real estate, properties, and travel routes along Chartiers Creek, the U.S. Army Corps of Engineers designed and later constructed the Unit 1 and Unit 2A Local Flood Protection project (Refer to Map 7) in the vicinity of Canonsburg (USACOE, 1997). These flood control projects, completed in 1970 and 1976, included channel widening, deepening, and realigning, streambank stabilization, and flow obstruction removal. Another flood protection project is proposed in the Houston floodplain area. This project, referred to as Unit 2B, is proposed to be constructed from the mouth of Plum Run, south to the mouth of Chartiers Run. The Unit 2B project involves the construction of levees, floodwalls, and other control structures to contain and divert high flows. Additionally, the U.S. Army

Corps of Engineers designed and later built in 1962, the Washington, PA Local Flood Protection project (Refer to Map 7) in the vicinity of Washington approximately from Catfish Run downstream to Georges Run. The project involved approximately 9,350 feet of improvements along mainly Chartiers Creek (USACOE, 1992)

The high use and destruction of floodplain for industrial/commercial activities and for flood protection facilities has reduced the amount of floodplain that exists along Chartiers Creek. Therefore, the values and functions that floodplains serve are either eliminated or reduced. However, the local flood protection facilities have improved the quality of life of residents and businesses by reducing the incidents of flooding in flood prone areas. Please consult the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps to assist in reviewing a specific property or location.

4.4 Characteristics

4.4.1 *Water Quality*

Most natural waters contain varying bicarbonate and carbonate compounds, originating from sedimentary rocks. The calcium bicarbonate content of freshwaters determines the pH or acidity/alkalinity balance (Allan, 1999). The more limestone that is associated with a stream, the better the stream is able to buffer against acidic water conditions. Thus limestone geology can determine to what extent buffering to degraded streams occurs. Water quality of the Chartiers Creek Watershed was good prior to man's intensive land use activities of the 19th and 20th centuries. The underlying geology of the watershed is made up of sandstone, shale, limestone, and coal.

The quality of water is important because it directly impacts chemical, physical, and biological processes that take place in streams. Human impacts to these parameters can indicate degraded water whereas conservation measures taken to make improvements can show the opposite. Surface water flows from land surfaces into drainage basins (via ephemeral, intermittent, and perennial streams) to the major tributaries until these streams meet Chartiers Creek. The quality of the water in these streams is directly related to the quality of the land from which it flows. Therefore, water coming from a commercial area will transport a different type of pollution versus water coming from a forested area.

As can be seen when comparing Maps 3 and 5, the water quality of streams in the Upper Chartiers Creek Watershed is variable depending on the land use associated with it. Due to the current large-scale developmental activities in the project area, Habitat Modification water quality problems are prevalent throughout the project area (Management Units A, B, D, and E). A secondary water quality issue involves nutrient enrichment. In many of the agricultural areas of the project area (Management Units B and C), nutrient enrichment problems seem to be making way for Habitat Modification problems due to on-coming developments. Though the project area has many sub-basins that are impacted by various land uses, there are still large areas of the Upper Chartiers Creek Watershed that were found to be In Attainment by PADEP during the 1998 303(d) study (Management Unit G). In order to maintain the quality of these streams and stream segments, it is important to have municipal plans and zoning ordinances that protect natural resources and encourage compatible land use activities adjacent to stream corridors.

The total Chartiers Creek Watershed size is 277 square miles. The Upper Chartiers Creek study area is approximately 139 square miles in size. An estimated total of 282 stream miles exist within the Upper Chartiers Creek Watershed (SPC, 2001). Of the 282 miles of assessed stream, there are 220 miles (78%) of stream that are not in attainment (i.e., not meeting water quality standards for designated use) with the Pennsylvania's Clean Streams Act (Refer to Map 5) in the watershed. The sources for non-attainment are shown in Table 4-C. PADEP inventoried the Chartiers Creek Watershed through the unassessed waters program in 1997. The results found from this inventory reaffirmed the earlier 303(d) listings and added additional stream segments to the list (PADEP, 2001). PADEP's 303(d) list (data) distinguishes between primary, secondary, and tertiary sources of water pollution. This shows that a stream reach may have multiple sources of non-attainment. Table 4-C shows the three primary sources of NPS pollution in the watershed and the amount of stream not in attainment. The top pollution sources are discussed later in this section.

4.4.2 *Point Sources*

Point source forms of water pollution, those that discharge pollution directly into a stream or other water body are regulated by state and federal environmental agencies. Anyone proposing to discharge industrial wastewater into surface waters (rivers, streams, and lakes) in Pennsylvania must receive an individual PADEP National Pollutants Discharge Elimination System (NPDES) permit or apply for coverage under an appropriate state-issued General Permit. The Part 1 permit authorizes the discharges and establishes discharge limitations, monitoring and reporting requirements and compliance schedules. For the Part 2 permit, anyone proposing to construct and operate an industrial wastewater treatment facility; dispose of industrial waste by land application, subsurface disposal or underground injection; construct and operate a surface impoundment; or perform any other activity which has the potential for causing surface or ground water pollution must first obtain a Part 2 - Water Management Permit (PADEP, 1999).

The project area has twenty-nine (29) direct and indirect dischargers of state permitted treated wastewater into Chartiers Creek and its tributaries (PADEP, October 1998 and EPA EnviroFacts Website, 2001). These permitted facilities [www.epa.gov/enviro/html/ef_overview.html] (Refer to Table 4-B) include sanitary sewer authorities, industrial facilities, homeowners associations, commercial businesses, and educational institutions. Please note that three (3) sites from the PADEP Direct/Indirect Dischargers list (PADEP, October 1998) were not found on EPA's EnviroFacts website.

Table 4-B
PADEP Direct and Indirect Discharge NPDES Permit Sites

Facility (NPDES Permit #)	
Jessop Steel Company (PA0001902)	South Strabane Township Sanitation Authority (PA0024783)
Washington Steel Corporation (PA0002721)	Kampgrounds of America (PA0097691)
Molycorp, Inc. (PA0040312)	Woodhouse STP (PA0098663)
Tree Haven Mobile Home Park (PA0095834)	Lukens Steel-Houston Plant (PA0002739)
Washington Penn Plastic Co. (PA0206041)	Western Area Vo-Tech School (PA0203891)
Washington East Washington STP (PA0026212)	Interstate 79 Association (PA0096954)
Ametek Specialty Metal Products (PA0034819)	Club 40 Restaurant (PA0203891)
Bethenergy Mines Division Office (PA0093262)	Airways Mobile Home Park (PA0094102)
Middle States Steel Construction Co., Inc. (PA0217883)	Joe Walker Elementary School (PA0096121)
Smith Machine, Inc. (PA0042579)	Franklin Manor Utilities (PA0033294)
84 Lumber Company (PA0203955)	Ridgecrest Mobile Home Park (PA0043820)
MLM Enterprises (PA0042587)	Thomas Cooper Truck Stop (PA0096831)
Wylandville Elementary School (PA0030651)	**Brookhaven Estates Mobile Home Park (PA0093076)**
Eighty Four Industrial Park (PA0091413)	**Clearview Mobile Home Park (PA206016)**
	Canonsburg-Houston Joint Authority (PA0025941)

*__Bold__ denotes those sites not listed on EPA Envirofacts Website

4.4.3 *Nonpoint Sources*

A non-point source form of water pollution is a source of water pollution that does not necessarily discharge water directly into a stream or other water body at one location or point. NPS water pollution is more difficult to regulate by state and federal environmental agencies. This is because the source of pollution occurred prior to its regulation, or the problem is so widespread that regulators would have an impossible task trying to regulate it (e.g., abandoned mine discharges, nutrient effluent from farms, and pesticide residue from yards). PADEP's 303(d) list of streams in the Upper Chartiers Creek Watershed lists five (5) specifically named streams, along with numerous additional stream segments or reaches that are not in attainment (or meeting water quality standards for designated use) (PADEP, 2000). The PADEP 303(d) listed streams are:

- Allison Hollow Run
- Brush Run
- Chartiers Creek
- Chartiers Run
- Little Chartiers Creek

Table 4-C
Sources of Non-Attainment of PA Clean Streams Act,
Water Quality Standards in Upper Chartiers Creek
(PADEP 2000 303[d] List) Stream Miles Effected by Pollution Source

Pollution Source	Primary Source	Secondary and Tertiary Sources	Total
Habitat Modification	208	318	526
Agriculture	165	252	417
Urban Runoff/Storm Sewers	60	315	375
Abandoned Mine Drainage	145	121	266
In Attainment	219	----	219
On Site Wastewater	12	44	56
Source Unknown	45	----	45
Construction	33	8	41
Land Development	14	19	33
Small Residential Runoff	12	17	29
Grazing Related Agriculture	----	22	22
Removal of Vegetation	----	10	10
Crop Related Agriculture	5	4	9
Golf Courses	7	----	7
Other	7	----	7
Combined Sewer Overflow	----	7	7
Total	**932 mi**	**1,137 mi**	**2,069 mi**

4.4.4 *Abandoned Mine Drainage (AMD)*

AMD is made up of numerous water quality parameters and can differ from discharge to discharge (Refer to Maps 2, 3, 5, and 8, and Appendix 3). AMD can be either acidic or alkaline and typically contains metals such as aluminum, iron, and/or manganese associated with it. Although AMD is one of the major water quality problems in the Lower Chartiers Creek Watershed, this source of water pollution is not as severe a problem in the Upper Chartiers Creek Watershed project area.

The Chartiers Creek Watershed has been impacted for many years because of its most valuable natural resource, the Pittsburgh coal seam, has been mined in the watershed since 1760. The employment opportunities created by the mining industry was one of the main reasons people settled the Chartiers Creek valley.

In 1968, the Pennsylvania Department of Mines and Mineral Industries' (PADMMI) assessment (*Acid Mine Drainage Pollution Study – Phases 1 & 2*) of the Chartiers Creek Watershed, a total of 233 pollution sources were located (PADMMI, 1968). Both major (45) and minor (188) AMD discharges were found from surface and deep mined areas (Refer to Map 8). The major discharges contributed a significant amount of acid loading to Chartiers Creek. Of these, only six were found to occur within the project area. AMD problems are mainly observed in Management Unit C, however some additional stream segments in Management Units D and E also have been impacted by AMD but to a lesser extent (Refer to Map 5).

Streams that are degraded by AMD include:

- Allison Hollow Run
- Catfish Run
- Chartiers Creek
- Little Chartiers Creek

4.4.5 *Sewage*

Sewage is predominantly composed of wastewater, feces, and particulate matter. In a conventional sewage treatment plant, sewage is transported to treatment facilities via an underground network of sewage pipelines from residences and businesses. At the treatment plant the sewage is then put through primary and secondary (and in some cases tertiary) treatment. This process removes solids, bacteria, viruses, and other waste material until the water is potable or drinkable for consumers. Thus, sewage or wastewater can be recycled for reuse by patrons of the water treatment authority.

The Washington County Planning Commission's 1972 *Sewage Facilities Plan* details the extent of sewage facilities in the Upper Chartiers Creek Watershed as of 1972. At the time, there were four sewage districts (District 11-14). These districts covered Canonsburg, East Washington, and Houston Boroughs; Amwell, Canton, Cecil, Chartiers, Peters, North Franklin, North Strabane, South Franklin, and South Strabane Townships; and the City of Washington. The watershed has had new and expanded sewage treatment facilities that have resulted in water quality improvements over the past 30 years; however combined sewer overflows still direct a large amount of urban runoff into the watershed's streams (PADEP, 2001).

4.4.6 *Nutrient Enrichment*

The Lower Chartiers Creek Watershed is experiencing difficulties with the sewer system facilities there. Stormwater in portions of the Lower Chartiers Creek Watershed has been combined with the sanitary sewers. This situation causes the combined sewer overflow situations during wet weather events. In the 1950's, there were already severe wet weather problems in the Chartiers Creek Watershed. Even in modest wet weather conditions the sanitary sewer overflow (SSO) control structures and the combined sewer overflow (CSO) structures were experiencing what is considered illegal discharges into local waterways. However, these problems are not unique to these communities and sewage pollution problems exist throughout the watershed.

In the lower portion of the Chartiers Creek Watershed, this pollution problem is due in part to old/poorly maintained sewer facilities and illegal connections to the sanitary sewer system (50% of these sources involve private property). Additionally, much of the infrastructure that involves the sewer system is located below groundwater levels and thus raw sewage in some cases is coming in contact with groundwater and contaminating it. This problem is being worked on with considerable effort by all levels of government (local, state, and federal). This is due to the enormous financial costs involved in retrofitting and/or replacing these systems. In most communities the cost of improving sewer facilities is cost prohibitive. One way new sewer facilities are added to a community is when new development projects are mandated to add these facilities to their development projects. This action may allow a community to add further sewer facilities to other areas of the community near the development project that would otherwise be economically unfeasible.

The pollution problem discussed above is not unique to the lower portion of the watershed. The Upper Chartiers Creek Watershed also has combined sewer systems, but to a lesser extent. The combined sewer overflow problem areas within the project area involve the older communities (e.g., Canonsburg, East Washington, Houston, and Washington). Combined sewer systems are primarily found in those communities. The other more recently developed communities have newer sewer facilities, however, these communities tend to have more on lot septic systems that can create sewage water quality problems. Sewage problems are observed in Management Units B and E (Refer to Map 5). The following is a list of sewer service providers in the project area (SPC, 1999):

- Canonsburg-Houston Joint Authority (PA0025941)
- Chartiers Township Municipal Authority
- North Strabane Township Municipal Authority
- Peters Creek Sanitary Authority
- Peters Township Sanitary Authority (PA0028711)
- Washington-East Washington Authority

The following are other point source (direct discharge) locations that have sewage treatment facilities:

1. South Strabane Township Sanitation Authority (PA0024783)
2. Clearview Mobile Home Park (PA206016)
3. Brookhaven Estates Mobile Home Park (PA0093076)
4. Ridgecrest Mobile Home Park (PA0043820)
5. Franklin Manor Utilities (PA0033294)
6. Joe Walker Elementary School (PA0096121)
7. Airways Mobile Home Park (PA0094102)

8. Club 40 Restaurant (PA0203891)
9. Western Area Vo-Tech School (PA0203891)
10. Kampgrounds of America (PA0097691)
11. Wylandville Elementary School (PA0030651)
12. Tree Haven Mobile Home Park (PA0095834)
13. Cecil Township Sanitary Authority (PA0043435)

4.4.7 *Habitat Modification*

Habitat modification is a designation given to streams that are impacted due to one or more water quality parameters that alone or together degrade the habitat, stream structure, and the environment for benthic organisms and fish. Habitat modification is one of the major water quality problems in the Upper Chartiers Creek Watershed. Streams that exhibit habitat modification problems are affected by high stream flows, turbidity, erosion and sedimentation, residual chemical (e.g., road salts, oils, solvents, etc.), and thermal pollution. The factors that lead to these types of water quality impacts are due primarily to areas with high developmental activities, high human population densities, high densities of residential/commercial/industrial structures, and transportation facilities. In general, habitat modifications occur due to a high degree of impervious surfaces (e.g., asphalt and concrete roads, structure's roofs, etc.).

In the project area, habitat modification problems are occurring along the Interstate 70 and 79, U.S. Route 19, and SR 519 transportation corridors. Additionally, habitat modification degradation is being observed away from these main corridors in other portions of tributary streams as developmental activities are moving towards more agricultural areas of Cecil, Chartiers, North Franklin, North Strabane, Peters, and South Strabane Townships (Refer to Map 5). Streams deteriorated by habitat modification problems are Allison Hollow Run, Brush Run, Catfish Run, Plum Run, a few unnamed tributaries, and a portion of Little Chartiers Creek (PADEP, 1998). Habitat modification problems are observed in Management Units A, B, D, and E (Refer to Map 5).

Habitat modification problems increase when vegetated buffers are not maintained along streams, stormwater management facilities do not exist, or inadequately planned/designed facilities are built, stormwater and sanitary sewer discharges are mixed, and when stormwater flow comes from warm/hot surfaces and increases stream thermal temperatures. Model ordinances (i.e., stream buffer and forest resource ordinances) can assist a community in developing local planning tools that can reduce developmental pressures on natural resources, thus giving added protection to water quality and biological resources. Stormwater management involves the control of water that runs off the surface of the land from rain, melting ice, or snow (PADEP, 1997). High stream flows coming from developed areas only add to this water quality problem. Currently only one stream flow gauging or monitoring station is maintained in the Chartiers Creek Watershed. This site is located in Carnegie and maintained by the USGS (USGS, 1999).

4.4.8 *TMDL*

Numerous water bodies in Pennsylvania have been listed on the Clean Water Act (CWA) Section 303(d) list as impaired waters. Many of these water bodies will be required to have a Total Maximum Daily Load (TMDL) completed in order to identify and describe the cause of impairment. Chartiers Creek in Washington and Allegheny Counties has recently had a TMDL assessment completed. Systech Engineering, Inc. completed the TMDL study of the entire Chartiers

Creek Watershed. This study is also referred to as the Watershed Analysis Risk Management Framework (WARMF). The WARMF reviewed the point and non-point sources of water pollution. Data collected were entered into the WARMF modeling program. The PADEP 303(d) list required that TMDLs be developed for the Chartiers Creek Watershed. The WARMF model is able to assist in delineating where remediation actions can take place in order to meet regulatory TMDLs. The TMDLs were developed by PADEP in March 2001. Chartiers Creek was listed because long-term, unlimited consumption of fish from certain areas in this stream could cause human health problems (PADEP, 2001).

The objective of the TMDL program is to restore and maintain the beneficial uses (drinking water, recreation, aquatic life, etc.) of impaired or threatened water bodies. The program is authorized by and created to fulfill the requirements of Section 303(d) of the federal Clean Water Act. **The overall goal of a TMDL is to achieve the fishable and swimmable goal of the CWA**. A survey was completed as part of the initial public participation activities for this project. From this survey it was observed that the public may not understand the fishable and swimmable components to the CWA and how the two components impact how water resources are regulated. The general opinion was that it is a very important to have swimmable and wadeable streams. In contrast, it was only somewhat important that the same area be fishable. Since the CWA states that both are equally important, both aspects should be considered with equal significance (Refer to the survey in Appendix 1).

A TMDL establishes the maximum amount of an impairing substance or stressor that a waterbody can absorb and still meet the water quality standards of the CWA, and allocates that load among pollution contributors. TMDLs are a tool for implementing State water quality standards. They are based on the relationship between pollution sources and in-stream water quality conditions (MDE, 2002) (www.mde.state.md.us/tmdl/index.html).

A TMDL was written for Chartiers Creek. The main stem of this stream is listed (contaminated with PCBs and chlordane) and is the main focus of the TMDL. However, a section of the Little Chartiers was included (from the mouth to the Canonsburg Lake Dam) using the argument that contaminated fish can swim from the main stem to the dam. PCBs and chlordane are both carcinogens and need to be controlled to an overall risk management level of 1 in 1,000,000 cases. The use of PCBs and chlordane has been banned in the United States. This demonstrates that there will be no new point sources of these chemicals. The levels of PCBs and chlordane are expected to decline by natural attenuation (covering of contaminated sediments and/or flushing of sediments in high stream flow). Natural attenuation seems to be the best implementation method available due to the decreased amount of habitat degradation, and the significantly decreased cost (PADEP, 2001).

4.4.9 *Water Supply*

Public Water Supply

Water supply has been an issue in the project area for some time. With the recent demographic shift of population from Allegheny to Washington (and other surrounding counties) County, there has been an increased need to improve the water supply system within the project area. The Pennsylvania American Water Company (PAWC) is the only water service provider in the project area (SPC, 2001). The water supply source for the study area is the Monongahela River. PAWC is continually expanding their service area within the project area to meet customer needs (PAWC, 1996).

Private Water Supply
Local residents and a few businesses utilize groundwater wells for water supply (Refer to Section 4.4 Groundwater and Map 7).

4.4.10 *Stream Characteristics*

The streams of the Chartiers Creek Watershed have a designated use as warm water fisheries (Pennsylvania Code, 1994). The Pennsylvania Fish and Boat Commission (PFBC) currently lists Little Chartiers Creek in Peters Township as an "approved trout water". Additionally, Canonsburg Lake in Peters Township is listed as an "approved trout water" and receives stocking from the PFBC. These fisheries are stocked as a put-and-take trout fishery. This is to provide recreational fishing opportunities in a waterway that will not support trout throughout the year due to environmental conditions (Pennsylvania Fish and Boat Commission, 2001). The PFBC *Hatchery Trout Subprogram in Streams* policy objective is to "use hatchery trout to provide recreation in those waters where wild trout populations are inadequate to sustain the fishery at desired levels". Trout stocking is determined through the following subprogram guidelines:

- A field survey conducted by the Area Fisheries Manager.
- Minimum stream flow must be at least 5 cubic meters per second at the time of stocking at any time prior to June 15.
- For new waters added to the catchable trout program, water temperature shall not exceed 24E C (75E F) at any time prior to June 15.
- The pH at the time of stocking shall not be less than 6.0 for brook trout (*Salvelinus fontinalis*) and brown trout (*Salmo trutta*), and not less than 6.5 for rainbow trout (*Oncorhynchus mykiss*).

Additionally, no stream section shall be stocked if pollutants are known to be present at concentrations equal to or greater than the Pennsylvania Department of Health action limits, or, in the case of a bioaccumulative substance, in a concentration, which is harmful to humans (PFBC, 1997).

The Environmental Protection Agency in January 2001, recommended to all states that a fish consumption advisory for mercury be made for all waters within each respective state. Pennsylvania recently adopted this policy. The mercury advisory is for one meal per week or 0.5 lbs. of fish per 150-lbs. person per week. This equates to 2 trout per week. The targeted group for the fish consumption advisory is children, women of child bearing years, and pregnant women. If there are any questions concerning this fish consumption advisory, please review the Pennsylvania Fish and Boat Commission's website at www.fish.state.pa.us (PFBC, April 2001).

5 Biological Resources

5.1 Section Purpose

Available data regarding terrestrial and aquatic biological resources in the Upper Chartiers Creek Watershed were compiled and interpreted to formulate the following resource inventory. This inventory represents a snapshot of general and specific conditions occurring in the Chartiers Creek Watershed. Resources inventoried included Wildlife, Vegetation, PNDI Species, and Important Habitats. By examining these biological resources and their limitations within the watershed, one can get a better perspective of the problems and opportunities that exist therein.

5.2 Wildlife

5.2.1 *Terrestrial*

The Upper Chartiers Creek Watershed contains a large variety of non-game (non-hunted) and game (hunted) wildlife species. The project area can be broken into two separate types of general terrestrial habitat settings - rural and urban. In the rural setting, birds, mammals, amphibians, and reptiles generally inhabit and migrate between areas of large, wooded tracts, agricultural land, edge/fragmented habitat, riparian, and wetland habitat.

The main wildlife problem is white-tailed deer (*Odocoileus virginianus*) overpopulation. In rural areas, deer cause crop damage. In the urban areas, deer have generally adapted and coexist with people but in a more confined atmosphere of fragmented forest, rangeland, and riparian zones. The problem that occurs here is property/vegetative damage to ornamental plants and property damage due to automobile accidents with white-tailed deer. Most often these accidents only cause physical damage to automobiles, but at times they have caused personal injury and even death. Management options include no management, wildlife contraception, private hunting, and public hunting. Some communities in the Upper Chartiers Creek Watershed permit legal hunting throughout their respective municipalities, while other municipalities have not permitted hunting due to the restrictive nature of the more suburban/urban communities.

The population of birds vary seasonally and annually. To assist in monitoring bird populations, USC-Citizens for Land Stewardship and other dedicated birders have recently established an Audubon Society Bird Circle in the South Hills of Pittsburgh. The center of this bird circle is located in the Lower Chartiers Creek Watershed but extends into the Upper Chartiers Creek Watershed study area. Additionally, two existing Audubon Society Bird Circles are located in the Upper Chartiers Creek Watershed. These are the Raccoon Creek and Washington bird circles. Bird circles assist in regional and national surveys of bird populations (both migratory and non-migratory species). With habitat fragmentation being a major cause in bird population decline, bird circles can assist in calculating increasing or decreasing populations of bird species.

A Great blue heron (*Ardea herodias*) rookery exist in the project area. The rookery was noted by the Pennsylvania Game Commission (PGC) as a “species of special concern,” because Great blue herons are colonial nesters and land development of their nesting habitat could have a major impact on the rookery population. The rookery is located within the boundary of the Canonsburg USGS quad map.

5.2.2 *Aquatic*

Chartiers Creek and its tributaries are designated as a Warm Water Fishery. Little Chartiers Creek has been designated as a High Quality Warm Water Fishery, this assignment designates this stream as one with "excellent quality waters…or other features that require special water quality protection" (Pennsylvania Code, Title 25, Chapter 93, 1994). The Pennsylvania Fish and Boat Commission lists Little Chartiers Creek and Canonsburg Lake in Peters Township as "approved trout waters" and therefore receive stockings of trout at least once annually (PFBC, 2001).

The PFBC has performed a number of aquatic surveys and fisheries evaluation in the Upper Chartiers Creek Watershed. These evaluations included electrofishing surveys of Chartiers Creek, Little Chartiers Creek, and Canonsburg Lake. Surveys generally involve assessment of species composition, abundance, age structure, growth trends, and water quality. By evaluating these parameters the commission can determine if existing regulations and management strategies are in tune with agency goals and public expectations. Surveys on some water bodies may determine if a stream is to be stocked or if stocking is to cease.

The PFBC performed one such survey of Canonsburg Lake, located in Peters and North Strabane Townships. The survey yielded fourteen (14) species of fish. Assessment of the data diagnosed poor growth in some fish species, but exceptional growth in others. The assessment showed that Canonsburg Lake is among the regions best lakes for largemouth bass production (PFBC, 2000). Another survey in the Chartiers Creek mainstem near Canonsburg yielded fifteen (15) species. Recreational fishing opportunities in this section, however, are limited to common carp, white suckers, and several panfish species. The survey also revealed the presence of two darter species, usually intolerant of poor water quality (PFBC, 1995). Additionally, surveys along Little Chartiers Creek have been completed in the past to determine feasibility of stocking. Currently some sections are managed as put-and-take trout stocked fisheries.

5.3 Vegetation

The Upper Chartiers Creek Watershed is a part of the Western Allegheny Plateau (70) - Permian Hills (70a) and Monongahela Transition Zone (70b) Level III and VI Ecoregions of Environmental Protection Agency, Region 3. Ecoregions denote areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources; they are designated to serve as a spatial framework for research, assessment, management, and monitoring of ecosystems and their components. Ecoregions are directly applicable to the immediate needs of state agencies, including the development of biological criteria and water quality standards and the establishment of management goals for non-point source pollution (Woods et al., 1999).

The project area has a great diversity of vegetation, both native and exotic species. This diversity has occurred due to both natural (physiographic) and anthropogenic (man induced) reasons. The natural geology, soils, and climate support vegetation that survive and thrive in the region. When settlers arrived in the watershed, land was cleared for agriculture and timber. From the late 1800s (during the Industrial Revolution) to the present, land has been cleared for more intensive industrial, commercial, and residential purposes, as well as for surface mining activities. These intensive land uses have not only changed the landscape, but the vegetative communities that exist. Many studies have been performed to characterize the vegetation of the region from many perspectives. In general, the Chartiers Creek Watershed area can be described as being located in the Cumberland and Allegheny Plateau Section of the original Mixed Mesophytic (dry-loving) forest region.

The following are the dominant hardwood and softwood species in the region (Wagner, 1994):

- American beech (*Fagus grandifolia*)
- Tulip tree (Liriodendron tulipifera)
- Basswood (*Tilia sp.*)
- Sugar Maple (*Acer saccharum*)
- Sweet buckeye (Aesculus octandra)
- Red oak (Quercus rubra)
- White oak (*Quercus alba*)
- Eastern hemlock (*Tsuga canadensis*)

The following is a list of some of the exotic invasive species in Washington County (Hart, East, and Wagner, 2002):

- Canada thistle (*Cisium arvense*)
- Giant higweed (Heracleum mantegazzianum)
- Autumn olive (Eleabnus umbellate)
- Common reed (Phragmaties australis)
- Norway maple (Acer plantanoides)
- Silt grass (Microstegium vimineum)
- Japanese barberry (Berberis thunbergii)
- Dames rocket (Hesperis matronalis)
- Common buckthorn (Rhamnus cathartica)
- Poison hemlock (Cononium maculatum)
- Multiflora rose (*Rosa multiflora*)
- Tree of Heaven (Ailanthus altissima)
- Common privet (Ligustrum vulgare)
- Purple loosestrife (*Decodon verticillatus*)
- Japanese Knotweed (Polygonum cuspidatum and sachaliense)
- Japanese Honeysuckle (*Lonicera japonica*) (vine)
- Amur honeysuckle (shrub) (*Lonicera mackii*)
- Morrow's honeysuckle (shrub) (*Lonicera morrowii*)
- Tartarian honeysuckle (shrub) (*Lonicera tartarica*)
- Garlic mustard (Alliaria officinalis)
- Crown vetch (Coronilla varia)
- Oriental bittersweet (*Celastrus orbiculata*)

A recent investigation performed by the Western Pennsylvania Conservancy (Wagner, 1994), involved the Natural Heritage Inventory for Washington County. The inventory describes the vegetative community as transitional in the Chartiers Creek watershed. This is because many areas in Washington County are reverting from past land uses (e.g., agricultural use) to forest. However, this does not mean that these transitional areas are reverting to historical vegetative communities, instead a hybrid or mixed composition of species that includes native and exotic-ornamental species is developing.

5.4 PNDI Species

The species of special concern (threatened and endangered species) listed below are tracked by the state and federal natural resource agencies in the Pennsylvania Natural Diversity Inventory (PNDI) program (PADCNR, 2000; PFBC, 2000; and PGC, 2000). The species listed in Table 5-A are reported to occur in or near the Upper Chartiers Creek Watershed boundaries in Washington County, PA. It is a matter of policy for the resource agencies not to provide specific site location information in order to provide a level of protection to these organisms and their critical habitats.

The state natural resource agencies are to be contacted if any land disturbance activities are planned within the watershed.

Table 5-A
PNDI Species of Special Concern

Common Name	Scientific Name	Last Observed
Plants		
Snow trillium	*Trillium nivale*	4/02/1997
Gray headed prairie coneflower	*Ratibida pinnata*	7/17/1946
Wild hyacinth	*Camassia scilloides*	5/28/1947

5.5 Important Habitats

5.5.1 *Riparian Forest Buffers and Wetlands*

Riparian forest buffers (the land that borders and interacts with a river, stream, lake, or coastline) and wetland habitats (0.2% of the study area's landcover) are very important areas in all watersheds for a number of reasons (Refer to Maps 2, 3, and 5, and Appendix 2). First, these habitats are transitional areas (ecotones) between the terrestrial and the aquatic portions (the receiving stream) of a watershed. These areas have direct interaction between terrestrial and aquatic ecosystems. Riparian and wetland areas can vary in size, diversity, and complexity. Riparian zones, wetland complexes, and floodplains are found to exist together in the natural environment. Riparian zones act as transportation corridors, integral and diverse habitats for wildlife and fishes (bio-diversity), high production areas for timber and food, and are important recreational areas. Wetlands serve much the same type of function as riparian zones plus they trap sediments, nutrients, pesticides, and they regulate flood/storm events.

Second, these areas are important from the watershed and fisheries management perspectives because streamside vegetation controls erosion and sedimentation, thus controlling streambank stability/channel morphology. These areas also add large, woody debris to streams, which create habitat and microhabitat for insects, wildlife, and fishes. Riparian zones and wetlands assist in moderating environmental conditions for wildlife, fishes, and humans. These areas assist in controlling the temperature of streams; where sediments, nutrients (phosphorus and nitrogen), and pesticides are deposited; and where energy from floodwaters dissipate (American Fisheries Society, 1997; Orth and White, 1999; and Wesche and Isaak, 1999).

In areas of a watershed where healthy riparian zones and wetlands occur, the environmental health will be better than in degraded riparian portions of the same watershed. In the Upper Chartiers Creek Watershed environmental and physical infrastructure impacts occur in relation to subdivisions and industrial/commercial development. The protection of remaining riparian zones and wetlands in the watershed is important (via improvements to municipal zoning codes – i.e., model riparian buffer ordinances) in order to achieve goals for water quality and erosion control in the watershed. Projects that promote the establishment of riparian buffers will assist in maintaining the aesthetics of the watershed as well as promoting environmental health.

5.5.2 *Forest*

Forest systems in the project area are very important habitats as well (Refer to Map 3, and Appendix 2). Forest is the second most dominant landcover type in the watershed at 40.65%. Forest habitat helps to maintain a healthy environment by adding barriers to pollutants that run off the land into adjacent streams. In many locations of the watershed, upland or steep sloped forests continue downslope to riparian/wetland habitats, thus helping to maintain a healthy environment for those important habitats. Additionally, forest habitat acts as shelter and produces forage for various types of wildlife species, provides needed recreational opportunities, and provides timber and jobs to the local economy. By improving and connecting riparian and upland forest systems, the aesthetics of the watershed improve and so will the environmental health of the watershed's land, stream, and biological resources. By encouraging forestry techniques (via improvements to municipal zoning codes – i.e., model forest timbering ordinances) that involve conservation principals and the restoration of degraded forest communities in the watershed, the quality of life for local citizens will also improve as well as maintaining a vital part of the local economy.

5.5.3 *Natural Heritage Areas*

The 1994 Natural Heritage Inventory (NHI) for Washington County identified and mapped significant natural areas of the county (Refer to Map 9). These investigations identified flora (plant) and fauna (animal) species and communities that are unique and/or uncommon. The NHIs also note areas of general wildlife habitat, educational value, and of scientific importance. The objective of the NHI is to provide information that can be utilized in planning for the protection of the biological diversity and ecological integrity of the county (Wagner, 1994). The areas in Table 5-B and graphically represented in Map 9 are noted for their significance in the Upper Chartiers Creek Watershed. Only three sites in the Upper Chartiers Creek study area are identified in the 1994 Natural Heritage Inventory for Washington County. These sites are Murray Hill Bend Biological Diversity Area (BDA), the Chartiers Creek Valley BDA, and the Canonsburg Lake Slope BDA.

A process of gaining this formal dedication is through the designation of these areas as Natural Areas. A natural area is an area of unique scenic, historic, geologic, or ecological value that will be maintained in a natural condition by allowing physical and biological processes to operate, usually without direct human intervention. These areas are set aside to provide locations for scientific observation of natural systems, to protect examples of typical and unique plant and animal communities, and to protect outstanding examples of natural interest and beauty. Guidelines governing the administration of Natural Areas are as follows (PADER, 1979):

- No human habitation, except primitive type; backpack camping in designated areas only.
- Access restricted to foot trails.
- Buildings and other improvements restricted to the minimum required for public health, safety, and interpretive aids.
- Timber harvesting prohibited except that required for maintenance of public safety.
- Rights-of-way, leases and mineral development prohibited.

Table 5-B
Natural Heritage Inventoried Resources

Site Location	Description
Murray Hill Bend BDA	**Floodplain habitat of the largest known population in the county of an animal of special concern in PA.**
Chartiers Creek Valley BDA	**One of the most mature sections of forest in the Chartiers Creek Valley.**
Canonsburg Lake Slope BDA	**Habitat for a rare plant in Pennsylvania.**

6 Cultural Resources

6.1 Recreation

Passive recreational uses and activities available within the Upper Chartiers Creek Watershed can include, but are not limited to, hiking, biking, cross country skiing, hunting, fishing, bird watching, photography, camping, canoeing, horseback riding, gardening, and swimming. Many of the passive recreational activities are currently being enhanced due to rails-to-trails and water quality improvement projects. Opportunities abound for further enhancement and/or improvement to the various natural resources in the watershed (Refer to Map 9, and Appendix 3). These improvements are already occurring in the Upper Chartiers Creek Watershed and can continue to be made by watershed stakeholders utilizing various programs that are available from private organizations (e.g., foundations and trusts) and public agencies (e.g., state and federal).

The following is a list of completed or on-going recreation projects:

- Washington Co. Comprehensive Recreation, Park, & Open Space Plan
- Canton Township – Purchasing 60-acres for a new park
- Houston – Development of a borough recreational facility
- North Strabane – Development of a Municipal Center Park
- South Strabane – Development of Zediker Station Park

6.1.1 *Parks / Rails-to-trails / Greenways*

Parks

Twenty-six (26) community and county owned park/recreational facilities, and seven (7) golf courses exist within the Upper Chartiers Creek Watershed (SPC, 2001). Many of these parks can be characterized as community parks that are associated with schools and have jungle gyms, basketball courts, soccer, softball, baseball, and football fields. These parks are geared towards school or municipal active recreation programs.

The watershed's parks, which vary in size and use, have become very popular with naturalists (Refer to Map 9). The National Road Heritage Park spans numerous communities and follows the Route 40 (National Road) corridor. This park was established to promote Pennsylvania's rich industrial heritage. Additionally, it is hoped that it would spur regional economic development, cultural and historic conservation, and opportunities for recreation and education (Pashek, 2000).

Table 6-A lists the designated park and recreational facilities of the Upper Chartiers Creek Watershed.

Table 6-A
Community Parks and Recreational Facilities

Municipality	Recreational Properties
Amwell Township	None
Buffalo Township	None
Canonsburg Borough	Canonsburg Borough Park, Canonsburg Playground, Falconi Field, Memorial Stadium
Canton Township	Canton Township Ballfield, Polish-American Beneficial Society of Washington
Cecil Township	Holy Rosary Park, Southpointe Golf Club
Chartiers Township	Washington County Fairgrounds
East Washington Borough	None
Green Hills Borough	Lone Pine Golf Club
Houston Borough	Houston Ballfield
Mt. Pleasant Township	Mt. Pleasant Township Park, Village Green Golf Course
North Bethlehem Township	None
North Strabane Township	Meadows Race Track, 84 Lumber Company Park, North Strabane Township Park, Borland Ballfield, Lindenwood Golf Course, Maggi's 8ighty-Four Golf Course
North Franklin Township	Trinity High School Ballfield
Nottingham Township	United Presbyterian Church Ballfield
Peters Township	Peters Township School Ballfield, Peters Lake Park
Somerset Township	None
South Franklin Township	South Franklin Township Park
South Strabane Township	Washington County Fairgrounds, Eighty-Four Youth Park (#1), Eighty-Four Youth Park (#2), Washington Park, Zediker Ballfield, Driscoll Park, Streater Park, Lakeview Park, South Strabane Township Park, Washington Country Club
Washington (City of)	Washington Park, National Road Heritage Park

Rails-to-trails

Abandoned railroad beds provide a unique opportunity for communities and environmental groups to develop trails for walking, biking, rollerblading, horseback riding, snow shoeing, and even cross-country skiing. Rails-to-trails provide an alternative to common transportation options as well as providing safer recreational opportunities due to the absence of vehicle traffic. Additionally, many abandoned rail corridors provide beautiful scenery and a relaxing atmosphere as a result of the many lengthy stretches of rural and wooded areas through which they pass (Allegheny Land Trust, 1999). There are two existing and one proposed trails facilities located in and/or adjacent to the Upper Chartiers Creek Watershed (Refer to Map 9). When completed, these trails will provide an exciting opportunity for a unique recreation choice for residents and tourists.

The Montour Trail is the most developed trail within the "entire" Chartiers Creek Watershed. Presently there is an abandoned railroad spur, which leads into the Upper Chartiers Creek Watershed through Mt. Pleasant Township. This railroad spur is not presently identified by SPC due to this railroad spur being abandoned and is thus not identified on Map 9. However, this abandoned railroad spur may be a good candidate for a connection to the Montour Trail. At present this area serves as open space and/or a greenway.

When completed, the Montour Trail will be a part of a complex of trails that stretch from Coraopolis, PA to Washington, D.C. The trail covers 54 miles of abandoned railroad right-of-way from the Montour Railroad in Allegheny and Washington Counties. The trail is completed in several sections, which total approximately 24 miles, with the right-of-way secured for its overall development. Additionally, feasibility studies have been completed and major funding sources are secured to complete sections just outside of the watershed. The Montour Trail Council was just awarded additional funding from the Transportation Equity Act for the 21st Century (or more commonly known as TEA 21) for construction of 3 more sections in the project area.

The National Pike Trail is not a rail-trail but a pedestrian and bicycle trail that follows Route 40, the "National Pike". This trail enters Pennsylvania from West Virginia near West Alexander, PA and proceeds east entering the Chartiers Creek Watershed near Sugar Hill, PA at the Buffalo and North Franklin Township's border. The National Pike Trail ends in Washington, PA (Refer to Map 9).

The Chartiers Creek Trail is a proposed trail that would extend northward from the Montour Trail to the confluence of Chartiers Creek and the Ohio River. It will also connect to the Panhandle Trail and the Three Rivers Heritage Trail. This newly proposed trail was recently awarded funding from the TEA 21. It is in the process of having a feasibility study completed so implementation actions can then be completed. The first segment to be planned is a 8 mile segment from East Carnegie to the Ohio River. Another 1.4 miles of trail has been funded for construction in Crafton Borough. Currently, this proposed trail is not planned to extend further into Washington County and the Upper Chartiers Creek Watershed. Finally, there is also an area along Chartiers Creek in the Chartiers-Houston School District that could also have a feasibility study completed to be incorporated into this larger trail system.

Greenways and Conservation Areas

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 wide corridors that incorporate diverse natural, cultural, and scenic features. Greenways can be land-based or water-based, running along stream corridors, shorelines or wetlands. Some follow old railways, canals, ridge tops, or other features. They can incorporate both public and private property. Some greenways are primarily recreational corridors, while 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 network will protect natural, cultural and scenic resources, provide recreational benefits, enhance the natural beauty and the quality of life in neighborhoods and communities, and stimulate economic development opportunities (Ramey, 1995 and The Pennsylvania Greenways Partnership, 1998).

The benefits of greenways have been well known and documented. These benefits can be thought of as functions. The six economic functions of greenways include: real property values, expenditures by residents, tourism, corporate relocation, public cost reduction, and intrinsic value (National Park Service, 1990). The functions help to attract people and businesses to an area because it is an attractive area to live and work. The natural functions of a greenway can also assist in reducing community infrastructure expenditures, thus reducing maintenance to facilities. Thus greenways also improve the economic conditions in an area that has an established greenway. The six natural functions of greenways include (J.M. Labaree, 1992):

- Habitat
- Filter
- Barrier
- Conduit
- Source
- Sink

These functions help to maintain the environmental health of an area by creating habitat for organisms, travel corridors for wildlife, barriers that prevent migration, filters that purify water quality, sources of purified water/food for organisms, and sinks to trap sediments, nutrients, and toxins. Greenways, which are associated with stream and river corridors, help to connect fragmented areas/habitats and are reduce flood water impacts.

Pashek Associates in the Washington County Comprehensive Recreation, Park, and Open Space Plan (2000) noted that the northern most area in the Upper Chartiers Creek Watershed near the confluence of Chartiers and Little Chartiers Creeks and downstream is an area for a future Greenway opportunity. This area could be connected with other similar areas in the Lower Chartiers Creek Watershed (e.g., Mayview State Hospital, Upper St. Clair's Boyce/Mayview Park, Allegheny Land Trust's upper St. Clair Property [former Wingfield Pines Golf Course site], Bridgeville's Chartiers Park, etc.).

Other potential greenways are the Murray Hill Bend BDA, and Canonsburg Lake Slope BDA as noted in the Washington County Natural Heritage Inventory (Wagner, 1994).

Recently, conservation groups have moved toward improving the natural/aesthetic aspects of local communities by encouraging greenway concepts in their activities and projects. These were started with the hope that governmental entities would acknowledge the economic, environmental, recreation/ transportation, and educational benefits of greenway and greenway concepts. Proposed greenway corridors would utilize existing, public, parkland, openspace, and forested areas in the watershed. The following list of properties are held in trust in the Upper Chartiers Creek Watershed:

- Allegheny Land Trust – Linder Farm (easement -103 acres)
- Allegheny Land Trust – Moreno Property (owned - 68+ acres)

6.2 Archaeological / Historical

6.2.1 *Archaeological*

Archaeological sites exist within the study area boundaries. These sites involve the location of past human activity, marked by the presence of artifacts or cultural features. Archaeological sites can date from as early as 10,000 B.C. to as late as the 20th Century. It is the policy of the Pennsylvania State Historic and Museum Commission (PHMC) not to disclose the location of sites for their own protection.

6.2.2 *History*

Chartiers Creek is the first major watershed downstream of the City of Pittsburgh. The confluence of the Allegheny and Monongahela Rivers forms the Ohio River. These rivers were and are important transportation corridors. The greater Pittsburgh area was an attractive location for Native Americans for the past 12,000 years. The Chartiers Creek drainage saw intermittent use as hunting and gathering territory from at least 10,000 B.C. to 1,000 B.C. After that point, burial mounds and more substantial residential sites began to appear, culminating in the large fortified villages of the horticulture-based Monongahela culture, ca. A.D. 1000-1650. In the mid-1700s, the Chartiers Creek drainage was traversed by the Catfish Path, which ran from present day Washington to the Forks of the Ohio River. The trail crossed the creek near present day Canonsburg and again near Bridgeville. The camp of a Delaware chief named Catfish (Tingoocque) had been established by 1769 near the present location of Washington, PA. In this period, the region was occupied by a mixture of Delaware, Shawnee, Seneca, Susquehannock, and other, less known tribes of the interior (Wallace, 1987).

Chartiers Creek is named after Pierre Chartiers, a trapper of French and Indian parentage, who spied for France while living in Philadelphia. After leaving Philadelphia, he established a trading post at the mouth of Chartiers Creek in 1743 (City of Pittsburgh, 1999). Much of the Chartiers Creek Watershed was settled by Anglo-Europeans prior to and after the American Revolution. At that time, the watershed had an agrarian-based economy. In 1760 the first mining of coal occurred in the watershed, with the mining of the watershed's most valuable natural resource, the Pittsburgh Coal seam. Washington County, in 1977, led Pennsylvania coal-producing counties with a total production of approximately 11 million tons. Major industries in the watershed's recent past were steel manufacturing, mining, wholesale and retail trade, transportation, agriculture, and construction. Today, steel manufacturing and mining are no longer major industries.

6.2.3 *Historical*

Historic resources include, or can include, standing structures (e.g., houses, barns, grist mills, etc.) and/or remnants of other built environments (e.g., dams, bridges, railroads, etc.). These resources are generally over fifty years old. There are sixty-one (61) historic properties listed as National Register Listed and Eligible properties in the project area by the Pennsylvania Historical & Museum Commission. (PHMC, 2001). Other potential historic properties may exist within the watershed but have yet to be identified and listed by their owners for such a designation. Table 6-B lists the historic properties in the Upper Chartiers Creek Watershed (Refer to Map 9).

Table 6-B
National Register Listed and Eligible Historical Properties

Municipality	Historical Properties
Amwell Township	1096 National Pike East Leslie Carron Tavern Stable Hootman Historic District Moses Little Tavern
Canonsburg Borough	309 Belmont Avenue Canonsburg Armory Colaizzo Building Hawthorne School Marline's Old Jefferson College Building Roberts House
Cecil Township	Hiskman Property Oil Resource D Oil Resource K Oil Resource L State School, Western Center
Chartiers Township	Pennsylvania Trolley Museum Washington County Home John White House
North Bethlehem Township	Frank L. Ross Farm
North Strabane Township	264 Munce Road Samuel Brownlee House Lindley Mine Alexander Quail House James Thome Farmstead
South Strabane Township	387 Zediker Station Road 1595 E. Beau Street 951 National Pike East Bail House Doak/Little House Iams Macbeth House Martin Farmstead Munce/Barnyak House
Washington City	17, 19, 21 E. Spruce Street 424 E. Main Street 520 South Main Street 85 Highland Ave. Administration Bldg, W&J College Baltimore & Ohio Passenger Station David Bradford House Chestnut Street Bridge Washington County Courthouse George Property George Washington Hotel William Henry Hotel Independent Oil Company Dr. Julius Lemoyne House Main Street Historic District Dr. Joseph Maurer Observer Reporter Publishing Co. Original Pony league Baseball field Pennsylvania Railroad Freight Stn. Sackville House Scott Motor Co. Sixth Ward School St. Paul Ame Church W & J College Historic District Washington Armory Washington County Jail YWCA of Washington

The historic properties are identified with numbers and are labeled to correspond to mapping found in Map 9a.

6.3 Educational

The following nine Public School Districts, 3 Parochial Schools, and two Private Schools are located in the Upper Chartiers Creek Watershed:

- **Bentworth School District**
- **Canon-McMillan School District**
- **Chartiers-Houston School District**
- **Fort Cherry School District**
- **McGuffey School District**
- **Peters Township School District**
- **Ringgold School District**
- **Trinity Area School District**

Two Pittsburgh Diocese Schools (St. Patrick's Elementary and John F. Kennedy, Jr. Grade School)

Four Private Schools (Central Christian School, Faith Christian School, Living Waters Christian Academy, and Children's School of Washington)

Washington and Jefferson College, California University of Pennsylvania, and Waynesburg College (the latter two with Southpointe Branch Campuses) are presently the higher educational facilities that are located in the Upper Chartiers Creek Watershed (Pashek Associates, 2000).

Adult and youth environmental educational opportunities exist in the Upper Chartiers Creek Watershed through the college and university, school districts, volunteer activities, Washington County Watershed Alliance (WCWA), and the Chartiers Creek Watershed Association (ChCWA) (Refer to Map 9). These opportunities are linked to schools, WCWA, and ChCWA. These activities consist of, but are not limited to, water quality monitoring, the "Washington County Children's Groundwater Festival", natural heritage education, nature hikes, and community projects. Many schools have made volunteer activities a component in the educational experience. Student participation has expanded due to these types of volunteer activities.

6.3.1 *Watershed Conservation Groups*

Within the "entire" Chartiers Creek Watershed several community oriented conservation groups have formed to promote the conservation of natural resources and the education of stakeholders involving environmental issues. These groups promote community involvement and create stakeholder interest within the watershed by promoting volunteerism, increasing community awareness, and providing environmental education. As environmental concern within the project area increases, membership, involvement, and interest should incur a similar growth. The following groups have formed to facilitate conservation and water quality improvements or have participated in such activities in the Chartiers Creek Watershed (PADEP-WRAS, 2001):

- Chartiers Creek Watershed Association
- Chartiers Creek Watershed Coalition
- Chartiers Nature Conservancy
- Chartiers Valley School District
- Lower Chartiers Watershed Council
- Mt. Lebanon Nature Conservancy
- Scott Conservancy
- USC (Upper St. Clair) - Citizens for Land Stewardship
- Washington County Watershed Alliance

WCWA is designed to enhance and coordinate the activities of individual watershed associations within the Washington County, not just the portion in the Chartiers Creek Watershed. WCWA's purpose is to promote the conservation of the natural resources of the watersheds, and to improve the land and water quality of the watersheds within Washington County, including both surface water and groundwater resources, and to support sound agricultural activities, encourage sustainable land use, and the protection and preservation of agricultural lands.

WCWA has sponsored an environmental outreach program since it's founding, and has expanded the program each year. The program involves a presentation of the issues and concerns of the Chartiers Creek Watershed and Washington County. Presentations have been made to schools, community organizations, and local fairs. Continued promotion of the activities in this plan and other activities being accomplished by organizations and communities of the watershed are important. One method of promoting environmental education within the watershed would be by utilizing local and regional media outlets. By further enhancing the existing programs and implementing new programs and facilities, citizens of the watershed will have a deeper understanding of where they live, work and play.

Additionally, WCWA performs the following activities:

- Water quality monitoring and other research related to natural resources conservation;
- Assistance and support for watershed groups that belong to the Alliance, including assistance with grants and funding and development of watershed management plans;
- Resource library, including information about federal and state programs and sources of funds for watershed projects.
- Educational activities of the Alliance are managed by the Groundwater Policy Education Committee, which is a permanent committee of the Alliance;
- Educational/outreach activities have included:
- Presentation of slide and video programs and displays for school and community groups;
- Water testing and screening;
- Publishing brochures, fact sheets and a quarterly newsletter, *WATERSHED CONNECTIONS*;
- Planning and presenting the annual "Washington County Children's Groundwater Festival"; and
- Holding training workshops for volunteer groups.

7 Issues, Constraints, and Opportunities

The Upper Chartiers Creek Watershed is experiencing varied combinations of environmental *issues*, and ecological and recreational *opportunities*. Major issues, constraints, and opportunities within the Upper Chartiers Creek Watershed are typical of water quality and watershed planning concerns in the region. During the data collection and analysis portion of the River Conservation Plan, several of the issues and opportunities stood out to be significant.

Watershed issues were the prinicpal topic of a public meeting held on November 14, 2001. Those attending that meeting participated in a visioning session that identified positive and negative aspects to the watershed (Refer to Appendix 1). Negative aspects to the watershed included the need for storm water management, loss of groundwater recharge areas, lack of media base and public education, long-wall mining, abandoned mine drainage, nutrients, sedimentation, and lack of or out dated zoning and comprehensive planning, amongst others. Some of the positive aspects included a lot of green space, the existence of a number of conservation organizations, the area's four colleges, recreational opportunities, diversity in land use, and a belief that preservation is possible, amongst others.
Two issues top the list as the most detrimental to the overall condition of the Upper Chartiers Creek Watershed;

1. Non-point source water pollution from developing areas and the resulting land use activities is a significant issue in the watershed. The most prevalent forms of non-point source pollution in the watershed are;
    - Habitat modification (i.e., erosion/sedimentation, storm water management, etc.)
    - Nutrient enrichment
    - Sewage waste
    - Abandoned mine drainage (AMD)

2. The increase of urban sprawl without sound land use safe guards in place (i.e., zoning, comprehensive planning, Intermunicipal Cooperation) is also an issue.

Other *issues* were also found in the watershed but will have less of an impact to the watershed's communities and environment. However, the issues are still important to correct at a local or site specific level. In the watershed there are also many *opportunities* such as improving recreational facilities, protecting and enhancing conservation and historic properties, and enhancing environmental education.
The data collection and analysis provided in Sections 1 through 6 have assisted in the determination of the following significant issues and opportunities in the Upper Chartiers Creek Watershed. What follows in Sections 7 are the specific issues as a result from Sections 1 through 6. The sub-section numbers of the issues in Section 7 correspond with the Recommendation Management Options in Section 8.

7.1 Project Area Characteristics

7.1.1 *Sprawl*

Water quality degradation from sprawl and habitat modification is observed in the northern and southern portions of the project area (Water Quality Management Units A, B, D, and E, Refer to Maps 3 and 5). Sprawl also consumes 'greenfields', which are lands suitable for development but have yet to experience the effects of development.

7.1.2 *Zoning and Comprehensive Planning*

Zoning and zoning-related problems are common in southwestern Pennsylvania. The municipal fragmentation of the Commonwealth and lack of statewide mandates related to land-use can create long-term problems unless local governments address the problems created by poor land-use planning.

However, Pennsylvania's commitment to comprehensive watershed planning provides local governments an excellent opportunity to work together as partners under an over-arching inter-municipal framework. This plan is the first step in that direction. By coordinating as a watershed unit, municipalities can address potential environmental, economic and public health concerns in such a way that a positive step in one area can benefit others elsewhere.

Intermunicipal Cooperation (or Partnering) is a process where municipal governments and local organizations work together to improve local conditions such as infrastructure, environment, and education. To solve a common problem throughout the entire length of a sub-basin, communities and organizations must work together to address the situation.

Of the 19 municipalities within the watershed, 15 are known to have zoning ordinances, 2 are known not to have ordinances and 1 is undetermined. Only 8 of the 19 have subdivision and land development ordinances and 5 of the 19 municipalities have comprehensive plans.
The zoning ordinances are vague in their description of policies dealing with natural resource protection. Few statements within the ordinances directly address methods and regulations that would protect natural resources.

The comprehensive plans were more in depth when describing community actions that could be taken to increase the protection of the local resources. Nevertheless, these plans could be improved by adding further information into the plan (i.e., model ordinances).

7.1.3 *Transportation Facilities*

While the existing roadway network provides access to almost all areas of the watershed, expanding development and growth within the northern and southern portions of the project area continue to necessitate improvements to the transportation system. The Southern Beltway project is the major on-going activity in the project area that will affect socioeconomic and environmental activities (Refer to Map 7), (PTC, 1997 and PTC, 2000).

It is extremely important for ALL of the communities within the watershed to have appropriate zoning ordinances in place to protect each communities' resources and character before the construction of the Southern Beltway.

7.2 Land Resources

7.2.1 *Farmland and Prime Farmland Soil(s) Protection*

The protection of farmland and prime farmland soils at the municipal level is an important issue in the Upper Chartiers Creek Watershed since agriculture is a major land use activity (44%) and industry.

7.2.2 *Critical Areas - Stream Access and Visibility and Stream Visibility Areas*

The formation of Stream Access and Stream Visibility Areas are opportunities to be taken advantage of within the study area. Having access to the watershed's streams is one way that people have to interact with nature.

7.2.3 *Unregulated Waste*

Illegal, roadside waste dumping and litter is a problem in many areas within the watershed. Automobile junkyards, located within the watershed impact the environmental and human health of the watershed and its inhabitants, as well as being visually unpleasant.

7.2.4 *Waste Sites - Molycorp, Inc. and Canonsburg Sites*

Molycorp, Inc. Site: This site is to be decommissioned in the future as per the Decommissioning Plan Part 1 and Part 2, and its amendments. A detailed schedule of the excavation and transport activities will be provided in the Decommissioning Plan Part 2 [Projected Date of October 2002] (Radiological Services, Inc., 1999). The projected October 2002 decommissioning date most likely will not be met. Therefore, the NRC and Molycorp, Inc. are currently in the process of determining a revised schedule to move the decommissioning of this site forward.

Canonsburg Site: This site has been cleaned up and the radioactive materials have been disposed of on site in an engineered disposal cell. This facility is owned, operated, and inspected by the United States Department of Energy (USDOE) as part of their Long Term Surveillance and Maintenance Program (LTSM). The 1999 compliance report states that the facility is in excellent condition and met all compliance requirements, as per the LTSM. This report also states that groundwater monitoring is continuing at the six wells on site as well as the surface water in Chartiers Creek. The report states that the LTSM requires water sampling of the six wells and three surface sampling locations two years following licensing of the site by the NRC. This two year monitoring requirement was met, however, due to the concentration of uranium in some wells being above the EPA Maximum Concentration Limit (MCL), USDOE continues to monitor the wells on an annual basis. It was found that…"Uranium was detected above the MCL at two down gradient wells, however it dropped below the MCL at the cross gradient well." Additionally…"USDOE considers the risk associated with the uranium in groundwater to be negligible and insignificant in that groundwater 1) is institutionally controlled, and 2) has no detectable effect on the chemistry of water in the creek." (USDOE, 1999). More information on this issue can be found by contacting the PADEP and the USDOE.

7.2.5 *Oil and Gas*

The study area has 203 known oil and gas wells. The abandoned and orphaned wells are an issue in the study area. As of December 10, 1997, 131 orphan wells have been identified in Washington County. One of those has been plugged since the program began. Many more abandoned wells are known to exist but have yet to be identified. These historic wells date back to when no records were required. The PADEP plans to plug 13 additional wells in the near future (PADEP, 1999). (http://www.dep.state.pa.us/dep/deputate/polycomm/update/10-22-99/10229910.htm).

7.2.6 *Deep Mining*

Deep mining (longwall mining) is a controversial and critical issue within the watershed. There are currently 3 underground mining operations partially

located in the study area (the Eightyfour Mine, the Maple Creek Mine, and the Mathies Mine). Like many human activities, underground coal mining cannot be conducted without some impact on the environment. Potential impacts are to surface structures; hydrologic features such as groundwater (wells and springs) and surface waters (streams and lakes); and surface lands. Deep mining is a critical issue in Washington County for both rural and urban areas. However, there is no agreed upon solution or management option for this involved regional issue.

7.2.7 *Abandoned Mine Land Restoration*

Abandoned mine land features, which can be found in a number of locations in the study area, are an issue (Refer to Map 8). Because these locations are frequently near streams, water pollution issues almost always exist at or near these sites.

7.3 Water Resources

7.3.1 *Groundwater*

The protection of groundwater is an important issue in the study area. Poor water quality can be attributed to both human causes and natural causes. The most severe pollution problem in Washington County is caused by abandoned deep mine drainage discharges to surface waters. Oil and gas production have been either abandoned or orphaned. Government agencies are becoming increasingly active in the prevention of pollution to water supplies. Most pollution gets into the groundwater from factors on the surface. For this reason, surface water quality monitoring is a valuable tool for indirectly addressing groundwater quality issues. As of the date of the 1973 groundwater study, overdrafting of groundwater, in and of itself, had not posed any major problems because of the small amount of the resource used in the area. This, however, is probably no longer the case due to the increases in development throughout the watershed during the 19 years since the study was completed.

7.3.2 *Lakes and Ponds*

There are numerous lakes, ponds, and reservoirs within the Upper Chartiers Creek Watershed including numerous small farm ponds and sedimentation structures that are utilized mainly for cattle water supply, soil conservation practices, and fire insurance protection. Lakes or ponds comprise 321 acres of the project area.

The major opportunity to be gained from the watershed's lakes and ponds is at Canonsburg Lake. The Pennsylvania Fish and Boat Commission (PFBC) records indicate that anglers underutilize Canonsburg Lake. The largemouth bass fishery would probably be ranked among the best in Area 8 of the PFBC.

7.3.3 *Wetlands*

Please refer to Section 5.5.1.

7.3.4 *Floodplains*

The protection and preservation of floodplains and their associated stream corridor is essential. Flooding, especially flooding within a developed floodplain, results in loss of housing, economic productivity and degraded human health. Five flood prone areas are located in sub-basin #1 (Chartiers Creek) and three floodprone areas are located in sub-basin #2 (Little Chartiers Creek). These

priority flood prone areas are located near community infrastructure and residential/commercial properties.

7.3.5 *Water Quality*

Water quality improvement is the focus of this plan. Development within the watershed has increased water pollution; unless proper management practices are adopted, future economic development may cause the quality of the water supply to deteriorate. Data collected demonstrates that approximately 77% of the project area streams are impaired per PADEP water quality standards. The major water quality problems in the project area are:

- Habitat Modification
- Nutrient Enrichment
- Abandoned Mine Drainage
- Sewage

7.3.6 *Pollution (Point and Nonpoint Sources)*

Abandoned Mine Drainage (AMD)
Made up of numerous water quality parameters and can differ from discharge to discharge, AMD water quality degradation was found in the streams of sub-basins 1, 3, 5, 8, and 9, and Management Units C, D, and E of the study area (Refer to Maps 5 and 8). The PADMMI – Chartiers Creek Watershed, Allegheny & Washington Counties, Abandoned Mine Drainage/Abandoned Mine Drainage Pollution Study, identified a total of two hundred and thirty-three AMD pollution sources located in the Chartiers Creek Watershed. Of these, only six were found to occur within the project area.

Sewage
Predominantly composed of wastewater, feces, and particulate matter. Sewage is a source of pollution in the Upper Chartiers Creek Watershed that is a major contributor to the overall water quality problems. Sewage water quality problems are observed in Management Units B and E (Refer to Map 5).

Nutrient Enrichment
A water quality problem associated with the lack of agricultural conservation practices, leaking septic systems, and uncontrolled fertilizer application (e.g., golf courses, parkland, home gardens, etc.). Nutrient enrichment is a major source of water quality pollution in the project area (Refer to Map 5, Management Units B, E, and F). In portions of the project area, as improvements are made to the AMD issue, nutrient enrichment water quality pollution sources will become more pronounced.

Habitat Modification
A designation given to streams that are impacted due to one or more water quality parameters that alone or together degrades the habitat, stream structure, and the environment for benthic organisms and fish. Habitat modification is the major problem in the watershed. Remediation projects could be identified in specific areas that exhibit modified stream habitat and conditions.

PADEP has an existing stormwater permitting program for certain storm sewer systems, industrial stormwater dischargers and stormwater from construction sites. In 1999, the EPA Phase II Stormwater Regulations were published. The regulations extend the stormwater permitting requirements to sources that were not subject to Permitting in the Phase I program. The Phase II program expands

the NPDES permit requirements to most municipal separate storm sewer systems (MS4) in urbanized areas, provides for some programmatic changes to the Phase I industrial stormwater regulatory program, and requires permits for stormwater discharges from construction activities disturbing more than one acre. The MS4 program is changing how stormwater issues are dealt with and permitted within the watershed. The MS4 permit requirements take effect on December 8, 2002 (PADEP, 2001).

Stream Flow Gauging

Currently only one stream flow gauging station is operated within the Chartiers Creek Watershed (USGS, 1999). This station provides hydraulic data that is utilized by various entities for planning and flood protection purposes. For real time stream gauging flow data for Chartiers Creek at the Carnegie, Pennsylvania USGS gauging station, visit the USGS website at:

http://pa.waterdata.usgs.gov/nwis/help/?redirect=rt_www_redirect&station=03085500

7.3.7 *TMDL*

The PADEP has determined TMDLs for Chartiers Creek. The main stem of Chartiers Creek is listed as being contaminated with PCBs and chlordane. These contaminants are the main focus of the TMDL for Chartiers Creek.

The use of PCBs and chlordane has been banned in the United States. This demonstrates that there will be no new point sources of these chemicals. The levels of PCBs and chlordane are expected to decline by natural attenuation (covering of contaminated sediments and/or flushing of sediments in high stream flow). Natural attenuation seems to be the best implementation method available due to the decreased amount of habitat degradation, and the significantly decreased cost (PADEP, 2001). TMDLs will become an important issue and regulatory tool for the state and federal resource agencies in protecting and improving the water resources in the Chartiers Creek watershed.

7.3.8 *Water Supply*

The water supply issue will continue to rise on the priority list because of increased demand for fresh water and continued non-point source pollution. Water supply demands are continually increasing as more and more people that have moved into the watershed to live and work.
As the Southern Beltway Project moves towards the construction phase, and more developmental activities occur, water supply will become a more critical issue.

7.4 Biological Resources

The existing ecological attributes provide for numerous opportunities to the residents and municipal officials of the project area.

7.4.1 *Wildlife Species Management*

A concern in portions of the project area has been white-tailed deer population increases and the subsequent negative interactions that occur with humans; particularly damage to landscaping and collisions between deer and motor vehicles.

Another concern in the project area is the protection of the Great Blue Heron Rookery. Great Blue Herons are listed by the Pennsylvania Game Commission (PGC) as a "species of special concern," because Great Blue Herons are colonial nesters. Land development of their nesting habitat could have a major impact on the rookery population.

7.4.2 *Habitat Enhancement*

The opportunity exists within the watershed for citizens to play an active role in habitat enhancement for both game and non-game species. As urban sprawl continues to encroach on natural wildlife habitats, many species may become dependent on suburban landscapes as a refuge. Additionally, numerous exotic invasive vegetative species have been planted and colonized throughout the watershed. An opportunity exist for local landowners in enhancing their own backyard habitats by eliminating exotic invasive plant species that may be negatively impacting native vegetation. A partial list of these species is listed in section 5.3 Vegetation.

7.4.3 *Riparian Forest Buffers, Wetlands, and Forest*

The protection of riparian zones, wetlands, and forest in the watershed is important in order to maintain the environmental health of the watershed. It also assists in improving the aesthetics of the watershed and makes the area more appealing to live in.

7.4.4 *Natural Area Designation*

An opportunity exists to formally dedicate more areas identified by the Natural Heritage Inventory (NHI) as 'Natural Areas'. A natural area is an area of unique scenic, historic, geologic, or ecological value that will be maintained in a natural condition by allowing physical and biological processes to operate, usually without direct human intervention. These areas are set aside to provide locations for scientific observation of natural systems, to protect examples of typical and unique plant and animal communities, and to protect outstanding examples of natural interest and beauty.

7.5 Cultural Resources

7.5.1 *Recreational Planning*

Recreational opportunities are one of the best assets and greatest potentials within the watershed. Twenty-six (26) park/recreational facilities and seven (7) golf courses exist within the watershed. In addition, recreational trail projects are in place, under construction, or being studied. These recreational opportunities provide the chance for everyone to experience and gain a stronger appreciation and understanding of the importance of nature within the watershed. Protecting, enhancing, and promoting the existing opportunities will help build support for making community and environmental improvements within the watershed.

7.5.2 *Linking Community Facilities*

Connecting of the watershed at a human-scale (as opposed to automobile-scale) would provide multiple benefits to the communities involved. If adjoining municipalities work together, the feeling of 'community' could be enlarged to encompass the natural, watershed boundaries instead of the rigid, political boundaries associated with municipal governments. Items as simple as sidewalks from township-to-township create better connectivity and interaction, possible alleviation of automobile traffic, safer streets and better quality of life.

Examples of other kinds of linkages include both rail-to trail and bikeway facilities, as well as by the network of streams throughout the watershed via a "blueway".

Abandoned railroad beds provide a unique opportunity for communities and environmental groups to develop trails for walking, biking, rollerblading, horseback riding and cross-country skiing. Rail trails provide an alternative to common transportation options as well as providing safer recreational opportunities due to the absence of vehicle traffic. The possible expansion of the Montour Trail into Mt. Pleasant Township via the abandoned railroad spur is an opportunity.

7.5.3 *Eco-tourism*

Eco-tourism is an opportunity that will increase in the future. To assist in the economic development of eco-tourism in the project area, the local chamber of commerce, municipal officials, small business or facility owner/operators need to work together to assist in spawning this type of economic activity (2003).

7.5.4 *Land Purchase for Conservation*

A vehicle for encouraging conservation in strategically identified areas is the outright purchase of the properties by a land trust, conservation organization, and/or municipality. When land is purchased for conservation purposes, parcels can then be used for green/open spaces, prevention of development on fragile lands and the treatment of degraded water. Municipal acquisition can be facilitated by adoption of a municipal map.

7.5.5 *Historic Property Preservation*

The preservation of historical properties in a community helps to give the community its character. People like to be located near historic properties. o The preservation of historic properties helps to attract business, restore economic health, and improve the quality of life, and bind communities together . By completing historical preservation work to properties, these buildings remain an integral part of the community, thus attracting people and business.

7.6 Educational Resources

An abundance of environmental educational opportunities exist in the watershed. These opportunities abound for youth, adult, youth/adult and lifetime education activities. Washington County Watershed Alliance's (WCWA) outreach program involves a presentation of the issues and concerns of the watershed and county's stakeholders.

Section 8 provides recommendations for implementation for the following tasks:

- Adult and youth education
- Educational facilities
- Community education / public relations activities

7.6.1 *Conservation Groups/Volunteer Opportunities*

Southwestern Pennsylvania, as well as much of the country, has experienced a growing interest in conservation. As development surges ahead, several groups in the region have become established to promote conservation and proper management of the area's resources. Membership in these recently-established groups is limited, but growing.

8 Management Recommendation Options

In this Section, the issue and/or opportunity is stated with recommended management options. These items are also found in a simplified Management Recommendations Matrix at the end of this section.

8.1 Project Area Characteristics

8.1.1 *Sprawl*

Recommendation - The establishment of Environmental Advisory Councils (EACs) would assist in protecting and improving natural resources by providing needed input to local planning boards. EACs could work among municipalities through Intermunicipal Cooperation to assist in improving resources holistically (2003). Sprawl issues will need to be approached by a combined effort of promoting sound development throughout the entire Chartiers Creek Watershed while at the same time providing for economic stability. This can be accomplished through a variety of tools that are discussed in Appendix 2 (Model Ordinances, Overlay Districts, and Guidelines/Standards), the Pennsylvania Land Conservation Handbook (Allegheny Land Trust, 1999), the Pennsylvania Smart Growth philosophy, the Growing Greener guidance documents (Natural Lands Trust, 1997 & 2000).

Potential tools include:

- Envisioning the Future through completion of Community Audits,
- Protecting Open Space Networks via Conservation Planning,
- Implementation of Conservation Zoning, and
- Utilization of Conservation Subdivision Design.

Intermunicipal Cooperation (or Partnering) is a process by which municipal governments and local organizations work together to improve local conditions such as infrastructure, environment, and education. To solve a common problem throughout the entire length of a sub-basin, communities and organizations must work together.

***An example of Intermunicipal Cooperation** can be found in the lower portion of the Chartiers Creek Watershed. Bethel Park, Bridgeville, and Upper St. Clair have teamed with USC-Citizens for Land Stewardship to alleviate habitat modified stream conditions that exist in the McLaughlin Run sub-basin. By working together, the communities and organization are improving McLaughlin Run's water quality and fish habitat, as well as correcting infrastructure problems, such as undercutting of roadways, bridge impacts and collapsing walls, to name a few. This effort was recognized in 2002 by being awarded a Pennsylvania Governor's Award for Watershed Partnering Efforts. This framework process also occurs in the upper portion of the watershed, where coalitions such as the Washington County Watershed Alliance and Chartiers Creek Watershed Association combine with school districts, municipalities, and organizations to assist in educating school students via the Children's Groundwater Festival and the Pennsylvania Envirothon.*

8.1.2 *Zoning and Comprehensive Planning*

Recommendation- Development of appropriate or minimally acceptable conservation zoning ordinances is needed for some municipalities in the study

area (Refer to Model Ordinances in Appendix 2). This will assist in further protecting natural resources and more specifically improving water quality of the watershed (2003).

Recommendation - The completion of the Washington County comprehensive plan will assist in standardizing the content of local planning efforts. This will help to address all of the resource issues that concern both the municipalities and the general public. This will also help to create a system of prioritizing natural resource issues countywide (2002-2003).

Recommendation - Comprehensive planning is needed in most of the municipalities. Improved or updated zoning ordinances and the completion of municipal comprehensive plans that assist in protecting natural and community resources are necessary for sound land management and development activities at the local level. The proper administration of existing zoning ordinances (i.e., enforcement, variance activities, etc.) is key to providing environmentally sound development practices. This could be done through intermunicipal cooperation (2003).

No Action Plan - If no action is taken to address the issue of sprawl and it's associated land-use problems, then the Upper Chartiers Creek Watershed will continue to suffer from:

- Water quality degradation
- Impacts on infrastructure
- Development of greenfields

Quality zoning and land use management methods can be used to address growth issues. Some examples are:

Overlay Districts

Are defined as special zoning districts which form a second layer over an underlying residential, commercial or industrial zoning in order to protect floodplains, wetlands, steep slopes, and other areas. River or Streamfront overlay zoning districts can also be made a part of the second layer of zoning in order to allow compatible development while protecting from flood hazards and enhancing river or streamfront recreational opportunities. A copy of model ordinances for a riverfront overlay district and floodplain overlay district, are included in Appendix 2. Additional details can be obtained from Improving Local Development Regulations: A Handbook for Municipal Officials (ACPD, May 1993).

Conservation Zoning

The intent of conservation zoning is to actively and legally encourage subdivisions that set aside at least 50% of the land as permanently protected open space. Several model ordinances that can be applied to conservation zoning include: site capacity analysis, whereby a percent of each kind of land type is reserved as open space. A cluster development option involves compact development through variations in lot sizes in order to preserve open space and sensitive natural resources. Randall Arendt, noted landscape planner, makes reference to the virtues of cluster development in Rural by Design (Arendt, 1994).

Conservation zoning allows for future growth with a balance between community goals and private landowner interests.

Conservation zoning has several distinct advantages:

Development can occur with the preservation of "valuable" open space and farmland,

New development is given incentives to group or cluster homes in order to promote ease of access to local businesses and public services,

A greenway and streamside buffer system can be encouraged along Upper Chartiers Creek & its tributaries

Other sensitive features and habitats, such as older tracts of forested land, can be identified and protected.

Additional details can be obtained by reviewing "Growing Greener – A Conservation Planning Workbook for Municipal Officials in Pennsylvania" (NLT, 2000).

Conservation zoning has sometimes been mistaken as a measure that could result in "a taking of land without compensation." This is not true for two reasons according to site-specific research conducted by the Natural Lands Trust, Inc. for Growing Greener, which found:

Conservation zoning allows full density development, but just requires the conservation of open space.

No land is taken for public use unless landowners or developers want the land to be open to the public. The municipality must negotiate with the developer to provide municipal recreation facilities on a willing buyer/seller basis. Conservation ordinances can be written with density incentives to encourage parts of their lands be made available for public ownership, access, or use.

Planned Residential Developments

Planned Residential Developments (PRDs) combine elements of zoning, subdivision, and land development ordinances into one package. Builders are given the flexibility to combine greater housing densities in return for the preservation, construction, or dedication of agreed upon public recreation areas/open space.

In conclusion, zoning is a tool to be used to ensure that the land uses of today are not taking away the future rights of generations to enjoy our communities. Even the most up-to-date zoning does not always account for the long-term interests of the public. Short-sighted zoning is often applied as a means to define the land's profit-making potential with land development as the goal rather than quality open space. Planning through progressive zoning can ensure that private property is maintained with farmland and open space as the norm rather than the exception. Open space does not have to be a temporary use until a land development plan is randomly built.

8.1.3 *Transportation Facilities*

Recommendation- Intermunicipal Cooperation (2003)
It is important for the communities in the watershed to have appropriate zoning ordinances in place, in order for sound land management and development activities to take place (Refer to Appendix 2).

Recommendation- Timing is Everything (2003)
Roadway projects involve a tremendous amount of development and evaluation due to numerous laws and policies and are also subject to intense political and public scrutiny. These factors create project schedules that can change often and erratically. Timing a local conservation project with transportation agency mitigation can become at best difficult and at worst impossible. The best option for local groups is to have several projects staged and available to partner with the transportation agency. This allows for some flexibility.

Recommendation- Resource Mitigation and your Project's Needs (2003)
According to the laws and policies of state and federal regulatory agencies (environmental and transportation) not all impacts associated with roadway projects can be mitigated through a local conservation group. Mitigation must justifiably replace the lost functions and values of the impacted resource. For example, AMD treatment wetlands cannot replace high quality forested wetlands. Impacts to a high quality trout stream cannot be replaced on a degraded warm water fishery. Knowing the types of impacts incurred on a project and the benefits to be obtained from a mitigation project are crucial to identifying potential mitigation options.

Recommendation- Gaining Project Approvals (2003)
The final decision on the success of a partnering opportunity lies in the hands of the regulatory agencies. These agencies must concur that the agreements set up between the local group and PENNDOT/PTC will compensate for the project related impacts. This concurrence includes the replacement of impacted resources and the confidence that the project will be successfully completed.

Recommendation- Project Organization is the Key to Success (2003)
Having a strong plan demonstrating a potential for long-term success to the regulatory agencies improves the likelihood of obtaining the necessary approvals. The planning and organization of individual projects are important issues. In many circumstances, funding sources other than PENNDOT/PTC are needed in order to complete a project. Funding sources such as grants, endowments, and in-kind services should be identified and applied for. Many of these other sources have their own time frames that, as discussed in the timing section, may not coincide with DOT requirements.

Recommendation- Matching Projects to Resource Impacts (2003)
Working together with PENNDOT/PTC to document comparable environmental benefits to roadway impacts is necessary to obtain regulatory concurrence. Projects that provide a variety of environmental improvements provide the best partnership opportunities.

No Action Plan - If no action is taken to address the issue of transportation facilities and it's associated land-use problems, then the Upper Chartiers Creek Watershed will continue to suffer:

- Water quality degradation
- Impacts on infrastructure
- Development of greenfields

How to Partner with Transportation Agencies

While the existing roadway network provides access to almost all areas of the watershed, expanding development and growth within the northern and southern portions of the project area continues to necessitate improvements to the transportation system. The Southern Beltway project is the major on-going activity in the project area that will have socioeconomic and environmental issues and opportunities related to it (Refer to Map 7), (PTC, 1997 and PTC, 2000). It is very important for the communities in this area to have appropriate zoning ordinances in place, in order for sound land management and development activities to take place. Additionally, as this area develops in the future, expanding public transportation opportunities via buses would assist in reducing air pollution and decreasing fuel consumption by cars, trucks, and motorcycles.

Roadway construction is one of the major impacts on environmental resources. Mitigation for these impacts consequently becomes one of the most significant contributors to natural resource creation and restoration efforts. Federal and state regulations provide specific guidance on how impacts are calculated, avoided, minimized, and ultimately mitigated. In addition, the sometimes arduously long process of roadway development and design can make it difficult for local conservation groups to track Pennsylvania Department of Transportation (PENNDOT)/Pennsylvania Turnpike Commission (PTC) projects and effectively cooperate with them to most efficiently protect and conserve natural resources. Working with PENNDOT/PTC can assist in reducing project impacts and it can be very beneficial in developing effective mitigation for the impacts incurred.

Most major roadway projects are funded at least in part by the Federal Highway Administration (FHWA). Because this funding is provided by a federal agency, these projects must adhere to the National Environmental Policy Act (NEPA). This Act generally requires any project funded by the federal government to give full consideration to impacts to the "quality of the human environment."

The basic concept of NEPA includes evaluating a range of alternatives to determine the alternative which best satisfies project needs while minimizing environmental impacts. Also, NEPA requires mitigation efforts to be undertaken to compensate for unavoidable impacts. In addition to NEPA, federal legislation authorizing FHWA funding generally includes language regarding environmental mitigation.

The present transportation act, commonly known as TEA 21 includes general guidance stating that wetland mitigation should utilize active banking sites for mitigation if possible. In addition, the act includes direct funding for "enhancement projects." These funds are predominantly used for trail work but may be available for other projects. State laws, most significantly PADEP Chapter 105 Regulations, also govern roadway construction and mitigation of impacts. Chapter 105 Regulations cover any impact to streams and wetlands and require a permit for these impacts. The permit application process also requires the applicant to evaluate the project's impacts on vegetation and cultural resources. In order to abide by these laws, PENNDOT/PTC must not only study and calculate impacts to natural resources but it must coordinate with the public regarding the project.

Roadway construction projects can result in a number of widely varying impacts to the environment. The most significant natural resource impacts are to wetlands, streams, and vegetation and wildlife.

Wetland impacts can involve direct impacts by filling or excavation. Indirect impacts predominantly involve changes to supporting hydrology. The loss in wetland area of and the loss of functions and values evaluate direct and indirect impacts to wetlands.

Stream impacts include culverting, relocation, and loss of stream length. Stream impacts are evaluated largely by a qualitative determination of the loss of stream value.

Vegetation and wildlife impacts include the direct loss of vegetative cover types and disruptions to wildlife movement patterns as well as direct and indirect impacts to endangered species.

Following the final determination of project related impacts, studies and coordination are undertaken to determine mitigation requirements for the project. Generally, these studies include evaluations of potential sites for mitigation projects and determining an appropriate compensation rate. Compensatory mitigation can include creation, restoration, enhancement, and preservation. The extent to which any of these options is utilized assists in determining the compensation rate required. Coordination is conducted with the regulatory resource agencies to obtain recommendations and ultimately approval.

Wetland mitigation is generally the most "straight forward" mitigation of natural resources. Wetland laws generally require a minimum replacement of wetlands at a one-to-one ratio. This is commonly equated to area lost to area replaced, but is also evaluated by functional replacement. Additional requirements include replacement of wetland impacts as close to the impacts as practicable and generally within the same watershed. Traditionally, transportation agencies have conducted wetland replacement projects on their own. They select a site, design the replacement wetland, purchase the property, and construct the site.

Traditional wetland replacement would be conducted by reviewing existing mapping (project related, U. S. Geological Survey [USGS] topographic) and field reconnaissance to identify areas that are favorable to wetland creation. Those sites are then reviewed for potential constraints such as archaeology, ownership, and utilities. A preferred site is selected and built. Recently other information sources such as wetland replacement programs through U.S. Fish and Wildlife Service and the PADEP have added to potential replacement opportunities. In addition, some transportation agencies and their contractors have added local conservation groups to the list of potential site sources. Following construction, the site is maintained by the transportation agency or turned over to a local interested party with some type of conservation agreement placed on the site. Options to individual wetland construction include banking and in-lieu of replacement. Different U.S. Army Corps of Engineers Districts, as well as different states, have wide ranging policies on implementation of these options.

Stream mitigation is less predictable than wetland mitigation. To start with, the evaluation of impacts includes a qualitative assessment of lost value. This equates to a qualitative determination of replacement requirements. Additionally, laws pertaining to stream impacts and mitigation requirements are generally not as specific as those for wetlands. Stream mitigation has traditionally involved enhancement and/or restoration work on streams adjacent to the project. The extent of work is informally negotiated with the regulatory agencies. Because stream mitigation is less defined, it can be easier to work with in a partnering agreement.

Vegetation and wildlife mitigation not associated with endangered species is very similar to stream mitigation. Generally, laws are not specific to the type of mitigation required. Extensive mitigation efforts for habitat impacts are usually only undertaken for large roadway projects such as highways on new alignment or major upgrades to long sections of existing roadways. Defining compensation rates is extremely qualitative. Mitigation often times involves land acquisition for preservation or enhancement of existing preserved land.

Working with PENNDOT or PTC to achieve their required mitigation can be a win-win situation. The benefits to be realized by both sides can be significant. By providing mitigation through a local group, transportation agencies generally see large reductions in costs due to lower administrative efforts and less stringent design standards. Local groups obtain significant funding with generally reduced efforts over standard grant writing requirements. The following items are important factors to keep in mind when trying to coordinate with PENNDOT or PTC.

8.2 Land Resources

8.2.1 *Farmland and Prime Farmland Soil(s) Protection*

The protection of farmland and prime farmland soils at the municipal level is an important issue in the Upper Chartiers Creek Watershed since agriculture is a major land use activity (44.%) and industry.

Recommendation - Institute zoning and comprehensive plans that are protective of farmland and prime farmland soils. Since more developmental activities will be occurring in the watershed. If suitable municipal zoning ordinances and codes are not in place prior to development activities that will be occurring, appropriate enforcement will not take place. These developmental pressures can then place these resources and the families that rely on them in jeopardy. Protection can be provided through intermunicipal cooperation or by adopted model zoning ordinances in the municipality codes (2003).

The Pennsylvania Municipalities Planning Code (MPC, January 2001), states that Ordinance Provisions must meet and/or exceed state and federal laws and regulations. MPC Section 603 (g)(1) states that, zoning ordinances shall protect prime agricultural land and promote the establishment of agricultural security areas. Further, MPC Section 604 (3) states that, the purpose of zoning ordinances shall be designed: to preserve prime agriculture and farmland considering topography, soil type, and classification, and present use. Maps 3 and 5 show developmental activities are moving away from the traditional commercial, industrial, and residential areas of the project area and moving outward towards the more agricultural areas.

No Action Plan - If no action is taken to address the issue of farmland and prime farmland protection, then the Upper Chartiers Creek Watershed will continue to suffer:

- Reduction in land being farmed
- Residential, commercial, and industrial development of Agricultural Lands
- A change in the community character of parts of the watershed

8.2.2 *Critical Areas*

Recommendation - Increase stream accessibility. Without accessibility to the streams, the watershed inhabitants become uninvolved and unconcerned about its resources and thus its health. Increasing accessibility through re-orienting how areas are developed near the watershed's streams can have beneficial opportunities for existing community facilities and businesses. An example of this in the Chartiers Creek Watershed is the Arrowhead Trail in Peters Township. The establishment of rails-to-trails facility near Brush Run has attracted business development near the natural and recreational resources (i.e., bicycle shops, restaurants, gift shops). Additionally, conservation easements can be developed for critical areas or properties within the watershed (2004).

No Action Plan - If no action is taken to address the issue stream accessibility, then stream corridors in the watershed will continue to be under utilized recreationally and stakeholders will continue to feel disconnected to the area's environment.

8.2.3 *Unregulated Waste*

Recommendation - Control unregulated waste sites at the local (municipal) level by implementing proper zoning ordinances which address the optimal placement of such activities in relation to adjoining natural, biological or cultural resources.

Numerous communities in the study area have zoning ordinances in place to control the location of junkyard facilities. Through inter-municipal cooperative planning activities, junkyard facilities can be located strategically so as to promote these businesses, and yet limit potential environmental degradation to community resources. (2002+).

Recommendation - Continued cleanup activities involving local citizens, conservation groups (WCWA and ChCWA), scout troops, and school districts can assist in eliminating promiscuous solid waste sites by participating in the "Ohio River Sweep Program" (2002+).

No Action Plan - If no action is taken to address the issue of unregulated waste and it's associated problems, then the Upper Chartiers Creek Watershed will continue to suffer:

- Water quality degradation
- Local promiscuous dump sites
- Development of greenfields

8.2.4 *Waste Sites*

Recommendation - Molycorp, Inc. Site and the Canonsburg Site: The Molycorp site is to be decommissioned in accordance with the decommissioning plan and its amendments. Monitoring of the radioactive waste materials, surface and groundwater, and other site conditions at these facilities must continue to ensure that local citizens, adjacent municipalities, and state and federal agencies are knowledgeable of existing conditions (On-going).

No Action Plan - If no action is taken to address the issue of the waste sites, then potential environmental degradation may occur and stakeholders in the watershed will be less informed as to the consequences.

8.2.5 *Oil and Gas*

Recommendation - Local landowners, municipalities, and the county need to work with PADEP to plug all the abandoned and orphaned oil and gas wells in the watershed (2002+).

No Action Plan - If no action is taken to address the issue of Oil and Gas Wells and the associated environmental problems, then the Upper Chartiers Creek Watershed will continue to suffer:

- Water quality degradation
- Potential health and safety hazards

8.2.6 *Deep Mining*

Recommendation - Continue public awareness of this issue, and communicate with the PADEP and federal agencies concerning future impacts to the watershed's resources as deep mining activities continue in the study area (2002+).

No Action Plan - If no action is taken to address the issue of mining and it's associated environmental problems, then the Upper Chartiers Creek Watershed will continue to suffer:

- Water quality degradation
- Impacts on infrastructure
- Impacts to water supply

8.2.7 *Abandoned Mine Land Restoration*

Recommendation – Removal of gob piles (coal refuse piles) and other abandoned mine land features and restoration of the land they occupy are important for improving the environmental health and aesthetics of the watershed. Additionally from a municipality's aspect, the remediation of these sites can make previously barren land that had been unproductive (unusable and thus untaxable), productive (usable and thus taxable) again (2006).

No Action Plan - If no action is taken to address the issue of abandoned mine land restoration and it's associated environmental problems, then the Upper Chartiers Creek Watershed will continue to suffer:

- Water quality degradation
- Impacts on infrastructure
- Impacts to terrestrial and aquatic habitats
- Un-used or under- utilized barren land

8.3 Water Resources

8.3.1 *Groundwater*

Recommendation - The completion of a Groundwater Protection Plan, Source Water Assessment Protection Plan, Headwater Protection Plan, and/or Wellhead Protection Plan can assist in giving the study area's groundwater resources added protection from pollution sources (2003-2007).

No Action Plan - If no action is taken to address the issue of groundwater protection, then the Upper Chartiers Creek Watershed will continue to suffer:

- Water quality degradation
- Impacts on water supply (private wells)

8.3.2 *Lakes and Ponds*

Recommendation - Efforts should be continued to inform the public of the excellent largemouth bass fishery in Canonsburg Lake normally known for trout. This could be accomplished through a Largemouth Bass Fishing Tournament (2003).

Recommendation - The depth of the Canonsburg Lake has decreased in the last 57 years due to siltation. Both point and non-point pollution sources in the lake need to be reduced (2003).

No Action Plan - If no action is taken to address the issue of lakes and ponds, then the Upper Chartiers Creek Watershed will suffer:
Loss of recreational opportunities

- Water quality degradation
- Impacts on Canonsburg Lake

8.3.3 *Wetlands*

Please refer to Section 8.4.3.

8.3.4 *Floodplains*

Recommendation - Protection of floodplain areas from further development near the floodplain is important. Further study and analysis of this issue is needed to specifically identify and prioritize flood prone areas and potential impacts to the communities (2003).

No Action Plan - If no action is taken to address the issue of floodplain protection and it's associated land-use problems, then the Upper Chartiers Creek Watershed will continue to suffer:

- Water quality and stream habitat degradation
- Impacts on infrastructure (roads, homes, business', municipal facilities, etc.)
- Increased flooding
- Development of greenfields

8.3.5 *Water Quality*

Recommendation - The Chartiers Creek Watershed Association has been collecting water quality samples. This volunteer activity should continue to assist with remediation opportunities (On-going).

No Action Plan - If no action is taken to address the issue of water quality sampling, then less knowledge (data) will be available to assist in correcting water quality and habitat problem areas.

8.3.6 *TMDL*

Recommendation - Continue to enforce standing permitting regulations on all necessary discharge locations (On-going).

Recommendation - Individuals and organizations that need to discharge water into local streams will have to work with regulatory agencies in order to attain the required permitting (On-going).

No Action Plan - If no action is taken to address the issue of TMDLs, then the Upper Chartiers Creek Watershed will continue to suffer:

- Water quality degradation

8.3.7 *Water Supply*

8.3.8 *Water Supply*

Recommendation - It is very important for municipal planning activities to take place in these communities. This will assist in meeting water supply needs and protecting existing public water supplies (2002+).

No Action Plan - If no action is taken to address the issue of water supply, then the Upper Chartiers Creek Watershed will possibly suffer:

- Water source degradation
- Impacts on water supply

8.3.9 *Pollution (Point and Nonpoint Sources)*

Abandoned Mine Drainage (AMD)

Abandoned Mine Drainage (AMD) is one of several water quality degradation issues; problems vary from site to site.

Recommendation - An AMD Assessment and Management Plan (to characterize and prioritize AMD discharges) is needed for the entire Chartiers Creek Watershed (2003).

Recommendation - Once a holistic watershed plan for AMD has been completed, site remediation (i.e., passive treatment) can be completed (2003+).

No Action Plan - If no action is taken to address the issue of abandoned mine drainage, then the Upper Chartiers Creek Watershed will continue to suffer:

- Water quality degradation
- Impacts on aquatic habitat
- Impacts on infrastructure

The following example details some of the activities that may be needed to correct abandoned mine drainage.

Abandoned Mine Drainage Remediation Example: As part of the analysis of Abandoned Mine Drainage (AMD) issues for this project, AMD has been noted in this plan as being found in Water Quality Management Units C, D, and E which entail watershed sub-basins 1, 3, 5, 8, and 9. The Management Options listed in the Management Recommendations Matrix include two management options for correcting AMD in the Upper Chartiers Creek Watershed. The recommendations are to
1) Complete an AMD Assessment and Management Plan (to characterize and prioritize AMD discharges) and
2) to complete AMD remediation activities at site specific locations.

To correct a specific AMD discharge, a preliminary site investigation is needed to gather data for future activities. The investigation can include the measurement of water chemistry and flow parameters of the discharge(s), conceptual engineering and design constraints, determination of property ownership, consideration of other potential site constraints (i.e., wetland, stream, and floodplain impacts), and to calculate project costs.

Once these activities have been completed, attaining funding to complete project administration, draft and final engineering design of the passive treatment system, site permitting, construction, and construction surveillance must be performed. Possible sources of assistance can be found in the Potential Technical and Funding Assistance matrix located behind the Management Recommendations Matrix in this plan. This matrix includes both state and federal, and private endowment grant programs. Once funding is attained, the draft and final engineering design, site permitting, construction, and construction surveillance activities can be completed.

After the construction of the passive treatment facility, it is important for post construction monitoring to take place. This assists in determining how effective the treatment system is and is usually a requirement of the grant. It also assists in determining if new problems have occurred and need addressed. Another issue that needs to be addressed includes the facilities operations and maintenance (O&M). Passive treatment systems generally need little O&M on a daily basis. However, while completing post construction monitoring, O&M activities can also be completed. Most passive treatment facilities will be designed for a 25-year life. However, the life span of a site is site specific. Towards the end of the facilities life, it is important to prepare for the removal of metal precipitates (i.e., iron, aluminum, and manganese) and possibly the replenishment of limestone and organic mulch.

From the recently released Draft Coal Remining BMP Guidance Manual, the following are the different BMPs that can be utilized to make improvements to problem situations involving AMD and AML sites (USEPA, 2000).

1.) Hydrologic and Sediment Control BMPs: *The following hydrologic and sediment control BMPs can assist in reducing groundwater, erosion and sedimentation pollution or both.*

Regrading of mine spoil – Utilized to establish positive drainage, facilitate revegetation, and reduce surface water infiltration of the mine spoil.

Revegetation - Utilized to revegetate areas that were previously mined and left devoid of vegetation thus exposing coal spoil material to the atmosphere. Bio-solids are often utilized to assist in fertilization of re-vegetated areas and to assist in soil formation.

Diversion ditch installation – Utilized to direct clean surface water away from contamination (mine spoil) sources.

Installation of low-permeability caps – Utilized on gob piles and other areas that need to have a synthetic or clay-lined cap placed over the material to reduce or eliminate ground and surface water pollution.

Stream sealing – Utilized to prevent clean surface water from entering an underground mine or surface mine spoil.

Underground mine daylighting (Remining) - Eliminates coal that had been partially mined by historic mining practices and left coal exposed underground. This exposed coal continues to degrade ground and surface waters, but if removed through daylighting activities, water pollution sources can be reduced or eliminated.

Mine entry and auger hole sealing – Refers to dry or wet seals. These seals prevent (dry seals) or control (wet seal) discharge of waters from mine entries.

Highwall and pit floor drains – Horizontal or vertical highwall drains and pit floor drains are used to collect groundwater entering the spoil and work to minimize contact with contaminants.

Grout curtains – Utilized to prevent or divert the flow of groundwater from one location to another. One example would be to utilize a grout curtain between a stream and an underground mine opening.

Ground water diversion wells - Utilized to intercept and collect groundwater prior to its entrance into a backfill area or underground mine where contaminants exist.

2.) Geochemical BMPs: *The following geochemical BMPs function to inhibit pyrite oxidation, reduce the contact of water with acid-producing materials, inhibit iron-oxidizing bacteria, or increase the amount of alkalinity generated within backfilled areas.*

Alkaline addition – Provides alkalinity to an acidic water source to enhance precipitation of metals.

Alkaline redistribution – Utilized to add alkalinity to one location (an area deficient of alkalinity) from another alkaline addition source.

Induced alkaline recharge – Utilized to add alkalinity to water prior to it entering a spoil area or underground mine.

Special handling of acid-forming materials – Segregate acid forming materials and handle them in a manner to minimize water contact. One example is to place acid forming materials (spoil) above the water table and then placing a cap over the reclaimed area.

Special handling of alkaline materials – Segregation of alkaline materials and encourage contact of these materials with water so dissolution takes place.

Use of bactericides – Use of bactericides is utilized to inhibit or eliminate certain bacteria from becoming established in a reclamation site. Some bacteria species can increase the acidic conditions thus reducing water quality.

3.) Passive Treatment Methods or BMPs: *The following passive treatment methods or BMPs entail a number of engineered treatment systems that require minimal maintenance after construction is completed and the systems become operational. These systems can be used by themselves and/or in combination to passively treat mine discharges. These systems vary in technical/engineering complexity and thus cost. This is because each site brings its own specific water quality (chemistry), discharge flow (gallons per minute, etc.), and engineering requirements (i.e., grading, materials, specific system type, permitting requirements, etc.). Thus it is impossible to give specific cost information to a general site, because each site can vary greatly.*

Successive Alkalinity Producing Systems (SAPS) – Utilized for sites with dissolved oxygen, iron (ferric or ferrous) and aluminum as components of the water quality.

Anoxic Limestone Drains (ALDs) – Utilized for sites with low dissolved oxygen, ferric iron and aluminum laden water quality.

Oxic Limestone Drains – Utilized for sites with a variety of AMD types, however, the dissolution of limestone and the generation of alkalinity is somewhat limited.

Limestone Diversion Wells (LDWs) - Utilized for sites that are relatively inaccessible and, therefore, difficult to treat. This type of system needs active (weekly to bi-weekly) maintenance to maintain treatment of the stream or discharge. This system can treat a variety of AMD types.

Open Limestone Channels (OLCs) – Is similar to oxic limestone drains and is utilized for a variety of AMD types too. However, they are found to be most effective on relatively steep slopes.

Limestone Sand – Utilized for treatment of marginally acidic streams. The sand is actually dumped along the stream bank and as flood flows wash the sand into the stream, the sand helps to increase stream alkalinity and can help to reduce dissolved metals. This treatment improves water quality in stream but does not treat the source of the AMD discharge.

Constructed Wetlands (Aerobic Wetlands and Compost Wetlands) – Utilized for treatment of sites with alkaline and acidic, laden with iron. These wetland systems can add alkalinity through sulfate reduction and in some cases dissolution of limestone that is present or added.

Pyrolusite® systems – This type of system is a patented biological process. It utilizes alkaline addition of limestone where the limestone bed is injected or inoculated with bacteria. This bacteria assists in increasing the oxidation process thereby reducing the metal concentration in AMD.

Sewage

All levels of government, along with local residents and businesses, need to work together in order to correct this water quality issue. This is due to its financial and technical aspects. Residences and businesses with deficient or no on-lot septic systems will need to have corrective action taken.

Recommendation - A Sewage Control Plan be completed in order to understand more fully where specific problems will arise, what type of sewage systems may be warranted, and where implementation is needed (2006).

Recommendation - It is encouraged that citizens, businesses, local officials, water treatment authorities, and regulators should participate in public meetings and forums in order to be educated on the issue(s) (2006).

No Action Plan - If no action is taken to address the issue of sewage, then the Upper Chartiers Creek Watershed will continue to suffer:

- Water quality degradation
- Impacts on aquatic habitat

Nutrient Enrichment

Recommendation - It is recommended that a Nutrient Control Plan be completed to study the need for improved agricultural conservation practices in the watershed. This plan should be completed in order to understand more fully where specific problems will arise after the AMD issue is remediated and where implementation action is needed (2006).

No Action Plan - If no action is taken to address the issue of nutrient enrichment, then the Upper Chartiers Creek Watershed will continue to suffer:

- Water quality degradation
- Impacts on aquatic habitat

Specific site remediation projects could utilize BMPs for corrective action. Many BMPs are relatively simple and inexpensive practice(s) and/or management techniques. BMPs involve conservation practices and management techniques that assist in improving water quality.

A listing of BMPs and what each BMP entails can be found in the Soil and Water Conservation Technical Guide for Pennsylvania (USDA Technical Document – Consult your local County Conservation District or USDA office).

The following is a list of BMPs promoted by the resource agencies:

BMP-1 Permanent Vegetative Cover
BMP-2 Animal Waste Management System
BMP-3 Strip cropping and Contour Farming Systems
BMP-4 Terrace System
BMP-5 Diversion System
BMP-6 Grazing Land Protection System
BMP-7 Waterway System
BMP-8 Cropland Protection System
BMP-9 Cropland Tillage System
BMP-10 Stream Protection System
BMP-11 Permanent Vegetative Cover on Critical Areas
BMP-12 Sediment Retention, Erosion, or Water Control Structures
BMP-13 Soil and Manure Analysis
BMP-14 Management of Excess Manure
BMP-15 Fertilizer Management
BMP-16 Barnyard Runoff System
BMP-17 Composting
http://www.pacd.org/products/bmp/bmp_orderform.htm , (CH2MHill, 1998).

Habitat Modification

Recommendation - A streambank inventory could be accomplished throughout the watershed to delineate problem areas that are in need of corrective action (2003). Potential habitat modification projects could be located in Management Units A, B, D, and E (Refer to Map 5) near areas of high developmental pressures.

Recommendation - Best Management Practices (BMPs) should be instituted to address habitat modification problems. If such BMPs are not utilized, continued impacts will occur and possibly spread to other, presently unimpacted areas. Currently a large portion of Little Chartiers Creek is found to be In Attainment (or meeting PA Water Quality Standards). However, if BMPs are not utilized in areas being developed in the sub-basin, this good condition could very quickly change to a degraded condition. The MS4 (stormwater) program is changing how stormwater issues are dealt with and permitted within the watershed. The MS4 permit requirements take effect on December 8, 2002 (PADEP, 2001). If residential and commercial development increases without consideration to stormwater management and other developmental planning issues, then this type of water quality impacts could be observed (2004).

No Action Plan - If no action is taken to address the issue of habitat modification, then the Upper Chartiers Creek Watershed will continue to suffer:

- Water quality degradation
- Impacts caused by stormwater (i.e., high flow events)
- Impacts on aquatic habitat
- Impacts caused by encroaching development

Best Management Practices (BMPs) are a series of practices and management techniques designed to control point and non-point pollution. To rectify water quality pollution sources, BMPs can be utilized in a number of different ways in order to attain the desired effect.

Recommendation - Prepare and conduct Stream Stability Assessments and Natural Stream Channel Designs for the sub-basins of the watershed to determine what can be done to restore streams and stream banks to a stable condition. This type of restoration would significantly reduce problems of erosion/sedimentation and flooding (2004).

Recommendation - Pennsylvania's Stormwater Management (Planning) Program (PA Act 167): Currently, a PA Act 167 Storm Water Management Plan has not been completed for the Chartiers Creek Watershed. This is due to the difficulty of funding and managing such a large assessment plan at the county level. Washington and Allegheny County governments are not pursuing this activity at present. The completion of this important assessment and management tool may be best performed at the state governmental level (PADEP) so as to move the completion of the management plan at a more reasonable pace (2003).

No Action Plan - If no action is taken to address the issue of habitat modification, then the Upper Chartiers Creek Watershed will continue to suffer:

- Water quality degradation
- Impacts caused by stormwater (i.e., high flow events)
- Impacts on aquatic habitat
- Impacts caused by encroaching development

Stream Flow Gauging

Recommendation - Re-establishment and construction of stream gauging stations in the Upper Chartiers Creek Watershed should be coordinated with the PADEP, USGS, and USACOE to assist in specific site location determination (2003).

No Action Plan - If no action is taken to address the issue of stream flow gauging, then specific hydrologic data will not be available to assist with planning efforts.

The following permanent and temporary vegetative and structural BMPs can assist in reducing water pollution to developing areas (CH2MHill, 1998). The BMPs are described in further detail in Section 8 of the Pennsylvania Handbook of Best Management Practices for Developing Areas that can be purchased through the PA Association of Conservation District. http://www.pacd.org/products/bmp/bmp_orderform.htm , (CH2MHill, 1998).

Protection, Block and Gravel
Inlet Protection, Excavated Drain
Inlet Bioretention
Constructed Treatment Wetland
Critical-Area Planting
Diversion
Energy Dissipator
Filter Bag
Filter Strip (Level Spreader - Alternative BMP)
Grass Swale
Infiltration Trench & Dry Well (Dry Well, Below-Grade Detention
Basin, Seepage Bed/Recharge Bed - Alternative BMP)
Inlet Protection, Fabric Insert
Interim Stabilization
Lined Channel
Outlet Stabilization Structure
Permanent Vegetative Stabilization
Permeable Paving System
(Seepage Bed or Recharge Bed - Alternative BMP)
Pond, Dry
(Below-Grade Detention Basin, Dry Well or Detention Basin - Alternative BMP)
Pond, Wet (Detention Basin - Alternative BMP)
Portable Sediment Tank
Riparian Corridor Management
Riparian Forested Buffer
Rooftop Runoff Management
Sand Filter, Closed
Sand Filter, Open
Sediment Basin
Sediment Trap
Silt Curtain
Silt Fence
Slope Drain (Chute - Alternative BMP)
Stabilized Construction Entrance (Tire Cleaning Strip – Alternative BMP)
Straw Bale Barrier
Stream Bank Stabilization
Temporary Stream Crossing
Tree Preservation and Protection
Trench Plug
Water Quality
Inlet

8.4 Biological Resources

8.4.1 *Wildlife Species Management*

Recommendation - The Pennsylvania Game Commission (PGC) should be consulted for assistance with the issues concerning the white-tail deer populations and the protection of the Great Blue Heron Rookery (On-going).

Recommendation - Participation in volunteer activities, such as assisting efforts to track migratory bird species, should be encouraged. Bi-annual bird counts are performed in the Pittsburgh South Bird Circle by USC-CLS and the National Audubon Society (On-going).

No Action Plan - If no action is taken to address the issue of wildlife species management, then the Upper Chartiers Creek Watershed will continue to suffer from:
Impacts caused by negative interactions between white-tail deer and man
Impacts on Great Blue Heron habitat
Missed environmental education opportunities

8.4.2 *Habitat Enhancement (Conservation or Eco-Zones)*

Recommendation - Citizens should develop opportunities to enhance backyard habitat, as well as to create conservation or eco-zones in portions of communities. Enhancements could be in the form of un-mowed fields, creating brush piles, growing native wildlife forage plants, eliminating exotic invasive plant species, or creating streamside buffers (On-going).

No Action Plan - If no action is taken to address the issue of habitat enhancement, then the Upper Chartiers Creek Watershed will continue to suffer from:

- Impacts caused by decreasing wildlife habitat
- Missed environmental education opportunities
- Continued colonization of exotic invasive species and the elimination of native plant species in certain habitats

8.4.3 *Riparian Forest Buffers, Wetlands, and Forest*

Recommendation - Complete an inventory and management plan for the protection of riparian zones, wetlands, forest, and floodplains in the Upper Chartiers Creek Watershed (2003).

Maturing forest stands serve as a renewable resource and a valuable economic commodity. Sustainable forestry management practices are important tools for preventing negative environmental impacts as well as for maintaining an economic resource for the future.

***An example** of the importance of riparian forest buffer, wetland, and forest systems can be seen in the Little Chartiers Creek sub-basin.*
The majority of this sub-basin is in attainment (meeting water quality standards).
This is due in large part to the protection these natural systems provide to streams and the lack of large-scale land development activities taking place in this sub-basin.
Without municipal protections of these resources at the local level (via model ordinances), community resources (i.e., infrastructure - parks, roads, bridges, athletic facilities) and private resources (i.e., homes and businesses) can be negatively impacted.

Recommendation - On-going promotion of forestry best management practices and the concept of sustainability is critical to healthy forest stand regeneration (On-going).

No Action Plan - If no action is taken to address the issue of riparian forest buffers, wetlands, and forest degradation, then the Upper Chartiers Creek Watershed will continue to suffer from:

- Impacts caused by decreasing wildlife habitat
- Water quality degradation
- Impacts caused by flooding
- Continued use of forests for recreational and economic purposes
- Missed environmental education opportunities

8.4.4 *Natural Area Designation*

Recommendation - Work with the local landowners, PADCNR, WCWA, ChCWA, and municipal officials to establish areas in the Upper Chartiers Creek Watershed as dedicated natural areas. An implementation goal of this RCP is to work towards gaining formal dedication of additional NHI areas for the protection of their ecological systems and biological diversity (2004).

The following reports discuss areas could become established Natural Areas, Greenways, and/or Conservation Zones:

-Pashek Associates in the Washington County Comprehensive Recreation, Park, and Open Space Plan (2000) noted that the northern most area in the Upper Chartiers Creek Watershed near the confluence of Chartiers and Little Chartiers Creeks and downstream is an area for a future Greenway (or Conservation Zone) opportunity. This area could be connected with other similar areas in the Lower Chartiers Creek Watershed.

-The Murray Hill Bend,Chartiers Creek Valley, and Canonsburg Lake Slope BDAs as noted in the Washington County Natural Heritage Inventory.

No Action Plan - If no action is taken to address the issue of natural area designation, then the Upper Chartiers Creek Watershed will continue to suffer from:

- Impacts caused by decreasing wildlife habitat
- Destruction of natural areas for recreational purposes
- Missed community character maintenance opportunities
- Missed environmental education opportunities

8.5 Cultural Resources

8.5.1 *Recreational Planning*

Recommendation - Require new subdivision plans to incorporate walking paths or sidewalks before permits are granted (On-going).

Recommendation - Complete park/recreational planning that includes facilities currently being planned (2004). For a recreational facility to satisfy its patron's needs, it is important to have a "Master Plan or Feasibility Study" completed.

The following is a list of completed or on-going recreation projects:

- Washington Co. Comprehensive Recreation, Park, & Open Space Plan
- Canton Township – Purchasing a new 60 acre park
- Houston – Development of a borough recreational facility
- North Strabane – Development of a Municipal Center Park
- South Strabane – Development of Zediker Station Park

No Action Plan - If no action is taken to address the issue of recreational planning, then the Upper Chartiers Creek Watershed will continue to suffer from:

- Missed recreational enhancement opportunities
- Missed environmental education opportunities

8.5.2 *Linking Community Facilities*

Recommendation - Create a watershed trails map that would inventory and map all the trails [rails-to-trails, bikeways, blueways (including boat launch sites)] thus showing the linkage made by these trails to the various communities and community shops, theaters, and other attractions (2004+).

No Action Plan - If no action is taken to address the issue of linking community facilities, then the Upper Chartiers Creek Watershed will continue to suffer from:

- Missed recreational enhancement opportunities
- Missed community connectivity opportunities
- Missed environmental education opportunities

8.5.3 *Rails-to-Trails and Bikeways*

Recommendation - Complete needed feasibility studies and construction activities on the Montour Run (spur), Chartiers Creek, and Chartiers-Houston School District Rail-to-trails (2004+).

No Action Plan - If no action is taken to address the issue of rails-to-trails and bikeways, then the Upper Chartiers Creek Watershed will continue to suffer from:

- Missed recreational enhancement opportunities
- Missed community connectivity opportunities
- Missed environmental education opportunities

8.5.4 *Eco-tourism*

Recommendation - The establishment of such activities as a Chartiers Creek Triathlon could help to bring revenue into the watershed. As facilities are constructed and activities established, the watershed will observe an increased venue from eco-tourism (2003).

No Action Plan - If no action is taken to address the issue of eco-tourism, then the Upper Chartiers Creek Watershed will continue to suffer from:

- Missed economic benefits from eco-tourism
- Missed recreational enhancement opportunities
- Missed community connectivity opportunities
- Missed environmental education opportunities

8.5.5 *Land Purchase for Conservation*

Recommendation - Strategically identify property for purchase by a land trust, conservation organization, and/or municipality so it can be utilized for the treatment of a water quality issue, green/open space, or to prevent land development in critical areas [No final implementation date (On-going)].

No Action Plan - If no action is taken to address the issue of land purchase for conservation, then the Upper Chartiers Creek Watershed will continue to suffer from:

- Missed greenspace protection opportunities
- Missed eco-tourism opportunities
- Missed wildlife habitat protection opportunities
- Missed recreational enhancement opportunities
- Missed community connectivity opportunities
- Missed environmental education opportunities

Conservation Easements

The conservation easement concept allows a landowner to give away certain rights to a qualified conservation organization. The landowner would grant conservation easements in order to protect important natural features (farmlands, forested tracts, wetlands, etc.) from inappropriate development and to assure long term conservation of the features that they value. Conservation easements can qualify a donor for income tax, property tax, and estate tax benefits. Examples of conservation (preferential tax assessment program) easement programs for farmland in Pennsylvania include the Pennsylvania Farmland and Forest Land Assessment Act of 1974 (Clean and Green)(Act 319) programs or the Act of January 13, 1966 (1965)(P.L. 1292, No. 515)(16 P.S. §§ 11941 – 11947)(Act 515) programs (PENNDOT, 1998).

The Conservation and Preservation Easements Act of June 22, 2001 is new legislation that strengthens the enforcement of conservation easements. According to the PA Land Trust Association, the Act reduces legal costs associated with establishing the validity of a conservation easement; narrows the bases for challenging a conservation easement in court; and eliminates a variety of ambiguities in easement law and creates a number of standards.

Transferable Development Rights

Transferable Development Rights (TDRs) enable a community to reduce development in rural and sensitive resource areas and encourage development within areas served by public infrastructure. The system of compensation is set-up to allow landowners in rural or sensitive resource areas to sell their development rights to individuals interested in developing predetermined locations in the municipality suitable for more intense development. The seller of the TDRs retains title to the land and the rights to use the land as farmland or other open space; however, the owner cannot develop the site for other uses (i.e., housing plans, strip malls, etc.). The purchaser of the TDRs has purchased the rights to develop another parcel more intensely than would have otherwise been allowed.

8.5.6 *Historical Property Preservation*

Recommendation - Create an inventory of historic properties that identifies each property for the purpose of preserving its historic integrity. This is an important tool in improving the economic and population flight from the watershed (On-going).

No Action Plan - If no action is taken to address the issue of historic property preservation, then the Upper Chartiers Creek Watershed will continue to suffer from:

- Missed historic building/property preservation opportunities
- Missed eco-tourism opportunities
- Missed recreational enhancement opportunities
- Missed community connectivity opportunities
- Missed cultural and environmental education opportunities

8.6 Educational Resources

8.6.1 *Educational Facilities*

Adult and Youth Education

Recommendation - WCWA and other educators need to continue to expand upon their community and environmental outreach programs with program substance (i.e., paid staff and brochures), equipment (i.e., power point computer software and projector, non-point source kit, groundwater kit, carrying case), and facilities (see below) (2002+).

No Action Plan - If no action is taken to address the issue of adult and youth education, then the Upper Chartiers Creek Watershed will continue to suffer from:

- Missed cultural and environmental education opportunities
- Missed environmental education program enhancement opportunities
- Missed community connectivity opportunities
- Missed eco-tourism opportunities

Educational Facilities

New environmental education facilities are currently being planned in the Lower Chartiers Creek Watershed.

Recommendation - Utilizing these and other regional environmental education facilities would enhance educational programs in the Upper Chartiers Creek Watershed and assist in establishing coordination with organizations in the lower portion of the watershed (2003).

No Action Plan - If no action is taken to address the issue of educational facilities, then the Upper Chartiers Creek Watershed will continue to suffer from:

- Missed cultural and environmental education opportunities
- Missed environmental education program enhancement opportunities
- Missed community connectivity opportunities
- Missed eco-tourism opportunities

8.6.2 *Community Education/Public Relations Activities*

Recommendation - Continue promotion of the activities listed throughout this plan (holistically throughout the Chartiers Creek Watershed by organizations and communities) (2002+).

Recommendation - Utilize the media in educating the general public of the watershed (2002+).

Recommendation - Stimulate community education as part of continued promotion of the activities in this plan (by organizations and communities) (2002+).

No Action Plan - If no action is taken to address the issue of community education/public relations activities, then the Upper Chartiers Creek Watershed will continue to suffer from:

- Missed opportunities to educate and inform stakeholders of the vital activities and opportunities being completed and offered
- Missed environmental education program enhancement opportunities
- Missed community connectivity opportunities
- Missed eco-tourism opportunities

8.6.3 *Conservation Groups/Volunteer Opportunities*

Recommendation – Continued water quality monitoring (2002+).

Recommendation – Participate in the 'Ohio River Sweep' (2002+).

No Action Plan - If no action is taken to address the issue of conservation groups/volunteer opportunities, then the Upper Chartiers Creek Watershed will continue to suffer from:

- Missed opportunities to educate and inform stakeholders of the vital activities and opportunities being completed and offered
- Missed cultural and environmental education opportunities
- Missed environmental education program enhancement opportunities
- Missed community connectivity opportunities
- Missed eco-tourism opportunities

Management Recommendations Matrix

Management Issue	Management Recommendations	Responsible Entity	Potential Assistance Sources	Implementation Schedule
A. Project Area Characteristics				
1. Sprawl (Refer to Section 8.1.1)	1. Establishment of Environmental Advisory Councils (EACs) would assist making improvements to natural resources by providing needed input to local planning boards. 2. Promote an inter-municipal framework necessary for coordinated or unified comprehensive plans, zoning codes, and subdivision and land development ordinances to assist in curbing sprawl, and to enhance the conservation of resources.	The county planning commission and 19 municipal planning commissions and the local conservation organizations.	Washington County Planning Commission and PADCNR: Keystone Funds.	2003
2. Model Land-use Ordinances (Refer to Section 8.1.2)	Develop example or model ordinances (i.e., zoning ordinances, sub-division and land development ordinances, and Official Map) that are protective of community resources. These resources may include, but are not limited to, agricultural soils, steep slopes, open space, riparian buffers, parks, and floodplain resources. These are especially important in the communities that are developing at a higher rate near the Southern Beltway corridor.	Local municipal officials and conservation organizations.	Pennsylvania Department of Community and Economic Development (DCED) and PADCNR: Keystone Funds. Potential Assistance Sources Section. Appendix 2.	2003
3. Washington County Comprehensive Plan (Refer to Section 8.1.2)	Washington County Planning Commission is currently in the process of developing a countywide comprehensive plan. The development of a county comprehensive plan will assist in having minimally acceptable planning standards for communities throughout the watershed.	Washington County Planning Commission	Pennsylvania Department of Community and Economic Development (DCED) and PADCNR: Keystone Funds. Potential Assistance Sources Section. Appendix 2.	2002-2003
4. Municipal Comprehensive Planning (Refer to Section 8.1.2)	Improve or update ordinances and the completion of municipal comprehensive plans that assist in protecting natural and community resources are necessary for sound land management and development activities at the local level.	Local municipal officials and conservation organizations.	Pennsylvania Department of Community and Economic Development (DCED) and PADCNR: Keystone Funds. Potential Assistance Sources Section. Appendix 2.	2003
5. Transportation Facilities (Refer to Section 8.1.3)	Work with PENNDOT and PTC to assist in protecting and enhancing natural resources of the watershed during project planning phases.	Local municipal officials and conservation organizations.	Pennsylvania Department of Community and Economic Development (DCED), PADCNR, PENNDOT, and PTC: Keystone Funds. Potential Assistance Sources Section. Appendix 2.	2003

Management Recommendations Matrix

Management Issue	Management Recommendations	Responsible Entity	Potential Assistance Sources	Implementation Schedule
B. Land Resources				
1. Farmland and Prime Farmland Soils Protection (Refer to Section 8.2.1)	Institute zoning and comprehensive plans that are protective of farmland and prime farmland soils by inventorying watershed farmland (active/inactive), prime soils, and farmland of statewide importance. This can include PA Acts 43 (Agricultural Security Areas), 71 (water and sewer assessment exemption), 100 (Agricultural Land Condemnation Approval Board- reviews transportation & solid waste issues related to farmland), and 319 (Clean & Green) properties as it relates to farmland protection.	USDA-Natural Resources Conservation Services, WCCD, local municipalities, and conservation organizations.	US Department of Agriculture (USDA) Public Law 83-566 Program, PADEP, PADCNR (Keystone Funds), and WCDC.	2003
2. Critical Areas (Stream Access and Visibility) (Refer to Section 8.2.2)	Develop stream access points to encourage recreational opportunities. Develop a "Blueway Trail" on Chartiers Creek to link it to other areas of the watershed. Encourage the reorientation of development around stream corridors to enhance community resources and aesthetics. Encourage the development of conservation easements to assist in protecting critical areas.	Streamside businesses and landowners, municipalities, Washington County, and local conservation groups.	Property placed into conservation easements, donated space adjacent to the stream, PADCNR: Keystone Funds, NPS - Rivers, Trails, and Conservation Assistance program, and the American Canoe Association.	2004
3. Unregulated Solid Waste Sites (Refer to Section 8.2.3)	Control unregulated waste sites at the local level by implementing proper zoning ordinances that address the optimal placement of such activities. By completing an inventory of unregulated waste sites for potential reclamation and development opportunities (e.g., dump sites). This can be accomplished through an inter-municipal framework. Participation in the "Ohio River Sweep Program."	PADEP, local municipal officials and conservation organizations.	PADEP, PADCNR: Keystone Funds, and EPA.	2002+
4. Waste Sites: Molycorp, Inc. and Canonsburg Borough Sites (Refer to Section 8.2.4)	Continued monitoring of the two sites by the NRC and PADEP. Monitor the progress of the decommissioning/remediation planning activities for the Molycorp site in Canton Township.	NRC and PADEP for monitoring and decommissioning/remediation activities. Local municipal leaders to be updated of changing circumstances.	NRC and PADEP.	On-going
5. Oil and Gas (Refer to Section 8.2.5)	Complete the closure of the abandoned and orphaned oil and gas wells per the PADEP abandoned and orphaned well program.	PADEP and municipalities.	Pennsylvania Department of Environmental Protection (PADEP)	2002+
6. Mining: Deep Mining (Refer to Section 8.2.6) **Abandoned Mine Land (AML) Sites** (Refer to Section 8.2.7)	1. Continued public awareness of the deep mining issue and coordination with municipal officials and PADEP. 2. Complete the remediation of AML sites. This activity could assist with the re-development activities in local communities.	PADEP, local municipal officials, local citizens, and conservation organizations.	PADEP (Abandoned Mine Land [AML] 10% Set Aside, Growing Greener, and WRAP Programs), PADCNR: Keystone Funds, US Environmental Protection Agency (EPA) 104 and 319 Programs, and Western Pennsylvania Coalition for Abandoned Mine Reclamation (WPCAMR) Funds.	2002+ 2006

Management Recommendations Matrix

Management Issue	Management Recommendations	Responsible Entity	Potential Assistance Sources	Implementation Schedule
C. Water Resources				
1A. Groundwater Protection Plan (Refer to Section 8.3.1)	Complete a Groundwater Protection Plan that includes a **Groundwater Inventory** and a **Groundwater Use and Needs Survey.** This plan would include i. Private Water, ii. Public Water, and iii. Commercial Water supplies (immediate and future use).	Local and County government, PADEP, EPA, WCWA, and ChCWA.	EPA, PADCNR: Keystone Funds, PADEP (Growing Greener), WPWPP, McKenna Foundation, Pittsburgh Foundation, Mellon Foundation, CVI, etc.	2003-2007
1B. Source Water Assessment Protection Plan (Refer to Section 8.3.1)	Complete a Source Water Assessment Protection Plan that would review all the potential sources of contamination to surface waters and provide recommendations for the protection of surface waters from contaminant sources.	Local and County government, PADEP, EPA, WCWA, and ChCWA.	EPA (319 program), PADCNR: Keystone Funds, PADEP (Growing Greener), WPWPP, McKenna Foundation, Pittsburgh Foundation, Mellon Foundation, CVI, etc.	2003-2007
1C. Wellhead Protection Plan (Refer to Section 8.3.1)	Complete a Wellhead Protection Plan that would identify wellhead protection areas for groundwater supplies. The plan would review all potential sources of contamination to the wellhead protection areas and provide recommendations for the protection of the wellhead protection area from contaminant sources.	Local and County government, PADEP, EPA, WCWA, and ChCWA.	EPA, PADCNR: Keystone Funds, PADEP (Growing Greener), WPWPP, McKenna Foundation, Pittsburgh Foundation, Mellon Foundation, CVI, etc.	2003-2007
1D. Headwater Protection Plan (Refer to Section 8.3.1)	Complete a Headwater Protection Plan that would identify headwater stream resources and the quality of these resources. Headwaters that are in good condition would have recommendations for their conservation and protection, and impaired sources would have recommendations for resource improvement.	Local and County government, PADEP, EPA, WCWA, and ChCWA.	EPA (319 program), PADCNR: Keystone Funds, PADEP (Growing Greener), WPWPP, McKenna Foundation, Pittsburgh Foundation, Mellon Foundation, CVI, etc.	2003-2007
2. Lakes and Ponds (Refer to Section 8.3.2)	Initiation of a **Largemouth Bass Tournament** at Canonsburg Lake, one of the PFBC's finest largemouth bass fisheries in the region. Elimination of point and non-point sources of pollution (siltation) from upstream locations of Little Chartiers Creek that are impacting Canonsburg Lake.	Municipal officials and PFBC	PFBC and American Sportfish Association and Foundation.	2003
3. Wetlands (Section 8.3.3 - Refer to Section 8.4.3 in Management Recommendations Matrix [D. Biological Resources])	See Note	See Note	See Note	See Note
4. Floodplains (Refer to Section 8.3.4)	Floodplains have been developed and impacted for years in the watershed. Analysis of the watershed to determine the priority flood prone areas is needed to protect community resources and enhance existing/remaining habitats.	Washington County Planning Commission, PADEP, and municipalities.	PADEP (Growing Greener Program), FEMA	2003
5. Water Quality Strategic Plan (WQSP) (Refer to Section 8.3.5)	As part of the watershed wide volunteer monitoring program, develop a strategic plan that assists in prioritizing restoration, enhancement, and protection activities to make improvement to the watershed which include management units A, B, C, D, E, F, and G.	Chartiers Creek Watershed Conservation Organizations working with PADEP.	EPA (104 & 319 programs), USDA PL 83-566 Program, PADCNR: Keystone Funds, PADEP (Growing Greener), Western Pennsylvania Watershed Protection Program (WPWPP) of the Heinz Endowments, Pittsburgh Foundation, Mellon Foundation, CVI, etc.	2004
6. Total Maximum Daily Loads (Refer to Section 8.3.6)	Continue to enforce standing permitting regulations on all discharge locations. Individuals and organizations that have a need to discharge water into local streams will have to work with regulatory agencies to attain needed permits.	Individual or Organization in need of a permit	PADEP and USACOE	On-going
7. Water Supply (Refer to Section 8.3.7)	Continued coordination between municipal planning officials and PAWC is needed to protect and enhance water supply facilities as continued development occurs. This is especially so in the communities near the Southern Beltway corridor.	Municipal officials and PAWC	Municipal, county, and state sources	2002+

Management Recommendations Matrix

Management Issue	Management Recommendations	Responsible Entity	Potential Assistance Sources	Implementation Schedule
C. Water Resources (Continued)				
8. Abandoned Mine Drainage (AMD) Plan (Refer to Section 8.3.8)	1. This plan could be a component to the WQSP and would develop a strategic plan that assists in prioritizing restoration activities to make improvement to the watershed that include management units C, D, and E. 2. Remediate AMD site discharges that have been evaluated as part of the AMD Assessment and Management Plan.	Chartiers Creek Watershed Conservation Organizations working with PADEP.	EPA (104 & 319 programs), PADCNR: Keystone Funds, PADEP (Growing Greener, Reclaim PA, Bond Forfeiture Program, etc.), Pennsylvania Department of Transportation (PENNDOT)/ Pennsylvania Turnpike Commission (PTC) mitigation funds, WPCAMR, and WPWPP.	2003 2003+
9. AMD Remediation Activities (Refer to Section 8.3.8)	Complete remediation activities of AMD sites in Management Units C, D, and E.	WCWA, ChCWA, and municipalities.	EPA (104 & 319 programs), PADCNR: Keystone Funds, PADEP (Growing Greener Program, Reclaim PA, Bond Forfeiture Program, etc.), PENNDOT/PTC mitigation funds, WPCAMR, WPWPP, and funding from Foundations.	2003+
10. Sewage Control Plan (Refer to Section 8.3.9)	1. Encourage municipalities and municipal authorities to complete plans to make corrections to faulty sewer systems or to expand systems. This includes sewer (Combine Sewer Overflows [CSOs]) upgrades and septic system correction plans to make improvement to antiquated facilities of the watershed that include management units B and E. 2. Encourage watershed stakeholders to participate in public meetings and forums to educate each other involving sewage issues.	Washington County, municipal governments, local citizens, conservation groups, PADEP, and EPA.	County, State (PA Act 537 program), PADCNR: Keystone Funds, and Federal.	2006 2006
11. Sewage Infrastructure Improvement Projects (Refer to Section 8.3.9)	Encourage municipal and local residents to make improvements to their sewer and septic systems. Especially in watershed management units B and E.	County and municipal governments, and residents.	County, State (PA Act 537 program), PADCNR: Keystone Funds, and Federal.	On-going
12. Nutrient Control Plan (Refer to Section 8.3.10)	Complete development of a nutrient control plan in rural areas of the watershed which include management units B, E, and F.	County government and PADEP.	EPA and PADCNR: Keystone Funds.	2006
Management Planning (Refer to Section 8.3.11)	Complete a PA Act 167 Stormwater Management Plan in Washington and Allegheny Counties. Priority areas in the watershed include management units A, B, D and E.	Municipalities, Washington and Allegheny Counties, and PADEP.	EPA, PADEP (PA Act 167 program), and PADCNR: Keystone Funds.	2003
14. Stormwater Management (Refer to Section 8.3.11)	1. Until a PA Act 167 Plan is completed at the county level, encourage local municipalities to create and/or improve local stormwater management ordinances. 2. PADEP Phase II Stormwater "Permitting" Program – Municipal Separate Storm Sewer Systems (MS4) for urbanized areas is in effect starting December 8, 2002.	Municipal governments. Developers, consultants, and governmental agencies.	PADEP and PADCNR: Keystone Funds and Local.	On-going
15. Stream Stability Assessment (Refer to Section 8.3.11)	Complete stream stability assessments in sub-basins which basins that are experiencing high development activities. Priority areas in the watershed include management units A, B, D and E.	County government and PADEP.	EPA (319 program), USGS, PADCNR: Keystone Funds, PADEP (Growing Greener and Releaf Programs), PENNDOT/PTC stream/wetland mitigation funds, WPWPP, McKenna Foundation, Pittsburgh Foundation, Mellon Foundation, CVI, etc.	2004
Design, Riparian, and Streambank Stabilization Projects (Refer to Section 8.3.11)	Utilize watershed assessments to assist with project designs for remediation of stormwater impacts to streams and infrastructure utilizing Best Management Practices.	PADEP, county and municipal governments.	EPA (319 program), PADCNR: Keystone Funds, PADEP (Growing Greener and Releaf Programs), PENNDOT/PTC stream/wetland mitigation funds, WPWPP, McKenna Foundation, Pittsburgh Foundation, Mellon Foundation, CVI, etc.	2004
17. Flow Monitoring (Refer to Section 8.3.12)	Re-establishment and construction of stream gauging (flow monitoring) stations in Upper Chartiers Creek Watershed to assist in gathering hydraulic data that can be utilized for a variety of planning activities.	PADEP, USACOE, and USGS.		

Management Recommendations Matrix

Management Issue	Management Recommendations	Responsible Entity	Potential Assistance Sources	Implementation Schedule
D. Biological Resources				
1. Wildlife Species Management (White-tailed deer and Great Blue Heron) (Refer to Section 8.4.1)	1. Due to the negative interactions with humans and White-tailed deer, continued communication with the Pennsylvania Game Commission (PGC) is needed to protect community resources. 2. Protect the Great Blue Heron rookery from increased development in the watershed by communicating with PGC.	Developers, municipal officials, and PGC.	PGC	On-going
2. Migratory Bird Count (Refer to Section 8.4.1)	Assist in efforts of the Pittsburgh South Audubon Society Bird Circle and in tracking migratory bird populations.	USC-CLS and other local conservation organizations.	Not Applicable	On-going
3. Habitat Enhancement (Refer to Section 8.4.2)	Enhance existing backyard habitats and create conservation or eco-zones in the watershed.	Local residents, businesses, and municipal officials with assistance from local conservation organizations, land trusts, and the Western Pennsylvania Conservancy (WPC).	Property placed into conservation easements, areas designated by owner, and PADCNR: Keystone Funds. PADEP, USACOE, USGS, USDA Public Law 83-566 Program, USDA and EPA.	On-going
4. Riparian Forest Buffers and Wetlands, Forest, and Natural Heritage Areas (Refer to Section 8.4.3)	1. Complete an inventory/management plan of the watershed's riparian forest buffer and floodplain areas for future streambank stabilization, riparian zone, and floodplain implementation opportunities (Refer to Map 8). Also utilize conservation easements as an option for keeping open/green space from becoming developed land. 2. Promote forestry best management practices and the concept of sustainability are critical to healthy forest stand regeneration.	County and municipal officials with assistance from local conservation organizations, land trusts, and the Western Pennsylvania Conservancy (WPC).		2003 On-going
5. Natural Area Designation (Refer to Section 8.4.4)	Establish Natural and Protected Areas in watershed as delineated in the Natural Heritage Inventories. Adopt land designation uses for parks, green space, and dedicated natural areas (e.g., natural areas, wild flower reserves, wild areas, etc.). Utilize existing land management plans (Refer to Section 8.4.4) to protect and enhance natural resources of the watershed.	Washington County, municipalities, land trusts, and WPC.	National Park Service (NPS) – Rivers, Trails, and Conservation Assistance program, EPA Environmental Education Grants Program, PADCNR – Keystone Funds, The Conservation Fund, Washington County and Municipalities.	2004

Management Recommendations Matrix

Management Issue	Management Recommendations	Responsible Entity	Potential Assistance Sources	Implementation Schedule
E. Cultural Resources				
1. Recreational Planning (Refer to Section 8.5.1)	1. Require new subdivision plans to incorporate walking paths or sidewalks before permits are granted. 2. Complete park/recreational planning that include facilities currently being planned. Utilize the various recreational plans that have been completed or are being completed to enhance the varied recreational opportunities (e.g., linking parks via bikeways or trails).	The yet to be establish a Chartiers Creek Watershed Conservation Organization, WCWA, ChCWA, and other local conservation organizations.	PADCNR: Keystone Funds and NPS - Rivers, Trails, and Conservation Assistance program.	On-going 2004
2. Linking Community Facilities (Refer to Section 8.5.2)	Create a watershed trails map that would inventory and map all the trails (rails-to-trails, bikeways, and blueways) thus showing the linkage made by these trails to various communities and attractions.	Local conservation organizations, chamber of commerce, municipal officials, small business/facility operators.	PADCNR: Keystone Funds and NPS - Rivers, Trails, and Conservation Assistance program.	2004+
3. Rails-to-Trails and Bikeways (Refer to Section 8.5.3)	Complete needed feasibility studies and construction activities for Rail-to-Trail opportunities (i.e., the Montour Run (spur), Charters Creek, and Chartiers-Houston School District trails).	Montour Trail Council (MTC), Local Conservation Organization, school districts, and local municipalities.	PADCNR: Keystone Funds, PADEP: Growing Greener, PENNDOT TEA-21 funds, and NPS - Rivers, Trails, and Conservation Assistance program.	2004+
4. Eco-tourism (Refer to Section 8.5.4)	Eco-tourism will increase as cultural, recreational, and educational opportunities expand. These opportunities (**Chartiers Creek Triathlon**) will be tied to the rail-to-trail networks that are developing along with the environmental educational facilities that are currently being planned.	Local conservation organizations, chamber of commerce, municipal officials, small business/facility operators.	Local chamber of commerce, municipalities, small business, PADCNR (Keystone Funds), and community and regional foundations.	2003
5. Land Purchase for Conservation (Refer to Section 8.5.5)	Strategically identify areas for the purchase of property (e.g., Important Habitats, Natural Heritage Areas, Critical Areas, and Potential Remediation Sites) for conservation, preservation and/or remediation opportunities. This could assist in developing a greenway corridor in the watershed.	Allegheny Land Trust, WPC, and local conservation groups.	PADCNR: Keystone Funds and NPS - Rivers, Trails, and Conservation Assistance program.	On-going
6. Historical Property Preservation (Refer to Section 8.5.6)	Complete a historical properties inventory to assist in the preservation of these sites, so they are destination points for tourists.	Historic property owner(s), community historical societies, and local chamber of commerce.	PADCNR: Keystone Funds, PENNDOT/PTC cultural resource mitigation funds, and community and regional foundations.	On-going

Management Recommendations Matrix

Management Issue	Management Recommendations	Responsible Entity	Potential Assistance Sources	Implementation Schedule
F. Educational Resources				
1. Adult and Youth Education (Refer to Section 8.6.1)	Provide life long environmental education opportunities to encourage conservation ethics within the watershed. This would assist in promoting the watershed as a whole with conservation in mind as local citizens grow throughout their lives. Improve local organization's needs by improving and/or expanding environmental outreach programs, staff, equipment, and facilities.	WCWA, ChCWA, other local conservation groups, local school districts (Envirothon Program), and local/regional colleges and universities.	PADCNR: Keystone Funds, PADEP's Citizens' Volunteer Monitoring Program, CVI, Alliance for Aquatic Resource Monitoring, LWV - Citizen Education Fund, SWRC, and EPA Environmental Education Grant program.	2002+
2. Education Facilities (Refer to Section 8.6.1)	Develop watershed wide integrated local school district and adult education programs with the currently planned environmental education facilities in the lower portion of the watershed (e.g., Scrubgrass Run, Settler's Cabin Park, Boyce/Mayview Park, etc.).	Local school districts and conservation groups.	EPA Environmental Education Grant program, PADCNR: Keystone Funds, Pennsylvania Department of Education (PADE), Environmental Education Program, LWV - Citizen Education Fund, and school district funded.	2003
3. Community Education/Public Relations Activities (Refer to Section 8.6.2)	1. Establish a Chartiers Creek Watershed Conservation Organization. This organization is the responsible organization for the whole of the watershed and implementation of the Rivers Conservation Plan. Have this organization be represented by individuals from throughout the watershed in both counties. This will assist by allowing conservation activities to be prioritized in a strategic manner.	Watershed Stakeholders and Conservation Organizations.	Pennsylvania Department of Conservation and Natural Resources (PADCNR) circuit rider for funding Executive Director position and Keystone Funds.	2003
	2. Public relations activities can be completed via local and regional papers, magazines, and regular, cable, and satellite television providers.	Local school districts, communities, and conservation groups.	GreenWorksChannel.org, Pennsylvania Center for Environmental Education	2002+
	3. Provide year round continuing education to watershed stakeholders through the use of various volunteer activities, outreach projects, and increased awareness.			
4. Conservation Groups/ Volunteer Opportunities (Refer to Section 8.6.3)	1. Continued water quality monitoring activities. 2. Participate in the 'Ohio River Sweep' 3. Integrate watershed wide volunteer activities with local school district curriculum via conservation demonstration projects and awareness activities.	Local school districts, communities, and conservation groups.	EPA Environmental Education Grant program, PADCNR: Keystone Funds, Pennsylvania Department of Education (PADE), Environmental Education Program, LWV - Citizen Education Fund, and school district funded.	2002+