I. INTRODUCTION

Cowanshannock Creek Watershed River Conservation Plan (RCP) was developed under a planning grant from Pennsylvania's Department of Conservation and Natural Resources (DCNR). The plan is intended to help communities better understand the natural, physical, and cultural resources in their watersheds, so that they can make conscious decisions regarding potential improvements, and protect important features. A further objective is to obtain DCNR approval of the river conservation plan in order to place the Cowanshannock Creek Watershed on the Pennsylvania Rivers Conservation Registry. This status gives special recognition to communities that lie within the Cowanshannock Creek Watershed and makes them eligible for granting dollars available through the Keystone Grant Program. The project was initiated by the Cowanshannock Creek Watershed Association (CCWA) in October 2000 upon receipt of the DCNR planning grant. CCWA is a conservation organization that has been working in the watershed since 1980 with goals to restore and improve the conditions in the area. The plan covers the entire the watershed, which is approximately 63.3 square miles in size.

A. PLANNING PROCESS

The planning process began with the selection of a consultant and development of a steering committee for the plan. The consultant worked closely with the steering committee through the planning process which included a strong public involvement component and collection of comprehensive data on the watershed. Community involvement was sought through a series of public meetings. The first public meeting was held in late 2000 to inform interested citizens and community representatives on the RCP process. This not only assisted in educating local citizens, municipalities, and organizations about the RCP effort, but also helped identify issues of concern, identify potential steering committee members for the plan, and provided opportunity for "grassroots" involvement from the onset of the project. This initial public meeting set the stage for major issues to be addressed in the plan (as described in Appendix A).

The consultant worked with a steering committee to further identify major issues and concerns and to identify existing data resources. Data on the natural, physical, cultural, and socio-economic resources in the watershed were collected and evaluated correlating their impacts to land development activities and trends. Further input on challenges and opportunities was obtained from the steering committee to develop a list of management options included in this plan. A draft plan and final plan were presented at additional public

meetings. Written correspondence of the summarized public comment period will be included in the final report.

B. GOALS & OBJECTIVES

The Cowanshannock Creek Watershed River Conservation Plan was developed to provide a holistic vision and plan of action for the entire watershed. A series of management recommendations were developed to address major issues and concerns throughout the area. The management options offer guidance to communities in the watershed to help them achieve the greatest environmental, recreational, and economic benefits. More specifically the recommendations will help communities reach the following goals, in no specific order:

- 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; and
- Encourage compatible and sustainable economic development.

II. PROJECT AREA CHARACTERISTICS

A. LOCATION

Cowanshannock Creek Watershed is located in midwestern Pennsylvania and flows west through Indiana and Armstrong Counties, Pennsylvania. The headwaters of the Cowanshannock Creek's main stem originate in the village of Denton, Indiana County (Refer to Figure 1). The Cowanshannock Creek discharges into the Allegheny River at Gosford, Armsrong County, approximately 2.5 miles upstream from Kittanning Borough. The watershed boundary contains a total of nine townships and one borough as shown in Table 1 (Refer to Figure 2).

TABLE 1: MUNICIPALITIES IN THE WATERSHED

Armstrong County	Indiana County
Townships	
Cowanshannock Township	South Mahoning Township
Kittanning Township	West Mahoning Township
Manor Township	
Plumcreek Township	
Rayburn Township	
Valley Township	
Wayne Township	
Borough	
Rural Valley Borough	

B. SIZE

The entire watershed covers approximately 63.3 square miles (164 square kilometers) and consists of approximately 153 miles (246 kilometers) of stream. The main stem of the Cowanshannock has an estimated length of 25.0 miles (40.2 kilometers) and includes the following six major tributaries with drainage areas ranging from 1.23 to 7.13 square miles (USGS, 1993): Mill Run (7.13 square miles) , Huskins Run (6.40 square miles), Spra Run (2.89 square miles), Spruce Run (2.44 square miles), Craigs Run (1.74 square miles), and Long Run (1.23 square miles).

C. TOPOGRAPHY

The watershed is characterized by a narrow floodplain from the west that widens in the middle and eastern sections through the villages of Yatesboro and Numine and along the north branch of Cowanshannock Creek (USGS, 1993). The floodplain is surrounded by hilly topography with some hilltops rising 400 to 500 feet in elevation. Steeper areas with greater than 25% slope are concentrated in the western portion near the mouth of Cowanshannock Creek and along the main stem through the villages of Sunnyside, Stonehouse, Greendale, as well as along Mill Run and lower reaches of Spra Run (SPC, 2001.) The overall elevations within the watershed range between less than 800 feet where the Cowanshannock Creek enters the Allegheny River and greater than 1580 feet in the far eastern portions of Cowanshannock Creek Watershed.

D. CRITICAL AREAS

The western portion of the Cowanshannock Creek, from Huskins Run to the mouth, is considered a critical area in the watershed due to the pristine nature of this area. This area includes the important habitat area of Buttermilk Falls (See Section V-D, Important Habitats). This stretch of the Cowanshannock is trout stocked and the most aesthetically pleasing. Therefore, this area attracts anglers, campers, and nature observers. However, litter, graffiti, and all-terrain vehicles are contributing to defacing this pristine area.

Other critical areas in the watershed include steep, unvegetated slopes. This type of terrain is considered a critical area because it is subject to erosion and sedimentation. The impact of rainfall disperses soil and water, while gravity pulls the soil down steep slopes, eroding the hillside on its way. This is particularly a problem on unvegetated slopes (i.e., agricultural fields, road cuts, and mining and construction sites). A thick vegetation cover will slow the rainfall before it reaches the soil, and erect, persistent vegetation will detain the water/soil association, inhibiting it from moving downhill. In addition to soil erosion, development of these areas can cause hillslope failure, or other disruption. Furthermore, the sediment washing into waterways as a result of development is carried downstream and may have other negative consequences on the watershed (Leopold, 1978). Therefore, care needs to be taken when planning the use of these areas to lessen the effects of hillslope erosion (Refer to Section II-C, Topography and Figure 3, Development Constraints).

E. LAND USE & MANAGEMENT

1. LAND USE/LAND COVER

Land use/land cover within the watershed consists of predominantly forested and agricultural lands. Together, these two land cover types compose more than 97% of the watershed area, at approximately 51% and 46% respectively. Forested and agricultural land uses are generally intermingled throughout the watershed. The largest areas of unfragmented forest land are observed south of Route 85 and Cowanshannock Creek in the southern portions of Valley Township and throughout Kittanning Township. These lands are primarily privately owned, with no large tracts of forest or agricultural lands owned by state, federal, or local governments. Table 2 and Figure 4 show the major land use types in the watershed (SPC, 2001).

TABLE 2: MAJOR LAND USE TYPES

Land Use Type	Estimated Acres	Percentage
Industrial	6	0.02
Mixed Development	180	0.44
Residential - Low Density, Rural	371	0.92
Agricultural	18,752	46.29
Forest	20,669	51.02
Wetland - Forested	261	0.64
Wetland - Non-Forested	143	0.35
Strip Mines or Disturbed	119	0.29
Other (Open Water)	13	0.03
TOTAL	**40,514**	**100.00**

Source: Southwestern Pennsylvania Commission, 2001

Developed areas compose less than 1.5% of the entire watershed and consist of primarily residential (e.g., homes, townhouses, trailers), mixed development areas (e.g., small non-commercial businesses, shops), one small industrial site, and two industrial parks. Residential and mixed development are concentrated in ten areas within the watershed. Most of these areas are located along Route 85 in the Cowanshannock valley. From west to east, the residential and mixed development

land uses are located at the villages of Gosford, Green Acres, Sunnyside, Spring Corners, West Valley, Mc Nees, Yatesboro, Rural Valley Borough, Numine, and Denton. The village communities consist of a mixture of single-family housing units and small businesses (e.g., gas stations, general stores, restaurants). One small industrial area is located in the upstream area of Cowanshannock Creek in Indiana County. Two industrial/commercial parks classified as mixed development, the East Hills Industrial Park and the Shannock Valley Industrial Park, are also located within the watershed. Additional isolated industrial facilities classified as commercial or mixed development are also present.

Remaining land use types within the watershed are wetlands and barren lands (i.e., strip mines or disturbed). Wetlands compose approximately 1% of the land cover area and are located along the main stem of the Cowanshannock Creek through Cowanshannock Township and Rural Valley Borough. Barren lands comprise less than 1% of the watershed and consist of seven sites scattered throughout the watershed. Sites identified include reclaimed or un-reclaimed properties.

Roads and highways cover a minimal amount of the watershed. Major roads include SR 28/66, SR 85, Route 422, SR 839, and Route 954. These roads provide transportation routes primarily for local residents, with routes to Kittanning and Ford City. Many smaller local roads are located throughout the watershed. See section II-G, for more information on the transportation issues within the watershed.

2. LAND USE CONTROLS

Available Land Use Planning Tools

Land use planning is guided at the local and regional levels through use of various planning and zoning tools. Use of planning and zoning tools helps communities plan for development activities to reach economic development goals, and can also be applied to promote conservation of community resources. These land use controls can be advisory in nature or enforceable. Examples of the type of zoning and planning tools available to the counties and municipalities in the watershed are listed in Table 3.

TABLE 3: PLANNING AND ZONING TOOLS

Zoning Tool	Description	Benefits
Zoning Ordinance	Determines land uses (e.g., residential, industrial, commercial) allowed for any given area within a municipality. Enforceable.	Can be applied to identify and protect sensitive lands and resources. May include special development restrictions (e.g., number of buildings, height of structures, setback distances from property lines, and open space provisions).
Comprehensive Plan	Guide for future growth, development, land use, and community character. Advisory.	Sets the stage for sound and reasonable zoning. Can address the goals to protect and enhance the community resources.
Official Map	Both a map and land use ordinance that identifies existing and proposed public facilities (streets, parks, etc.). Can be applied to the entire municipality or for a particular area. Enforceable.	Helpful in notifying landowners of existing and proposed streets, public lands (i.e., parks, trails, etc.), streams/waterways, and other public right-of-ways. Reserves important lands, including private lands, without immediate purchase.
Subdivision and Land Development Ordinance	Governs development activity of land planned for division or developed for non-residential uses. Enforceable.	Sets standards for property plats, street design, water and sewer, and open space dedications. Caution--Without designation of where specific land uses can be located, these ordinances may be relied upon too heavily to achieve land use objectives.

Source: Governor's Center for Local Government Services. January 2000. *Land Use in Pennsylvania: Practices and Tools - An Inventory*. 2000.

Under the Pennsylvania Municipalities Planning Code of 1968, P.L. 805 (No. 247 as enacted and amended) municipalities have the authority to manage land use through the enactment of *enforceable* zoning ordinances. Zoning ordinances are blueprints or plans that specify allowed land uses (e.g., residential, commercial, industrial) throughout the community. By having zoning in a community, developers can be held to standards that will protect a community from poor development (both environmentally and economically). An article entitled "Paying for Growth, Prospering from Development" in Appendix B relays the value of planned development to communities. Examples of model planning ordinances are included in Appendix C.

Recent development activities have included building of the new West Shamokin High School, Rural Valley Borough jail, a glass factory, and Charlie Brown Trailor Courts. Areas outside of Kittanning and Ford City on the western end of the

watershed show signs of development, and several municipalities have relatively high projected growth. Nevertheless, with development composing less than 1.5% of the Cowanshannock Creek Watershed, development activities have had relatively little impact on water and land resources. Sprawl development is generally not a major concern (Armstrong County Planning Commission, 2001 and Indiana County Planning Commission, 2001). Rather, protection of existing sensitive lands (forest resources, floodplains, wetlands, etc.) through use of various planning tools and other protection efforts will be important to protecting the integrity of the watershed.

Zoning Activities Within the Cowanshannock Creek Watershed

Zoning activities at the county level in both Armstrong and Indiana Counties govern all planning and development in the watershed. Currently, none of the municipalities within the watershed have enacted zoning at the municipal level (Armstrong County Planning Commission, 2001 and Indiana County Planning Commission, 2001).

In Armstrong County, zoning and planning is guided by the *Subdivision and Land Development Ordinance* as amended in 1992. The ordinance contains language that requires various levels of protection of natural and cultural features during development. For example, connection or access to water and sewer service or on-lot facilities is required, minimal disturbance to soil and geologic features is recommended, and protection of floodplains is promoted. However, dependance on a subdivision ordinance alone, without designation of areas for protection and areas for development, may be inadequate for protection of local resources. Some type of comprehensive planning and zoning is needed. Armstrong County is on its way. In April 2001, the county began work towards developing a comprehensive plan that will be important to future development and natural resources conservation county-wide.

Within Indiana County, a County Comprehensive Plan adopted in 1967 is the only enacted zoning. Since then, the comprehensive plan has not been updated and no new ordinances have been put in place (Indiana County Planning Commission, 2001). However, Indiana County Planning Commission submitted a grant application in May 2001 to update their comprehensive plan.

F. SOCIOECONOMIC PROFILE

1. CENSUS DATA & METHODOLOGY

Two sets of data are available to describe the socio-economic conditions of the watershed. They are census tract data and municipal data.

Census tracts refer to areas designated by the U.S. Census for purposes of organizing information collected on population and housing. Census tracts are based on a combination of political, geographic, and population count factors. There are seven census tracts that compose the Cowanshannock Creek Watershed. Of these seven tracts, four tracts (#9807, #9806, #9808, and #9602) cover more than 95% of the land area. Additional tracts covering less than 5% of the land area are tracts #9801, #9809, and #9817.

Census data for individual municipalities are also available. There are a total of ten municipalities within the watershed (See Figure 2 and Table 1). Of these ten municipalities, five (Cowanshannock, Kittanning, Valley, Rayburn, and South Mahoning Townships) cover 92% of the watershed. The remaining five municipalities (Rural Valley Borough, Manor, Plumcreek, Wayne, and West Mahoning Townships) cover 8% of the watershed.

For this plan, municipal data rather than census tract data have been applied. Census tracts cover a much larger area than the municipalities posing greater degrees of variability. Municipal data are also useful in identifying issues that can be addressed at the local government level.

Population and growth estimates were completed using information from all municipalities. Overall estimates within the watershed were calculated considering the area of the municipality within the watershed and assuming the population is evenly distributed. For some topics (e.g., poverty, education), data from only the five major municipalities were used. Covering 92% of the watershed, data from these municipalities were considered representative of the entire watershed. The 2000 Census data was only available for total populations, age, and race information at the time data was collected for this report. Information on education, income, etc. from the 2000 Census was not available.

2. POPULATION ESTIMATES AND PROJECTED GROWTH

The estimated current populations, future growth, and population densities of municipalities in the Cowanshannock Creek Watershed are shown in Table 4 (US Census Bureau, 2000; SPC, 2000). Overall an estimated 5,499 people lived in the watershed in 2000 (column 6), and population projections indicate that an estimated 5,929 people will be living in the watershed in 2025 (column 7). This represents an expected growth of 7.1% (430 people) over the next 25 years. This projection differs from steady population trends observed in the area in recent decades. For example, the Cowanshannock Creek Watershed experienced a population increase of less than 2% from 1990 to 2000.

Future projected growth is mixed across the watershed with sharp declines in growth in some municipalities and sharp increases in others (See Figures 5 and 6). Most notably Rayburn Township (53%), followed by Plumcreek (19%), Manor (13%), and Cowanshannock (13%) Townships have projected increases. All remaining municipalities have projected decreases in population. The sharpest projected decreases are in Wayne Townships (-49%) and Kittanning Township (-26%). The population projections are based on a national econometric forecasting model that considers impacts of proposed economic development and transportation projects in the region (SPC, 2000). The model assumes that these proposed development and transportation projects are implemented.

The distribution of population within the watershed can be viewed on the basis of population density. Population densities in each municipality are shown in column 8 of Table 4. Overall, the 2000 population density of municipalities within the watershed was approximately 87 individuals per square mile.

3. AGE AND RACE

Based on 2000 US Census data of the five major municipalities in the watershed, the age groups within the Cowanshannock Creek Watershed are fairly evenly distributed. The age distribution is as follows:

- Under 18 26.6 %
- Age 18 to 24 7.2%
- Age 25 to 44 28.5%
- Age 45 to 64 23.3%

- Age 65 and over 14.0%

The overall median age is 37 years. The age distribution is close to the age distribution for the State of Pennsylvania where the median age is 38.

The race of the population is predominantly white. Overall, only 225 individuals of minority races (approximately 1% of the municipal population) lived in municipalities located in the watershed in 2000 (US Census, 2000).

TABLE 4: POPULATION AND POPULATION GROWTH

	Column 1	*Column 2*	*Column 3*	*Column 4*	*Column 5*	*Column 6*	*Column 7*	*Column 8*
Municipality	**Estimated 2000 Population**	**Estimated 2025 Population[1]**	**Percentage Change 2000-2025**	**Percent of Municipality in Watershed**	**Percent of Watershed in Municipality**	**Estimated 2000 Population in Watershed**	**Estimated 2025 Population in Watershed**	**Persons Per Square Mile in Watershed 2000**
Armstrong County					92	5,244	5,724	139.3
Cowanshannock Township	3,006	3,389	12.74	59.9	43	1,801	2,031	65.9
Kittanning Township	2,359	1,743	-26.11	32.3	16	762	563	76.8
Manor Township	4,231	4,775	12.86	5.4	1	229	258	254.9
Plumcreek Township	2,304	2,733	18.62	1.2	1	28	33	54.3
Rayburn Township	1,811	2,779	53.45	56.0	11	1,014	1,557	152.2
Rural Valley Borough	922	837	-9.22	100.0	3	922	837	439.0
Valley Township	681	644	-5.43	66.3	15	451	427	46.3
Wayne Township	1,117	570	-48.97	3.3	2	37	19	25.0
Indiana County					8	255	205	44.9
South Mahoning Township	1,618	1,298	19.78	14.9	7	241	193	56.6
West Mahoning Township	974	827	-15.09	1.4	1	14	12	33.2
TOTALS	**19,023**	**19,595**	**3.01%**		**100%**	**5,499**	**5,929**	**86.9**

Notes:

[1] 2025 projections based on 1997 population estimates.

TABLE 3: PLANNING AND ZONING TOOLS

Zoning Tool	Description	Benefits
Zoning Ordinance	Determines land uses (e.g., residential, industrial, commercial) allowed for any given area within a municipality. Enforceable.	Can be applied to identify and protect sensitive lands and resources. May include special development restrictions (e.g., number of buildings, height of structures, setback distances from property lines, and open space provisions).
Comprehensive Plan	Guide for future growth, development, land use, and community character. Advisory.	Sets the stage for sound and reasonable zoning. Can address the goals to protect and enhance the community resources.
Official Map	Both a map and land use ordinance that identifies existing and proposed public facilities (streets, parks, etc.). Can be applied to the entire municipality or for a particular area. Enforceable.	Helpful in notifying landowners of existing and proposed streets, public lands (i.e., parks, trails, etc.), streams/waterways, and other public right-of-ways. Reserves important lands, including private lands, without immediate purchase.
Subdivision and Land Development Ordinance	Governs development activity of land planned for division or developed for non-residential uses. Enforceable.	Sets standards for property plats, street design, water and sewer, and open space dedications. Caution--Without designation of where specific land uses can be located, these ordinances may be relied upon too heavily to achieve land use objectives.

Source: Governor's Center for Local Government Services. January 2000. *Land Use in Pennsylvania: Practices and Tools - An Inventory*. 2000.

Under the Pennsylvania Municipalities Planning Code of 1968, P.L. 805 (No. 247 as enacted and amended) municipalities have the authority to manage land use through the enactment of *enforceable* zoning ordinances. Zoning ordinances are blueprints or plans that specify allowed land uses (e.g., residential, commercial, industrial) throughout the community. By having zoning in a community, developers can be held to standards that will protect a community from poor development (both environmentally and economically). An article entitled "Paying for Growth, Prospering from Development" in Appendix B relays the value of planned development to communities. Examples of model planning ordinances are included in Appendix C.

Recent development activities have included building of the new West Shamokin High School, Rural Valley Borough jail, a glass factory, and Charlie Brown Trailor Courts. Areas outside of Kittanning and Ford City on the western end of the

In 1990, the average income of individuals within the watershed averaged $9,646 in 1990 dollars, with average median household income at $23,242 in 1990 dollars (compared to state 1997 median household income of $37,267).

The lowest income levels were in West Mahoning Township with per capita income at $6,537 and median household income at $17,353. The highest incomes were in Manor and Valley Townships, with average per capita income at $12,022 in Manor Township and median household income at $27,917 in Valley Township.

7. POVERTY

Based on 1990 US Census data, an average of 17% of the population and 14% of families were living under the state poverty level within the watershed. This is higher than the state average, where an estimated 10.9% of population were living under the poverty level. The highest levels of poverty are in West Mahoning, Rayburn, and South Mahoning Townships with the percentage of families living in poverty at 28.1%, 20.7%, and17.2%, respectively.

G. TRANSPORTATION FACILITIES

1. ROADS

Road transportation within the watershed consists of several major roads, with a few secondary roads, and a larger network of smaller paved and dirt roads.

The largest roadway passing through the watershed is State Route (SR) 66/28. It crosses the western end of the watershed primarily through Rayburn Township and runs in a northeasterly direction. A major secondary road within the watershed is SR 85. SR 85 is a two-laned paved road that runs along the northern bank of Cowanshannock Creek throughout most of its length. The road crosses the main stem of Cowanshannock Creek near Sunnyside in Rayburn Township. Other major roads include Route 422, SR 839, and Route 954.

Local roads within the area include dirt and gravel roads networks. More than 489 miles of dirt and gravel roads are located throughout Armstrong County (Armstrong County Conservation District, 2001). More specifically among the primary municipalities within the watershed: Rayburn Township has 6.4 miles; Valley Township has 6 miles; and Rural Valley has 0.5 miles of gravel and dirt road. None

of the dirt and gravel roads within Indiana County are located within the Cowanshannock Creek watershed (Indiana County Conservation District, 2001). Dirt and gravel roads can be a source of sedimentation to streams and rivers. Proper maintenance is important to protect streams from potential impacts and is a responsibility of the local municipalities.

There is some current road construction activity within the watershed. Construction along SR 422 (Kittanning Bypass) in the southwestern portion of the watershed is currently underway (PENNDOT, 2001). Although most of the construction lies in neighboring watershed of Garrett Run, a small portion just upstream of the SR 85 bridge to the SR 28/SR 66 bridge is located within the Cowanshannock Creek Watershed. Because greater potential improvements that be made along the Cowanshannock Creek, wetland and stream mitigation required as part of construction activities were completed in the watershed. Overall a total of 14.3 acres of wetland mitigation (including wetland construction, enhancement, and protection), 5.9 acres of terrestrial mitigation, and 4,920 feet of streambank enhancement was completed in the Cowanshannock Creek Watershed as a result of transportation mitigation efforts.

Work on Route 422 also has potential to lure some limited development near the western portion of the watershed. The *2000 Long Range Economic Development Program* proposed by the Armstrong County Planning Commission indicates development of two industrial parks near route SR 422 - a West Industrial Park to be located on the 422 corridor west of the West Hills Interchange and an East Industrial Park to be located on the 422 corridor east of the Kittanning Bypass. Table 5 lists PENNDOT's Transportation Improvement Projects (TIP) identified within Armstrong County over the next four-year period and includes a number of bridge replacements and restorations. Projects of interest include a bridge replacement at Buttermilk Falls Bridge (T507) proposed for 2000-2003 and construction of parts of the Armstrong Trail in Gilpin, Manor, and Kittanning Townships proposed for 2000-2003.

TABLE 5: TRANSPORTATION PROJECTS PROPOSED FOR THE COWANSHANNOCK CREEK WATERSHED UNDER PENNDOT'S TRANSPORTATION IMPROVEMENT PROJECTS

Project	Municipality	Description	Year Proposed
Armstrong Trail	Gilpin, Manor, and Kittanning	Construction of a 10 foot wide segment	2000-2003

In 1990, the average income of individuals within the watershed averaged $9,646 in 1990 dollars, with average median household income at $23,242 in 1990 dollars (compared to state 1997 median household income of $37,267).

The lowest income levels were in West Mahoning Township with per capita income at $6,537 and median household income at $17,353. The highest incomes were in Manor and Valley Townships, with average per capita income at $12,022 in Manor Township and median household income at $27,917 in Valley Township.

7. POVERTY

Based on 1990 US Census data, an average of 17% of the population and 14% of families were living under the state poverty level within the watershed. This is higher than the state average, where an estimated 10.9% of population were living under the poverty level. The highest levels of poverty are in West Mahoning, Rayburn, and South Mahoning Townships with the percentage of families living in poverty at 28.1%, 20.7%, and17.2%, respectively.

G. TRANSPORTATION FACILITIES

1. ROADS

Road transportation within the watershed consists of several major roads, with a few secondary roads, and a larger network of smaller paved and dirt roads.

The largest roadway passing through the watershed is State Route (SR) 66/28. It crosses the western end of the watershed primarily through Rayburn Township and runs in a northeasterly direction. A major secondary road within the watershed is SR 85. SR 85 is a two-laned paved road that runs along the northern bank of Cowanshannock Creek throughout most of its length. The road crosses the main stem of Cowanshannock Creek near Sunnyside in Rayburn Township. Other major roads include Route 422, SR 839, and Route 954.

Local roads within the area include dirt and gravel roads networks. More than 489 miles of dirt and gravel roads are located throughout Armstrong County (Armstrong County Conservation District, 2001). More specifically among the primary municipalities within the watershed: Rayburn Township has 6.4 miles; Valley Township has 6 miles; and Rural Valley has 0.5 miles of gravel and dirt road. None

United States Congress

12th Federal Legislative District: (John P. Murtha [D])

Pennsylvania Senate

41st PA Senatorial District (Donald C. White [R])

Vice Chair, Community and Economic Development Committee

Pennsylvania House of Representatives

8th PA Legislative District (Richard R. Stevenson [R])

Subcommittee Chairman on Mining, Environmental Resources, and Energy Committee

62ndPA Legislative District (Sara G. Steelman [D])

Vice Chairman, Agriculture and Rural Affairs Committee

63rdPA Legislative District (Fred McIlhattan [R])

66thPA Legislative District (Samual H. Smith [R])

III. LAND RESOURCES

A. GEOLOGY AND SOILS

The Cowanshannock Creek Watershed is located in the Pittsburgh Low Plateaus section of the Appalachian Plateaus Physiographic Province. The Pittsburgh Low Plateaus section consists of relatively flat lying rocks. Folds are generally very broad and are not noticed on the surface. In the watershed area, several regional anticlines and synclines occur. Traveling east from the western end of the watershed, near Kittanning, Pennsylvania, structural features that are crossed include the Duquesne-Fairmont Syncline, the Greendale-Sprankle Mills Anticline, an unnamed anticline near Meredith, Pennsylvania, the Elderton Syncline, an unnamed anticline near Smeltzer, Pennsylvania, and finally, the Punxsutawney-Caledonia Syncline (Berg and Dodge, 1981).

The bedrock in the watershed ranges from the oldest Pottsville Group to the youngest member of the Conemaugh Group, the Casselman Formation. All these rocks are of Pennsylvanian age. The "layer cake" geology causes the ridge tops to be formed by the more resistant rocks of the Conemaugh Group, the Glenshaw and Casselman Formations. The incised stream valleys are where the older rocks of the Pottsville and Allegheny Groups are found. All of these formations and groups contain cyclical beds of shale, siltstone, sandstone, and limestone. The Pottsville Group also contains several conglomerates. The Allegheny Group contains the valuable Freeport, Kittanning, and Brookville-Clarion Coals (Berg, et al., 1980). For a visual representation of the geologic structure of the watershed, refer to Appendix D.

The mineral resources found in the surrounding area include coal, clay, limestone, sandstone, oil and gas. Coal is among the most important mineral resource within the watershed and a number of coal mining activities continue within the area. In addition to coal mining, underground mines have been developed for clay resources in Armstrong County. Numerous mineable coals and underclays are associated with the Pottsville and Allegheny groups. For more information about coal and clay mining in the Cowanshannock Creek Watershed, refer to Abandoned Mine Lands (Section III-E).

Pennsylvanian Vanport Limestone, a high-calcium limestone covered by less than 100 feet of sedimentary rock, is located within a majority of the watershed through the western and central regions (PADCNR, 2000). Although limestone is typically associated with the formation of sink holes, the geologic conditions within the watershed, that are typical of western Pennsylvania limestones, do not lend to the formation of significant sink holes.

Occasional sink holes may be found, however, they are not a geologic hazard.

Soil Associations

The watershed has numerous soils and soil associations. Soil associations in the watershed include (Soil Survey, Armstrong County 1977, Indiana County 1991):

Armstrong County

- Weikert - Gilpin,
- Gilpin - Weikert - Ernest,
- Rainsboro - Melvin - Steff,
- Rayne - Ernest - Hazleton,
- Warton - Rayne - Cavode.

Indiana County

- Gilpin - Weikert - Ernest,
- Gilpin - Wharton - Cavode.

Weikert-Gilpin associations are well-drained, shallow and moderately deep, steep, and very steep soils on uplands. This association makes up about 27 percent of Armstrong County. Some of the most scenic areas of the country, as well as many of the areas that have been strip mined, are in this association.

Gilpin-Weikert-Ernest are well-drained and moderately well-drained associations that are shallow to deep, gently sloping to moderately steep soils on benches, ridges, and hillsides. This association makes up about 24 percent of Armstrong County and about 32 percent of Indiana County. This type of soil association makes farming difficult because of the dissected landscape and complex slopes of the soils. Due to the over take of brush and weeds, many of the steep slopes of this association have been planted to Christmas trees. This association is generally too shallow for septic tank systems, however, some areas are suited to limited urban development.

Rainsboro - Melvin - Steff associations are moderately well drained to poorly drained, deep, nearly level to gently sloping soils on terraces and flood plains. This association consists of broad acres adjacent to large creeks and rivers. The soils are underlain by stream sediment. Rainsboro - Melvin - Steff associations make up about nine percent of Armstrong County. Much of the recent urban development have been on the terraces of the early towns and boroughs that were in this association throughout Armstrong County. Construction was easy on the gently sloping soils, and therefore, railroads and early highways were built on this association.

Rayne - Ernest - Hazleton associations are well drained and moderately well drained, deep, gently sloping to moderately steep soils in low-lying areas on ridgetops, and on

hillsides. Nineteen percent of Armstrong County is covered by this association. Most of the soils are from weathered shale but some formed in colluvium at the base of slopes and others weathered from sandstone. Some productive farms are on this association and many of the soils have only moderate limitations for urban development.

Warton - Rayne - Cavode associations are well to somewhat poorly drained, deep, nearly level to moderately steep soils. They are typically found on ridges, benches, and hillsides. This association makes up about 21 percent of the Armstrong County. Farming with modern machinery is less difficult among the more gentle slopes in this association than in some of the other associations. Many areas need artificial drainage, and once drained, they are suited to general field crops. Slow permeability and a seasonal high water table, that characterize many places, are limitations for on-lot sewage.

Gilpin - Wharton - Cavode associations are medium textured soils on moderately sloping to moderately steep valley slopes and broad, gently sloping hilltops and benches. This is an area of rolling hills carved out by streams that form a dendritic (or branching) drainage pattern. It covers about 19 percent of Indiana County. The soils of this association have moderate or severe limitations for residential development. Gilpin soils are generally too shallow for septic tank systems. Wharton and Cavode soils have a seasonal high water table, and therefore, these areas are typically undesirable for home sites or highway locations.

Prime Farmland Soils

Prime Farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for these uses (the land could be cropland, pastureland, forest land, or other land, but not urban developed land or water). It has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed (e.g., irrigation management) according to acceptable farming methods (USDA, 2001).

The prime farmland soils in the Cowanshannock Creek Watershed include:

Armstrong County

- Hazelton channery loam (HaB), 3 to 8 percent slopes;
- Pope loam (Po);
- Rainsboro silt loam (RaA), 0 to 3 percent slopes;
- Rayne silt loam (RnB), 3 to 8 percent slopes;
- Steff loam (Se);
- Steff loam (Sf), high bottom;

- Wharton silt loam (WrB), 3 to 8 percent slopes;
- Wharton-Gilpin silt loams (WtB), 3 to 8 percent slopes;
- Wharton-Vandergrift complex (WvB), 3 to 8 percent slopes.

Indiana County

- Cookport loam (CoB2), 3 to 8 percent slopes, moderately eroded;
- Ernest silt loam (ErA2), 0 to 3 percent slopes, moderately eroded;
- Gilpin channery silt loam (GcA2), 0 to 5 percent slopes, moderately eroded;
- Gilpin channery silt loam (GcB2), 5 to 12 percent slopes, moderately eroded;
- Monongahela silt loam (MoA2), 0 to 3 percent slopes, moderately eroded;
- Philo silt loam (Ph);
- Upshur-Gilpin silty clay loams (UgB2), 3 to 8 percent slopes, moderately eroded;
- Wharton silt loam (WrB2), 3 to 8 percent slopes, moderately eroded.

B. LAND OWNERSHIP

Nearly all of the land within Cowanshannock Creek Watershed is privately owned. Municipal governments own a few small public buildings and facilities throughout. In addition, the Cowanshannock Creek Watershed Association owns and/or manages public/recreational land within the watershed that makes up less than 1 % of the watershed. These areas include:

- Bernard C. Snyder Picnic Area, a 7 acre tract;
- Canfield-Holmes Sanctuary, nearly 300 acre parcel;
- Devils Washbasin, 1.5 acre lake, 4 acres surrounding land;
- Great Shamokin Path, 4 mile trail;
- White Lake and Wetland, 2 ½ acre lake, 15 acres surrounding land.

C. SOLID WASTE MANAGEMENT FACILITIES

The Waste Management Program for the Pennsylvania Department of Environmental Protection (PADEP) indicates that no landfills exist within the project area (PADEP, 2001).

The only waste management facility located within the watershed is the Armstrong County Recycling Center. The recycling center is located on Route 85 east of Kittanning at the Armsdale Center. The facility is a joint effort between Armstrong County and the Progressive Workshop. The Progressive Workshop is a private non-profit vocational rehabilitation facility that provides vocational rehabilitation services to adults who have a physical and/or mental handicap. The recycling center is used as a training facility for their clients. Recyclable materials collected at the facility include glass containers, metal containers,

newspaper, magazines, office paper, plastic bottles, corrugated cardboard, and used motor oil. The recycling center also has a circuit rider program that includes scheduled pick up of recyclable materials at 15 locations within Armstrong County. See www.armstrongcounty.com/recycling.html or call (724) 548-8048 for more information.

Indiana County Recycling Center is located in Homer City on Route 119 (outside the watershed). It accepts glass, plastics, cardboard, office paper, yard waste, metal containers, newspapers and magazines and has additional special recycling programs throughout the year. For more information see www.indianapa.com/icswa/ or call (724) 479-0444.

D. WASTE AREAS

1. Hazardous Waste Areas

What is a Hazardous Waste?

A hazardous waste is any hazardous solid, liquid, or contained gaseous material that is no longer used, and it is either recycled, thrown away, or stored until there is enough to treat or dispose. A waste is considered hazardous if it appears on any one of the four lists of hazardous wastes contained 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) toxicity testing. Examples of these materials 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 the Environmental Protection Agency (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 the EPA of the sites that the 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 (USEPA, 2001).

Hazardous Waste Sites

The National Priorities (Superfund) List (NPL) is the EPA's database of uncontrolled or abandoned hazardous waste sites identified for priority remediation under the Superfund program (Environmental Institute, 1991). The PADEP, Hazardous Sites Clean-up Program maintains an inventory of facilities (State Priority List [SPL]) subject to investigations concerning likely or threatened releases of hazardous substances from those facilities. There are no NPL, SPL, PA Hazardous Sites Clean-up Act, or EPA CERCLIS sites within the watershed. This is partly due to the rural nature of the watershed and the subsequent lack of industrial/commercial sites. Table 6 outlines the Resource Conservation and Recovery Act (RCRA) Handler and Compliance Report for the Cowanshannock Creek Watershed area.

TABLE 6: RESOURCE CONSERVATION AND RECOVERY ACT(RCRA) HANDLER AND COMPLIANCE REPORT

Handler ID	Handler Name	Location Address	City	Zip Code	State Dist	Gen. Type	Act. Loc.
PA0000918839	Curly Moore Chevrolet	½ MI East of SR 1028 on RT 85, ½ MI W of Rural Valley	Rural Valley	16249	5	CEG	PA
PAD000650291	Agway, Inc. - Kittanning Fertilizer Plant	Box 272, Tarrtown Road	Kittanning	16201	5	SQG	PA
PAR000031872	Altmeyers Fabricating	422 E 8 MI of Kittanning	Kittanning	16201	5	CEG	PA
PAD987398807	Altmeyers Fabricating, LTD	RD 1, Box 250A	Kittanning	16201	5	SQG	PA
PAR000028696	Altmeyers Fabricating, LTD	RT 422, 0.5 MI E of Sawmill RD, RT 1 Box 233A	Kittanning	16201	5	SQG	PA
PAR000010843	Burfords Auto Body	RT 268, N 3 MI E of RT 278	Kittanning	16201	5	CEG	PA
PAR000005116	Diamond Back Trailer MFG	Birch Haven RD, 1/4 MI S of RT 422	Kittanning	16201	5	CEG	PA
PAD981739568	Guido Oldsmobile	RT 422 E	Kittanning	16201	5	SQG	PA
PAD982693731	IA Construction Corp., Tarrtown	Tarrtown RD, 3 MI N of Old SR 422	Kittanning	16201	5	CEG	PA
PAD987337805	Kwik Fill, S0048 208	Box 260, RD 6	Kittanning	16201	5	SQG	PA
PAR000003418	Meyers, AJ & Sons, Inc.	Box 6C, RD No. 9, RT 422 E	Kittanning	16201	5	CEG	PA
PAR000032060	Peoples Natural Gas Vly.	RD 5, Margaret RD, 1 MI S of RT 85	Kittanning	16201	5	SQG	PA
PAD987388857	Peters Auto Body	RD 3, Box 352A	Kittanning	16201	5	CEG	PA

TABLE 6: RESOURCE CONSERVATION AND RECOVERY ACT(RCRA) HANDLER AND COMPLIANCE REPORT (continued)

Handler ID	Handler Name	Location Address	City	Zip Code	State Dist	Gen. Type	Act. Loc.
PA0000368506	Reesman Body Shop	Moorehead RD, 1/4 MI W of RT 66 N	Kittanning	16201	5	CEG	PA
PA0000557561	Schaeffers Auto Body	State Highway #85, RD 2, Box 84	Kittanning	16201	5	CEG	PA
PAD048191183	Tri County Mack Sales, Inc.	RT 66, N of Kittanning	Kittanning	16201	5	SQG	PA
PA9960023027	USARC Kittanning	PA RT 28 & PA RT 85, Manor	Kittanning	16201	5	CEG	PA
PAR000041160	Zambotti Collision CTR	RD 5, Box 89, RT 85, Sunnyside Main ST	Kittanning	16201	5	SQG	PA

Source: United States Environmental Protection Agency, 2001.

TABLE 7: EMERGENCY RESPONSE NOTIFICATION SYSTEM (ERNS) SITES

Regional Case Number	NRC No.	Potential Responsible Party	Incident Location	Township and County	Spilled Material	Quantity	Source	Cause	Medium Affected	Spill Date
None	None	Macson Corporation	Eastern Armstrong Secondary School	Cowanshan-nock Twp./ Armstrong County	Diesel Fuel	1000-1300 gallons	Fuel Tank	Fuel Tank Leak	Land and Water - Cowanshan-nock Creek	5/17/99
PA990720	None	Shaun Mcknight	RD 34, Box 121, Slatlick Exit off RT 28	Kittanning Twp./ Armstrong County	Tires and House-hold Chemicals	Not Known	Fixed Facility	Other than Listed	Air	6/10/99
PA91369	55388	Dayton Oil Company	Intersectio n of RT. 839 and RT. 85	Cowanshan-nock Twp./ Armstrong County	Oil Fuel; No. 2	Not Known	Not Known	Not Known	Water - Cowanshan-nock Creek	1/17/91
PA970312	None	Unknown	Old Rt. 66 near Kittanning	Manor Twp./ Armstrong County	Coal	15 Tons	High-way	Transpor-tation Accident	Land	Not Known

Source: United States Environmental Protection Agency, Pennsylvania Department of Environmental Protection

The Emergency Response Notification System (ERNS) is a database where events are reported to the EPA by hazardous waste response teams after responding to a spill. Events that have occurred within the watershed within the last fourteen years are outlined in Table 7.

2. Illegal Dumping

Roadside solid waste, private burning of waste, and small dumping locations on public and private property is occurring throughout the watershed, and is aesthetically displeasing. Fines have been issued to individuals for their actions, however, the problem continues to exist. A major challenge is changing the attitude of local residents on waste disposal. Many locals feel they have a "right to free dumping." Local residents need to understand that backyard dumping poses public health and environmental impacts to the *entire* community. In past years, the CCWA in cooperation with the Natural Resource Conservation Service (NRCS), conservation district, and others worked to clean-up dump sites. However, continued dumping frustrated and hindered clean-up activities. As a result, coordinated dump site clean ups are not currently held.

Enforcement of solid waste management regulations, including illegal dumping, is enforced by numerous Pennsylvania agencies. These include the PA Fish and Boat Commission, PA Game Commission, PA Bureau of State Parks, PA State Police, PADEP Bureau of Land Recylcling and Waste Management, as well as local municipal agencies (See Appendix E for more information). At the local level within Indiana County, a special enforcement program is in place to help municipalities enforce their waste management ordinances to curb illegal dumping in these communities. An enforcement officer employed by the county works in cooperation with municipalities who have a cooperative agreement with Indiana County Solid Waste Authority(ICSWA). Neither South Mahoning or West Mahoning Townships have cooperative agreements with ICSWA to date. Armstrong County has no such support program in place to date.

Both counties hold special recycling days periodically throughout the year which provide alternatives to the illegal dumping. Indiana County holds special drop-offs for large appliances, tires and batteries four times annually during the months of April, June, August, and October. Armstrong County holds a "Hard to Recycle Day" two times a year in April and September. They collect materials at the local Wal Mart in Kittanning and collect large appliances, tires, scrap metals, batteries, and other additional items. Both of these events can be utilized to promote recycling and proper waste management across both counties.

In addition to county and municipal agencies, the Pennsylvania CleanWays (PA Clean Ways) is a statewide organization that strives to battle illegal dumping and littering. PA Clean Ways has a state board that oversees and provides assistance to local county chapters. Chapters are run by volunteer advisory boards who build

community teams and set local priorities. Indiana County has had a chapter in place since 1998 and is based out of Homer City, PA. Armstrong County established a chapter in 1995, however, with the lack of participation, the organization had to fold. Additional background information on Pennsylvania Clean Ways can be found at www.pacleanways.org.

E. ABANDONED MINE LANDS

1. Coal Mines

Abandoned deep mines and abandoned surface mines exist throughout the watershed. The watershed was impacted from mining efforts in the late 1800s until the mid 1970s. Rochester and Pittsburgh Coal Company was among the first major mining operators. The company consolidated a number of small operations and then operated the Yatesboro mines in the early 1900s. Three major coals seams appear to be dominant throughout the watershed - the Upper Kittanning, Lower Freeport, and Upper Freeport. Mining activity has occurred within all three major coals seams. There was mining activity within the Upper Freeport "E" vein, some deep mine activity in the Lower Freeport "D" vein of the abandoned Yatesboro No. 9 and No. 3 mines, as well as some activity in the Upper Kittanning coal vein in the western section of the watershed (Carson Engineers, 1972).

Between 1940 and 1950, serious surface mine activity began and continues in some portions of the watershed. Table 8 outlines past and present permitted mining activity within the watershed. Table 9 and Figure 7 summarizes the types and acreage of abandoned mine land features from past mining operations located within the Cowanshannock Creek Watershed (BAMR, 2001).

TABLE 8: MINING ACTIVITY WITHIN THE WATERSHED

OPERATOR/SITE NAME	PERMIT	TOWNSHIP	STATUS	TYPE
Amerikohl Mining, Inc./Blanco Mine	03970109	Cowanshannock	Other Active	Coal Surface
Amerikohl Mining, Inc./Huskins Run	03960105	Cowanshannock	Active	Coal Surface
Amerikohl Mining, Inc./Huskins Run 2	03000105	Cowanshannock	Active	Coal Surface
Amerikohl Mining, Inc./Slagle Mine	03990103	Cowanshannock	Inactive	Coal Surface
Amerikohl Mining, Inc./Rose Valley	03950102	Cowanshannock	Inactive	Coal Surface
Mears Enterprises, Inc./Samosky #2	03890110	Cowanshannock	Inactive	Coal Surface
Amerikohl Mining, Inc./Spera Strip	03970104	Cowanshannock	Inactive	Coal Surface
Keystone Coal Co./Margaret #7 Mine	03801302	Cowanshannock	Inactive	Non-OSM

TABLE 8: MINING ACTIVITY WITHIN THE WATERSHED (continued)

OPERATOR/SITE NAME	PERMIT	TOWNSHIP	STATUS	TYPE
Rochester & Pittsburgh Coal Co.	500121	Cowanshannock	Inactive	Non-OSM
Walter L. Houser Coal Co./Kinnard	03830116	Kittanning	Active	Coal Surface
Walter L. Houser Coal Co./Smith Mine	03940114	Kittanning	Inactive	Coal Surface
Walter L. Houser Coal Co./Kinnard III	03980101	Kittanning	Not Started	Coal Surface
M. B. Energy, Inc./Croyle Mine	03880107	Kittanning	Other Active	Coal Surface
Brookport Resources Co./Spaces Corners Mine	03831304	Rayburn	Inactive	Coal Deep
GLR Mining, Inc./Nelson Strip	03970106	Valley	Inactive	Coal Surface
GLR mining, Inc./Virag Strip	03970110	Valley	Not Started	Coal Surface
Amerikohl Mining, Inc./Jud Mine	03000104	Valley	Active	Coal Surface
T. C. Mining/Peters Mine	03910102	Valley	Inactive	Coal Surface
Walter L. Houser Coal Co./Rimel Mine	03910113	Valley	Inactive	Coal Surface
B & B Coal, Inc./henry Mine Sub-F	03930107	Wayne	Inactive	Coal Surface

Source: Department of Environmental Protection, 2001; District Mining Office, 2001.

TABLE 9: TYPES AND ACREAGE OF ABANDONED MINE LANDS

Abandoned Mine Lands	Area of Abandoned Mine Lands (acres)
Abandoned Deep Mine	2.00
Abandoned Mine Drainage Discharge Area	1.39
Burning Refuse Pile	7.48
Deep Mine Intersected by Strip Mine	26.58
Dry Strip Mine	21.47
Flooded Strip Mine	10.00
Known Subsidence Prone Area	5.57
Suspected Subsidence Prone Area	41.50
Refuse Pile	1.78
Spoil Pile	30.91
Underground Mine Fire	4.54
Vertical Mine Shaft	2.54
Total	155.76

Source: Bureau of Abandoned Mine Reclamation, 2001.

2. Clay Mines

Along the southern end of the watershed, clay mining was prevalent during the Industrial Revolution which began in the late nineteenth century, and there is still some clay mining occurring today. Freeport Brick Company, Kittanning Brick Company, and Continental Clay Company, who is still in operation, are some of the clay miners of the watershed(Armstrong Conservation District, 2001). Drexel Dynamics Company, who had two clay mines in the watershed, has mined in the Mercer Coal Seam in the lower end of the watershed. The Bernard C. Snyder Picnic Area at Canfield-Holmes Sanctuary is the location of an old clay mine. The old mine buildings were removed and the picnic area was established in this area.

IV. WATER RESOURCES

A. STREAM CHARACTERISTICS

In all, the watershed is composed of almost 50 tributaries that compose approximately 153 stream miles flowing within a substantially rural setting. The main stem of Cowanshannock Creek itself is approximately 25.0 miles in length with meander ratio of 1.18 and relief ratio of 32.7 (PDER, 1984). Six major tributaries ranging from 1.23 to 7.13 square miles in drainage area are located within the watershed (USGS, 1993): Mill Run (7.13 square miles), Huskins Run (6.40 square miles), Spra Run (2.89 square miles), Spruce Run (2.44 square miles), Craigs Run (1.74 square miles), and Long Run (1.23 square miles).

The main stem and tributaries of the Cowanshannock Creek Watershed are primarily designated for warm water fishes (Pennsylvania Code, Title 25, Chapter 93, 1998). A section of the main stem from Huskins Run to the mouth has been designated for trout stocking since 1990. It is stocked by the Pennsylvania Fish and Boat Commission (PFBC, 2001). Additional fish species found in the Cowanshannock include dace, darters, chubs, bluegills, minnows and bass (PFBC, 1988). (Refer to Section V. A. Biological Resources, Wildlife for more information on aquatic species.)

Cowanshannock Creek has distinctive land use and topographical features in its upper, middle, and lower sections moving from the headwaters to the downstream ends where the Creek discharges into the Allegheny River. The upper portion of Cowanshannock Creek consists mainly of farm lands used for cattle grazing and agricultural crop production with small rural towns located along Cowanshannock Creek. The upper portion of the watershed maintains a very mild valley slope with a broad floodplain, typically less than one percent.

The middle portion changes to a more confined, highly dissected fluvial slopes with a slight increase in valley slope ranging between 1.0 to 1.5 percent. The land use is forested with minimal farming, and is dominated by active, abandoned, and reclaimed mine sites.

The lower portion of the watershed is mixed with well forested tree stands with active, abandoned, and reclaimed mine sites. Within the lower section of the creek, the valley slope steepens to a range between 1.5 and 3.0 percent within a well confined valley. Within the extreme lower portion of the watershed, there is a reach of stream where the valley slope increases to approximately 3.0 percent. This reach of stream is confined to moderately steep side slopes with geologic bedrock in the bottom of the valley and large rock outcrops.

B. WETLANDS

In order for an area to be considered a wetland, the area must have wetland hydrology (the presence of water), a dominance of hydrophytic (water-loving) vegetation, and hydric (wet/moist) soils. Wetlands of the project area vary in size, complexity, and type depending on their location in the watershed. Palustrine and riverine wetland are the dominant wetland type found within the project area. More than 400 acres of wetlands are found within the watershed, of which 260 acres are classified as forested wetlands, and the remaining 140 acres are non-forested wetlands. A large continuous section of wetlands are located along the stream corridors of Cowanshannock Creek within Cowanshannock Township and Rural Valley Borough (See Figure 4). Located along the riparian corridor they serve important functions of pollutant and nutrient filtration and help reduce impacts from flooding. These wetlands are identified by National Wetland Inventory (NWI) Mapping and incorporated in the Southwestern Pennsylvania Commission's GIS database (SPC, 2001).

Natural wetland areas not indicated by NWI mapping can be found throughout the project area. For example, smaller pocket wetlands appear throughout the landscape. Detailed wetland inventory and field review is needed to identify and assess the functions of all wetland areas. Comprehensive assessments for wetland evaluations are typically not completed until a site specific development is proposed.

In addition to natural wetlands, constructed wetlands have also been developed within the watershed. Constructed wetlands have the ability to improve water quality entering streams by acting as nutrient and pollution filters, enhancing wildlife habitat, controlling floodflow, etc. Within the Cowanshannock Creek Watershed constructed wetlands have been utilized to treat abandoned mine drainage (AMD) and enhance wildlife habitat in some areas. For example, a series of three wetland systems were constructed upstream of White Lake to address pollution from abandoned mine drainage entering the Cowanshannock Creek. Wetlands totaling 8.8 acres were also designed and constructed as part of mitigation requirements for the Route 422 Kittanning Bypass Project (PENNDOT, 2001).

C. 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. A floodplain's size and sinuosity is also dependent on the stream's location within the drainage basin. Generally, the upstream reaches of the watershed have associated floodplains with smaller widths, and widths of the floodplains increase as a water system flows downstream.

Floodplains are an important resource because they hold storm flows, thus reducing destructive flooding downstream. If development is reduced or eliminated from occurring within floodplains, more intensive infrastructure (i.e., flood channels, levees, etc.) would not be needed. Preventing development in the floodplain reduces the financial burden of maintaining structures located in 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 yet 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, they are an important resource to enhance and protect.

Generally, a narrow floodplain exists in the western reaches of the creek then widens to a low flat floodplain area in the central section of the creek and along the north branch of the eastern section (USGS 1993). The floodplain is most pronounced in the Yatesboro-Numine area of the watershed. Flood prone areas are shown by the Southwestern Pennsylvania Commission data in Figure 3 (SPC, 2001). Detailed floodplain mapping to assist in reviewing a specific property or location can be obtained from the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps.

D. LAKES AND PONDS

Only smaller ponds are found within the watershed. A majority of the ponds are used to water livestock, for soil conservation practices to reduce impacts from sedimentation, for fire protection, and for recreational purposes.

Two noteworthy recreational lakes within the watershed include White Lake and the Devil's Wash Basin. White Lake is a man-made, 2.5 acre lake with a series of adjacent wetlands. The White Lake and Wetlands area also comprises fifteen acres of land. The Devil's Wash Basin is a dammed impoundment covering approximately 1.5 acres with surrounding land totaling 4 acres (See Section VI-A, Recreational Resources, for more detailed description

of the areas).

E. WATER QUALITY

Limited data are currently available on the water quality of the Cowanshannock Creek Watershed. Watershed assessments performed by the DEP under the 305(b) Water Quality Assessment program have not been conducted to date for the Cowanshannock Creek Watershed, and assessment in the near future is not currently scheduled (DEP, 2001). In addition, no recent volunteer monitoring data is available. The water quality condition described in this report is based primarily on the following studies and data sources:

- Observations noted in the fluvial geomorphology (FGM) study recently conducted by Skelly and Loy, Inc. for the CCWA in 2001. The FGM Study involved stream corridor evaluation for all waterways in the watershed with special focus on evaluation of channel condition, bank stability, hydraulic alteration and riparian zone.;
- A past study of non-point source pollution in Cowanshannock and Crooked Creek Watersheds completed by the Armstrong and Indiana County Conservation Districts in 1994. The Conservation District Study assessed agricultural impacts and practices in the study area.;
- Macroinvertebrate sampling recently completed by a graduate student at the Indiana University of Pennsylvania within the Cowanshannock Creek Watershed (Hawley, 2001). ; and
- Impacted areas listed on DEP's 303(d) list of impaired waters (PADEP, 2000).

Overall water quality is good as indicated by the above mentioned data sources. The macroinvertebrate study involved collection of macroinvertebrates at six sampling points along Spruce Run, Mill Run, and Cowanshannock Creek (See Figure 8 for locations). The ability of a stream to support aquatic invertebrate animals, especially intolerant species (those that cannot survive in polluted water) is a good indicator of water quality and healthy stream conditions. The most abundant species of macroinvertebrates collected at each of the six sites sampled were stoneflies (order: Plecoptera), caddisflies (order: Tricoptera), and mayflies (order: Ephemeroptera). Plecoptera, Tricoptera, and Ephemeroptera are known to be sensitive to poor water quality caused by a variety of pollutants, and therefore are typically only found in streams with good water quality (PADEP, 1999). One site on the Cowanshannock had a large population of aquatic flies and midges (order: Diptera). Diptera orders are tolerant of a wide range of conditions and can flourish in waters where sensitive orders cannot (PADEP, 1999). Overall, the organisms found at these six sites indicate good water quality at the sampling points within the watershed. The FGM Study and Conservation District Study indicated that overall condition of the watershed is good, however data sources also indicated that the watershed has signs of nutrient enrichment and stream bank erosion from poor land use practices and lack of riparian buffers, as well as iron and acidity loadings from AMD sources in places.

Many of the threats to water quality in the Cowanshannock are related to human pollution sources. Generally, human induced water pollution sources are categorized as one of two types - point sources and non-point sources. Point source water pollution is the discharge of polluted water directly into a stream or other water body at an identifiable location or point. For instance, piped discharges from a factory or treatment plant directed

to a water body are examples of point sources. Non-point source (NPS) water pollution does not necessarily discharge polluted water directly to a water body at one location or point. Examples of NPS pollution include abandoned mine discharges, nutrient effluent from farms, and pesticide residue from yards. Because the pollution is not from a single point and there are a large number of non-point sources, it is more difficult to monitor and regulate. In particular, reducing non-point sources of pollution is critical to reaching water quality goals within the Cowanshannock Creek Watershed. Description of impacts from non-point pollution sources is a major focus of this section. Description of natural factors and point source pollution follows.

Listing of Impaired Waters Within the Cowanshannock Creek Watershed

Under the Clean Water Act, the Department of Environmental Protection (DEP) is required to report on the quality of waters throughout the state biannually in the 305(b) Water Quality Assessment Report. This report is based on DEP conducted sampling and field investigations and collection of additional data from citizens, universities, schools, etc. An important aspect of the report is to identify areas that do not meet designated use goals and water quality standards outlined in the Pennsylvania Code. Waters that do not meet the designated standard as identified in the 305(b) report are placed on what is referred to as the 303(d) list of impaired waters.

Once placed on the 303(d) list of impaired waters, DEP is obligated under the Clean Water Act to work toward restoring these areas. This may involve project funding support to address the pollution source, or development of a Total Maximum Daily Load (TMDL) program for the watershed. Total Maximum Daily Load involves identification of the maximum pollutant loading a water body can withstand and still maintain designated use goals. They are an important tool used by the PADEP for identifying water pollution limits and aid in meeting water quality objectives (PADEP, 2000). **In short, if impaired waters are present in the watershed, it is important to make sure these areas are listed on the 303(d) list** to encourage future project funding and program support from the DEP and others.

An assessment of the Cowanshannock Creek Watershed as required by the PADEP 305(b) water quality assessment program has not been completed to date, nor is an assessment currently scheduled (PADEP, 2001). However, monitoring data collected and reported to the DEP by citizens, universities, schools, etc. that indicate a particular water body is not meeting designated water quality goals can place impacted areas on the 303(d) list and assure their protection. Within the Cowanshannock Creek Watershed, two stream segments shown in Figure 7a, Water Quality, have been identified by reported data as not meeting designated water use goals (trout stocking along portions of Cowanshonnock Creek and warm water fisheries in the remaining areas). Both are listed due to impacts from abandoned mine drainage. They are:

- Cowanshannock Creek (5.76 miles)
- Huskins Run (2.76 miles)

Metals and other inorganics were listed as primary pollutants. All four areas are of medium priority listing and none are identified as being targeted for development of Total Maximum Daily Loads (TMDLs).

1. NUTRIENT ENRICHMENT FROM SEWAGE AND AGRICULTURAL RUNOFF

Nutrient Enrichment is a water quality problem caused by increased levels of nitrogen, phosphorous, and other nutrients. Nutrient loadings are often associated with poor land use practices including agricultural and residential processes such as spreading animal manure on fields, utilizing poor stormwater and wastewater drainage systems, overusing fertilizers (herbicides and insecticides), and destroying riparian buffer zones in favor of farm fields and residential lawns. Under these conditions, an increased amount of algae, floating and rooted macrophyte growth occurs, due to the enhanced food source provided by nutrients. The algae and macrophytes continue to grow until the nutrient source is depleted, and then dies off. Decomposition of large amounts of biomass reduces oxygen levels in the stream, which in turn, impacts aquatic life and has potential to cause fish kills. Nutrient enrichment problems increase when agricultural conservation practices are not followed; buffers are not maintained along streams; fertilizer/pesticides are applied or used improperly; and septic systems have not been built or maintained.

Nutrient enrichment causes obvious water quality impacts as observed by scientists performing the FGM study, residents, and members of the CCWA. The Cowanshannock Watershed is impacted by poor land use practices on both residential and agricultural areas. Figure 9 shows stream segments identified for as high priorities for restoration by the FGM Study. An overview of initial FGM results is included in Appendix F. A number of the poor and fair quality segments as indicated by the FGM Study are impacted by nutrient enrichment. Overall fifty-nine segments (of the 214 segments evaluated across the watershed) showed signs of nutrient enrichment based on the methodology and rating scheme established under the USDA Stream Visual Assessment Protocol (1998). Based on all background data sources, two major non-point pollution sources stand out within the watershed: (1) sewage from malfunctioning and/or non-existent septic systems in residential areas, and (2) agricultural sources from livestock using streams as watering holes; animal waste from livestock operations; and lack of use of various agricultural conservation farming practices.

Sewage

Sewage is basically composed of wastewater, feces, and particulate matter. In a conventional sewage treatment system, 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. Two sewage authorities currently provide or proposals to offer conventional sewer treatment services to residents and businesses within the watershed:

- Shannock Valley General Services Authority which services approximately 830 customers in Cowanshannock Township and Rural Valley Borough; and

- Kittanning Borough Sewer Department, which currently serves 1,877 customers in Kittanning Borough (outside the watershed) with proposed expanded sewage service to Rayburn Township.

Sewage facilities planning at the municipal level is promoted under the Pennsylvania's Sewage Facilities Act, commonly known as Act 537. Under Act 537, municipalities are given the responsibility for ensuring that sewage and wastewater is properly treated and disposed. DEP provides funding support for planning efforts to study sewage issues at the municipal level and to develop proposals for new facilities, upgrades, or expansions to address any identified sewage problems. Act 537 plans were recently completed in three communities in the watershed: Cowanshannock Township and Rural Valley Borough completed a combined plan; and Rayburn Township completed a plan approved by DEP in December 2000 (Armstrong County Planning Commission, 2001).

Cowanshannock Township and Rural Valley Borough recently implemented their plans for expanded sewage services provided by the Shannock Valley General Services Authority to the villages of Rose Valley, Rural Valley, Meredith, Numine, and Yatesboro. The new connections were completed in Fall 2001 (See Figure 5).

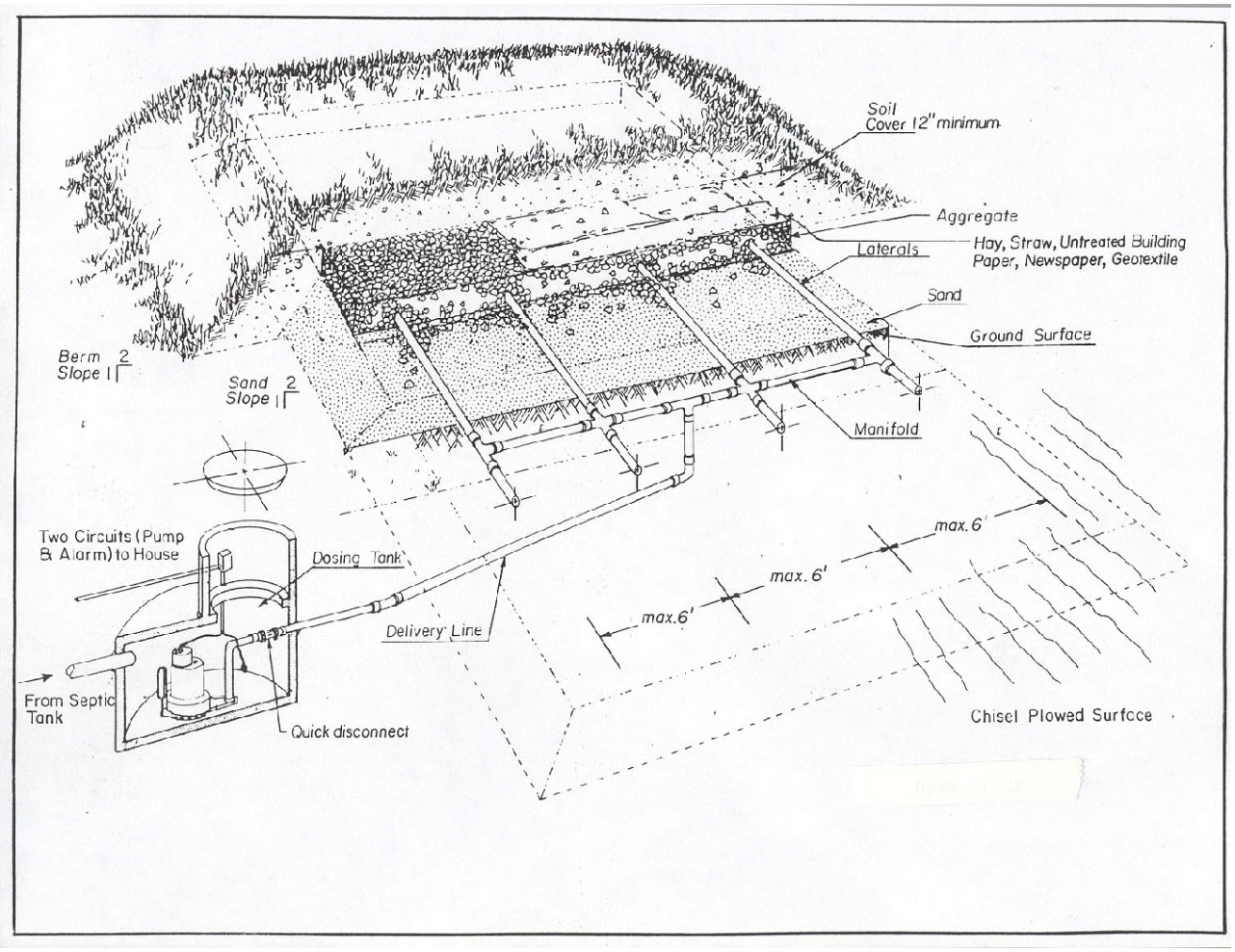
The Act 537 plan for Rayburn Township proposed expansion of sewer services to four areas. Two of these areas would be provided treatment through use of gravity sewers connected to the Kittanning Borough Sewer Department and the remaining two areas would also be connected by gravity sewer to the Armsdale sewage treatment plant (STP). Upgrade and expansion of the small facility at the Armsdale STP will first be required. Funding sources are needed to implement the plan.

Until now, most residents within the watershed have been using septic systems or no system at all. Septic systems are small on-lot waste water systems that utilize soil to treat small wastewater flows, usually from individual homes. These systems, if maintained properly, will adequately treat sewage. Critical to proper maintenance,

accumulated solids in the system should be pumped out every two or so years (Armstrong County Sewage Enforcement Agency, 2001).

Often, homeowners and businesses do not maintain the systems resulting in faulty septics that may leach bacteria and viruses into the groundwater and pose threats to public health. An added problem within the watershed is lack of adequate soils for use of conventional systems. Most soils in the watershed are too shallow and too permeable to use for conventional systems. For example, within all of Armstrong County out of 50 permit requests this past year, only six had suitable soils for conventional in-ground systems (Armstrong County Sewage Enforcement Agency, 2001).

The most common type of system found within the watershed is the sand mound system(Armstrong Conservation District, 2001). These systems help overcome problems with reduced permeability, poor drainage and shallow soils. They are more expensive ranging from $5,000 to $10,000, compared to the conventional systems which cost typically less than $5,000 (Armstrong Sewage Enforcement Agency, 2001). The most successful designs use a bed of sand over natural soil with soil berm to protect the mound interior and provide a stabilized material to establish a vegetative

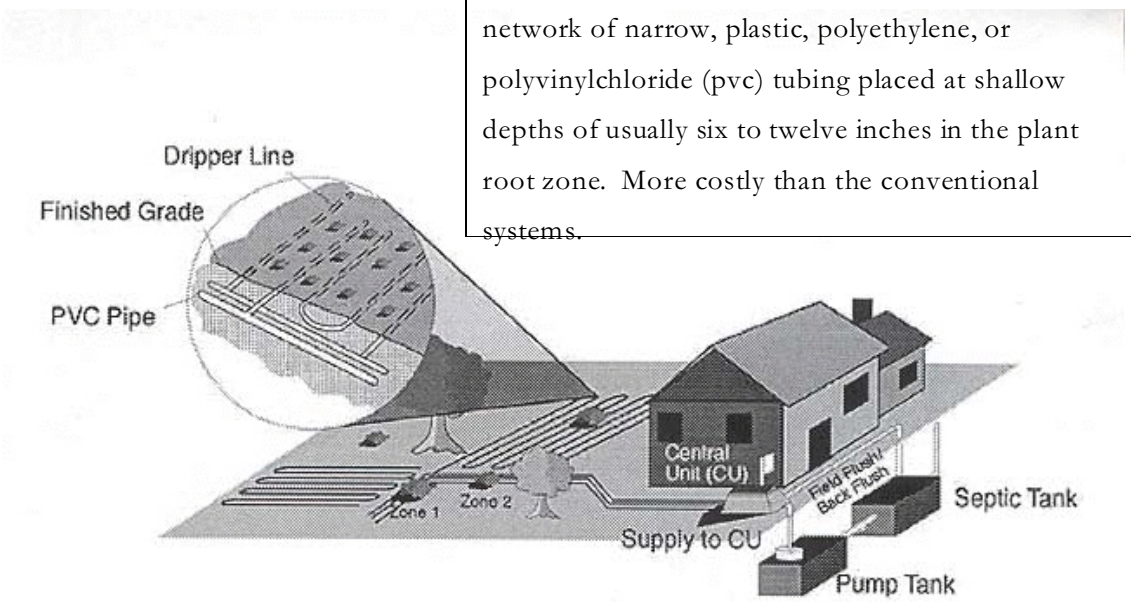


Elevated Sand Mound System. *Armstrong County Sewage Enforcement Agency, 2001.*

cover. The sand traps the suspended solids from the treatment tank in its upper layers. Maintenance needs are also similar to conventional systems where septic tanks should be pumped every 3 to 4 years.

Other special systems that can be applied within the more limiting soil conditions found within the watershed include drip irrigation systems, spray irrigation, and chlorinated discharge to streams. However, these non-conventional systems are expensive and typically cost more than $20,000.

Example of a special system - Drip Irrigation System: Involves application of treated wastewater to soil slowly and uniformly from a network of narrow, plastic, polyethylene, or polyvinylchloride (pvc) tubing placed at shallow depths of usually six to twelve inches in the plant root zone. More costly than the conventional systems.



Even with the new Shannock Valley sewage systems connections now in place, households located in the middle and eastern portions of the watershed will remain unserved. Water quality will still be affected to some level by malfunctioning and/or non-existent on-lot septic systems. During summer months, residents have noted the "stench" from direct sewage discharge into the streams. Some level of education on public health benefits of sewage/septic treatment and proper septic management will be needed for those areas not served.

Agricultural Runoff

Agricultural runoff refers to water that flows to surface and ground waters after traveling across agricultural lands during storm events. The runoff often carries high nutrient and pollutant concentrations from contact with pesticides, fertilizers, and animal waste found on farm lands. It also contains high sediment loads impacting to streams. Because agricultural land composes nearly half of the watershed, impacts from

agricultural runoff are high. Although the level of impact is unclear, physical observations of the watershed and some sampling indicate potential influence on water quality from agricultural sources. Surface water samples taken as part of the Conservation District Study indicated elevated nitrate levels during the spring season where plowing, fertilization with manures, and early spring grazing by livestock is highest (Armstrong Conservation District, et.al., 1994). Assessment of the watershed through the FGM Study (2001) also indicated impacts from agricultural sources.

Cropped land and livestock operations pose differing pollution sources and solutions. On cropped land, improper application of fertilizer and pesticides, can lead to polluted runoff that contains high nitrogen and phosphorous levels, pesticides and sediment. For example, animal manure applied on frozen or saturated ground can leach nutrients into ground and surface waters. Use of conservation and nutrient management plans can guide farmers on use of Best Management Practices (BMPs), which help minimize impacts to the watershed. Interviews with 50 farmers within the Cowanshannock and Crooked Creek watersheds as part of the Conservation District Study (1994) indicated that most farmers in the study area had conservation plans, but none of the farmers interviewed had nutrient management plans. Another practice that needs to be encouraged is use of cover crops to slow down erosion and sedimentation impacts during winter months.

Livestock operations present high nutrient loadings from: animal waste that leaches into groundwater or runs into the surface water; erosion of pasture land and open space; and erosion and pollution of streams where animal access is not controlled. The Conservation District study (1994) indicated that most farmers need to improve their management of pastures as well as their livestock watering. Scientists completing the FGM study also noted that livestock use of streams and sedimentation concerns are high in the headwaters of Cowanshannock Creek Watershed. In addition, concentrated animal operations (CAO), defined as livestock operations with more than two animal units per crop acre, are also of potential concern. Under the Pennsylvanian Nutrient Management Program, CAOs may be required to develop a nutrient management plan if discharge during storm events reaches a specified level. At the federal level, farms meeting the definition of a concentrated animal feeding operation (CAFO) are subject to point source pollution requirements and must obtain a permit under the National Pollutant Discharge Elimination System (WCD, 2001).

2. HABITAT MODIFICATION FROM STORMWATER RUNOFF & OTHER FACTORS

Habitat modification refers to impacts to environments supporting benthic

organisms and fish, and/or stream structure. Streams that exhibit habitat modifications are affected by high stream flows, turbidity, erosion and sedimentation, residual chemical (e.g., road salts, oils, solvents, etc.), and thermal pollution. In many cases these factors are associated with high levels of development activity, high human population densities, and other land use changes within the watershed.

Overall, habitat modification problems are not a significant issue in the watershed; however, there are some factors in need of attention. Lack of vegetation is an issue particularly along sections of the main stem of Cowanshannock Creek. There are also areas where stream bank erosion and sedimentation is notable.

Stream Bank Erosion and Sedimentation

Stream bank erosion is one type of habitat modification that is often a result of elevated levels of stormwater runoff linked with development and urbanization. Stormwater runoff is the rainfall or precipitation that flows into surface waters during storm events. As development increases, previously vegetated areas that would allow water to seep into the ground and reach streams more slowly or recharge ground water, are replaced by impervious areas (e.g., roads, parking lots, rooftops). Impervious areas prevent recharge and retention of water and cause stormwater to reach the stream more quickly while carrying urban pollutants (e.g., oil, gasoline) on its way. The increased stormwater brings higher flows, thermal impacts, and pollutants damaging to stream health. In addition, any blocks to natural changing structure of a stream system, such as bridges, dams, etc., can constrict flow and cause stream bank erosion and scour damage to existing infrastructure crossing the stream. Bridge crossings for private driveways, minor and major roads are expected to place a significant impact on the Cowanshannock watershed (NRCS, 2001). There are an estimated 219 bridges crossing streams and tributaries of Cowanshannock Creek based on review of minor and major roads and stream GIS data layers. It is also important to note that stream bank erosion can also be a result of natural physical changes in stream structure.

Many of the poor and fair quality stream segments identified in the FGM study have unstable banks. Overall a total of 33 segments out of 216 segments evaluated are impaired by unstable banks (See Appendix F).

Related to bank erosion, sedimentation is also a large issue within the Cowanshannock. Increased sediment loads come from several sources. Bank erosion, downcutting and widening of the stream reaches contribute to the sediment load in streams. Overall, the study found a total of 10 miles of unstable stream bank throughout the watershed. Actual bank erosion rates monitored at an eroded segment (Reach 25) in the FGM Study indicated loss of approximately 35 tons of soil over an

eight month period along 100 feet of eroding bank. The analysis indicated an estimated erodibility rate of 0.7 to 1.7 feet per year for the entire creek. In addition to sediment loading from channel widening and downcutting, sediment carried in runoff from agricultural and residential fields, construction sites, as well as sediment from dirt and gravel roads also contribute to increased loads. Use of agricultural BMPs described in Section V. E. 1. (Water Quality, Nutrient enrichment from Sewage and Agricultural Runoff) and proper maintenance of dirt and gravel roads will reduce sediment loadings. Dirt and gravel roads found within the watershed are described in Section II. G. 1. (Transportation Facilities, Roads).

Riparian Buffers Zones

Another factor influencing habitat modification is the amount of vegetation along streams and waterways. Results of the FGM Study indicate that the Cowanshannock Creek is not only impaired by poor land use practices, but is also affected by a lack of riparian buffer zones. The absence of stabilizing vegetation along the stream contributes to bank erosion, lateral channel migration, and other bank instability and channel alteration problems within the streambed. Vegetation also serves to filter sediments, nutrients, and pollutants entering waterways, which could impact aquatic habitat. In addition, lack of vegetation along creeks and their tributaries results in less shading and potentially warms surface waters. The warmer waters impact aquatic habitat and limit the use of the streams by cold water aquatic species and fish, such as trout, which are stocked along the main stem.

Many of the poor and fair quality stream segments identified in the FGM study lack riparian buffer zones. Overall a total of 46 segments (of 216 segments across the watershed) are impaired by poor riparian buffer zone, especially along a number of sections on the main stem of Cowanshannock Creek (See Appendix F).

Stream Restoration/Enhancement Projects

Recently, a stream bank mitigation project was completed by the Pennsylvania Department of Transportation on a quarter mile stretch along the main stem of the Cowanshannock Creek. Past proposals have also been made for natural stream bank stabilization along the Cowanshannock near Sunnyside as part of the FGM Study. Additional high priority areas for restoration identified by the FGM Study are shown in Figure 9 and also described in Appendix F.

Stream Flow Patterns

Data on streamflow patterns are not available for the Cowanshannock Creek Watershed. No USGS stream flow gauging stations are operated in the watershed nor

does PADEP have any permanent stream sampling/gauging stations in the watershed However, through evaluation of the localized region five active U.S.G.S. gage stations located in the Appalachian Plateaus Province were identified and applied in the FGM Study. They are as follows.

- Chartiers Creek at Carnegie, Pennsylvania (U.S.G.S. Station 03085500)
- Buffalo Creek near Freeport, Pennsylvania (U.S.G.S. Station 03049000)
- Redstone Creek at Waltersburg, Pennsylvania (U.S.G.S. Station 03074500)
- Little Pine Creek near Etna, Pennsylvania (U.S.G.S. Station 03049800)
- Mahoning Creek at Punxsutawney, Pennsylvania (U.S.G.S. Station 0303400)

3. POLLUTION FROM ABANDONED MINE DRAINAGE

Abandoned mine drainage (AMD) is the discharge of water that is contaminated from past or current mining operations. Abandoned mine drainage can be either acidic or alkaline and often contains elevated levels of aluminum, iron, manganese, and/or sulfates. Abandoned mine drainage is caused by exposure of geologic formations to air and water that is affected by numerous environmental parameters that differ from discharge to discharge. In past years, AMD has been the major water quality issue within the watershed. The watershed has been impacted by coal mining since the late 1800s (Carson Engineers, 1972). Unfortunately, much of the mining activity took place in the watershed prior to the passing of needed pollution control regulations in the 1960s.

A Scarlift Report for the Cowanshannock Creek, completed in 1972, evaluated and identified five of twelve deep mines with AMD showing evidence of severe drainage impacts, one strip mine in immediate need of reclamation, and two gob piles causing severe impacts on the watershed (Carson Engineers, 1972).

Since the investigation, many of the most problematic sites within the watershed have been reclaimed or treated. Abandoned mine drainage has been addressed through application of various types of abatement projects including surface mining and direct treatment of discharges (See Table 10). Surface mining activities help improve water quality by reclaiming coal that if otherwise not mined, can contribute to abandoned mine drainage. Today there are six active surface mining sites within the watershed that when completed are expected to protect and/or improve water quality of Cowanshannock Creek (See Table 8). Also, two surface mining bond forfeiture (BF) projects have been completed within the watershed. BF funds come from bonds placed for permitted mining activity by mining companies. Mining companies who complete reclamation have their bonds returned, while companies not completing full reclamation forfeit their bonds to DEP who then uses the bond funds to carry out

reclamation activities. Reclamation has also been completed on a total of 50 acres at the Devil's Washbasin and White Lake and Wetlands sites under the Rural Abandoned Mine Program (RAMP).

In addition, passive treatment systems that include settling ponds, limestone drains, and wetland systems have been constructed to treat AMD prior to discharge into surface waters. For example, pollution from AMD is treated by the lake design at the Devil's Washbasin and White Lake and Wetland sites completed in 1987 and 1988 respectively by the Soil Conservation Service (SCS, now the Natural Resource Conservation Service) (Armstrong County Conservancy Trust, et. al., 1993). Both of these sites improve water discharged to the watershed. Treatment of underground sources have also been completed through a bond forfeiture projects in various locations throughout the watershed.

TABLE 10: RECLAMATION AND TREATMENT PROJECTS WITHIN THE WATERSHED[1]

Type	Municipality	Description	Identification No.	Status
RAMP	Cowanshannock Township	Twenty acre reclamation area adjacent to Devil's Washbasin	N.A.	Completed 1984
RAMP	Cowanshannock Township	Thirty acre reclamation area near White Lake	N.A.	Completed 1984
SCS	Cowanshannock Township	Devil's Washbasin, Lake design for recreational use and stormwater detention.	N.A.	Completed 1987
SCS	Cowanshannock Township	White Lake and Wetland, AMD passive treatment system.	N.A.	Completed 1988
BF	Rayburn/Manor Township	Underground	Permit No. 03911303	Reclaimed by private owner, Completed
BF	Rayburn/Manor Township	Surface Mine Reclamation	Permit No. 2869BSM15	Reclaimed by private owner, Completed
BF	Manor Township	Surface Mine Reclamation	BF 417-102.1	Completed 1999
OSM	Cowanshannock Township	Re-design and construction of White Lake and Wetlands	03(0743)-101.1	Currently being designed, 2001

Notes:

[1]See Table 8, page 23 for a listing of the six active mining permits.

BF: Bond Forfeiture Project; OSM: Office of Surface Mining; RAMP: Rural Abandoned Mine Program; SCS: Soil and Conservation Service [Now the Natural Resource Conservation Service (NRCS).]

Source: Bureau of Abandoned Mine Reclamation, 2001; Armstrong County Conservancy Trust, et. al., 1993

Although impacts from mining are not as severe as thirty years ago, some impacts from AMD remain. Two stream segments: 5.76 miles along Cowanshannock

Creek and 2.76 miles along Huskins Run impacted by AMDs are identified on the 303(d) list of impaired waters (See Figure 8). Metals and inorganics were listed as primary pollutants and both areas were listed as medium priority. Also, several gob piles that pose pollution threats are still within the watershed (Figure 7). One large pile located near the White Lake and Wetlands passive treatment system poses potential impacts to water quality.

In addition, several AMDs observed by CCWA, NRCS staff and local residents are known to exist in the watershed. Among them is the White Lake and Wetland passive treatment system which has reached peak loading and is in need of rehabilitation. This system is currently being redesigned by the Office of Surface Mining to address high aluminum and acidity levels observed in the lake (BAMR, 2001, See section VI. A. 1. Recreational Resources, Parks/Recreational Areas). Also included is an AMD discharge currently feeding a local trout nursery. Water quality conditions in the past have been adequate for raising trout, however declining water quality in recent years has indicated need to treat the discharge (See Section V. A. Biological Resources, Wildlife). Impacting or untreated discharges remaining in the watershed include the following and are shown in Figures 7 and 8 (PADEP, 2000; CCWA, 2001; and Armstrong County Conservation District, 2001):

- AMD-1 Numine
- AMD-2 Craigs Run
- AMD-3 Meredith 1
- AMD-4 Meredith 2
- AMD-5 Huskins Run
- AMD-6 Buttermilk Falls 1
- AMD-7 Buttermilk Falls 2
- AMD-8 Junkyard
- AMD-9 Mill Run 1
- AMD-10 Mill Run 2
- AMD-11 White Lake and Wetlands
- AMD-12 Trout Nursery

4. NATURAL BUFFERING CAPACITY

Buffering capacity refers to the ability of a stream to withstand the addition of various inputs that may cause extreme decreases or increases in the water's acidity and alkalinity, which impacts aquatic life. It is an important factor because it relays the ability of a stream system to resist negative impacts of various pollution sources. Natural buffering capacity is largely influenced by the local geology. The presence of

various compounds in streams and groundwater is related to the geology. In particular, the presence of bicarbonate and carbonate compounds in streams influences the extent of natural buffering in a stream system (Allan, 1999). The geology of the Cowanshannock Creek Watershed is composed of sedimentary rock layers of shale, siltstone, sandstone, and limestone (USDA Soil Survey Armstrong County, PA 1977 and USDA Soil Survey Indiana County, PA 1991). Presence of limestone, which is composed of calcium bicarbonate, is a good indicator of relative buffering capacity. Pennsylvanian Vanport Limestone, a high-calcium limestone covered by less than 100 feet of sedimentary rock, is located within a majority of the watershed through the western and central regions (PADCNR, 2000). Hence, natural buffering capacity is expected to be greater in the western and central portions of the watershed, and is more limited in the eastern headwaters of Cowanshannock Creek that pass through Indiana County.

5. POINT SOURCE WATER POLLUTION SOURCES

As stated earlier, point source water pollution is the discharge of polluted water directly into a stream or other water body at an identifiable location or point. Point sources are regulated by state and federal agencies. Under federal and state laws, dischargers are required to obtain National Pollutant Discharge Elimination System (NPDES) Permits that set limits on the amount and concentration of pollutants being discharged into waterways. Based on a search of DEP and EPA databases, the watershed has 7 active point sources regulated under state and federal permits (DEP, 2001; EPA, 2001). In addition, one inactive site and two sites most likely allowed prior to implementation of the NPDES program were identified. These point source discharges are expected to pose minimal impacts to the watershed. The identified point source discharges in the Cowanshannock Creek Watershed are listed in Table 11. Permitted discharges are shown on Figure 8.

TABLE 11: LIST OF DIRECT AND INDIRECT POINT SOURCE DISCHARGES IN THE WATERSHED

Site No.	Site Name	NPDES Permit No.	Status
1	Armsdale Sewage Treatment Plant (STP)	PA0029840	Active
2	Cowanshannock Township Industrial Site	PA0217310	Active
3	Numine STP Shannock Valley General Services	PA0216984	Active

Site No.	Site Name	NPDES Permit No.	Status
4	Yatesboro STP	PA0216992	Active
5	Grey Personal Care Home STP	PA0217166	Active
6	Shannock Valley Elementary	PA0093734	Active
7	Shannock Valley STP	PA0216984	Active
8	Rural Valley WTP	PA0094285	Inactive
9	Rural Valley Municipal Sewer System	No permit number listed[1]	Active, Raw Sewer Discharges

TABLE 11: LIST OF DIRECT AND INDIRECT POINT SOURCE DISCHARGES IN THE WATERSHED (continued)

Site No.	Site Name	NPDES Permit No.	Status
10	Roger Stone	No permit number listed[1]	Active, 6 inch Effluent Pipe

Note: [1]These facilities were listed in DEP's Upstream Facilities Report for Cowanshannock Creek Watershed. These discharges most likely began prior to requirement of NPDES permitting in the 1970s (PADEP, 2001).

Source: DEP, 2001; US EPA, 2001.

F. WATER SUPPLY

Communities within the Cowanshannock Creek Watershed rely primarily on groundwater resources from public and private wells as their major source of water. The watershed is fairly well supplied with groundwater from sandstone based aquifers, which can support plentiful amounts of water. Many steep slopes support small springs. As is typical of groundwater in sandstone, groundwater in the area has naturally high levels of iron (Carson Engineers, 1972). Deep welling is also not advised due to potential for highly saline waters.

A small portion of the population in the watershed is supplied with water from one of two municipal authorities: Cowanshannock Municipal Water Authority which serves approximately 400 customers, and Manor Township Joint Municipal Authority which serves approximately 2,630 customers (See Figure 6). Both water authorities utilize well water treated primarily with chlorine. In addition to these two water authorities, other public well water sources are used in public facilities or businesses found throughout the Cowanshannock Creek Watershed. Overall there are 11 public water systems (25 wells) located in the watershed (see Table 12).

To date, no PADEP approved wellhead protection plans have been developed for any public water supplies located within the watershed (PADEP, 2001). A wellhead protection plan identifies major threats and potential pollution sources to a water supply and provides a plan to manage pollution sources to minimize any potential threats to drinking water. This does not mean a plan is not in place, it simply indicates that no plan approved by PADEP has been developed. Often, simplified plans are developed that have not undergone the PADEP approval process. A PADEP approved wellhead protection plan has been in place for wells owned by the Manor Township Joint Municipal Authority for several years (located outside of the watershed). Although not a wellhead protection plan, the Yatesborough well was recently drilled in 1997/98 and identification of an immediate protection zone surrounding the well was

required as part of the permitting process (Banks and Engineers, 2001).

Testing of the public wells by DEP field staff indicate concerns with high iron, manganese, and hydrogen sulfide gas greater than drinking water standards (DEP, 2001). In addition, issues of decreasing ground water supply may be of concern. The Yatesboro/Numine drinking water well was drilled deeper several years ago and Rural Valley is looking for a new well site.

TABLE 12: PUBLIC WATER SYSTEMS WITHIN THE COWANSHANNOCK CREEK WATERSHED

PWS ID	Name
5030021	Cowanshannock Municipal Authority – Margaret System
5030022	Cowanshannock Municipal Authority –Sagamore System
5030047	Cowanshannock/Yatesboro/Numine System
5030012	Rural Valley Water Works
5030048	Altmeyers Country Rest Estates
5030310	Greendale Tavern
5030031	Greys Colonial Acres Boarding
5030331	Keystone Inn
5030313	Nelsons Mini Mart
5030320	New Shannock Park Tavern
5030848	Previously Priestas Country Market

Source: Department of Environmental Protection, 2001

Because public water is not available through most the area, a majority of residents and businesses obtain water from private wells. However, these private wells are often not used due to poor water quality. A number of people are known to fill drinking water from a spring on the Canfield-Holmes Property, owned by CCWA (CCWA, 2001). High levels of iron in private wells, as observed in the public wells, is typical. In addition, sampling conducted on farming operations indicate high coliform levels in private wells and springs (Armstrong County Conservation District and Indiana County Conservation District, 1994). Of 33 samples taken in the Cowanshannock and Crooked Creek watersheds in the Conservation District Study, 25 did not pass PADER standards for coliform (0 per 100 mL) in drinking water. The results indicate that more education is needed on testing and protecting groundwater resources

Spring at Canfield-Holmes Property used for drinking water by many locals.

V. BIOLOGICAL RESOURCES

A. WILDLIFE

Terrestrial Wildlife Species

The Cowanshannock Creek Watershed contains a variety of wildlife species. In the watershed, the terrestrial habitat setting is mostly forested and agricultural. In this setting, birds, mammals, amphibians, and reptiles generally inhabit and migrate freely between areas of large, wooded tracts, agricultural land, fragmented habitat, riparian, and wetland habitats. Due to the rural setting and overall lack of development in the watershed, most wildlife species thrive.

There are no designated state game lands within the watershed, however, public hunting is allowed at White Lake and Wetlands, Devil's Washbasin, Canfield-Holmes Sanctuary, and Buttermilk Falls. The most common game species include white-tailed deer, black bear, wild turkey, and ruffed grouse (PA Game Commission, 2001). Other common terrestrial wildlife found throughout the watershed includes gray and red fox; coyote; raccoon; opossum; gray, red, and fox squirrel; chipmunk; a variety of other small mammal species (mouse, mole, shrew, vole, etc.), as well as a variety of reptile and amphibian species (turtles, frogs, salamanders, etc.), and bird species (waterfowl, song, predatory, etc).

Bobcats and fishers have been known to pass through the watershed and signs that indicate the presence of the northern river otter and the American beaver have been witnessed. Additionally, the bald eagle, osprey, and the great blue heron have been observed feeding in the warm water at the western end of Cowanshannock Creek (PA Game Commission, 2001).

Aquatic Species

The six main tributaries to Cowanshannock Creek, Mill Run, Spra Run, Long

Run, Huskins Run, Craigs Run, and Spruce Run and the unnamed tributaries to Cowanshannock Creek are all managed for Warm Water Fishes. A portion of Cowanshannock Creek (from Huskins Run to the mouth) is stocked with trout by the Pennsylvania Fish and Boat Commission (PFBC, 2001). A variety of other fish species have been found in the Cowanshannock Creek and its tributaries. Some of these include dace, darters, chubs, bluegills, and a variety of minnows (PFBC, 1988). Small mouth bass, and other game species, such as walleye, pike, and muskellunge, that inhabit the Allegheny River, have been caught by fishermen in the lower end of the Cowanshannock Creek. The small mouth bass can use the creek to spawn (as well as the walleye, in limited areas). Additionally, some native and indigenous species that occur in the Allegheny River could also be found in the Cowanshannock to forage or spawn (PFBC, 2001). Table 13 summarizes the common terrestrial and aquatic wildlife found within the watershed.

In addition to the streams and lakes, the four mile Shamokin Path runs next to about 15 ponds along its stretch which sustain a variety of amphibian species. Great blue heron can be seen hunting for frogs at these ponds (PGC, 2001).

Trout Nursery

The Arrowhead Chapter of Trout Unlimited (TU), with the cooperation of Shannock Valley Sportsmen's Club, and the Pennsylvania Fish and Boat Commission (PFBC), have operated a trout nursery in the watershed since the mid 1980s. The nursery is valuable local fisheries resource used to stock a number of local streams including the Cowanshannock Creek. The nursery is located off of Water Street in Rural Valley (along the Great Shamokin Path), on the property of Tom Rocco. It is fed by an abandoned mine drainage (AMD) from a borehole under artesian pressure. The discharge just meets water quality standards for raising trout. Mr. Rocco takes care of the AMD, which discharges iron into two of the nursery's raceways.

Although the nursery had the highest growth rate of fish in the state just a few years ago, recently there has been increased fish mortality. PFBC in past years has provided the nursery with brook trout fingerlings and some rainbow trout fingerlings. The brook trout are the most tolerant of acidic conditions and seem to do best in the raceways, while the rainbow trout fingerlings are more sensitive but have done well in

the past. Recently many of the fingerlings have been dying, especially the more sensitive rainbow trout. This past year, the PFBC has supplied the nursery with mostly brown trout preferred by TU. Many of the brown trout fingerlings, slightly more sensitive to acidic conditions compared to brook trout, have also been dying. Among the suspected reasons for increased mortality, is declining water quality. TU is now looking into the installation of a diversion well to improve water quality at the facility. This technique is utilized to neutralize acidic water. With less acidic water in the nursery's raceways, the fingerlings will have a greater chance of survival and will be successfully raised for use in stocking local streams (Armstrong Conservation District, 2001).

TABLE 13: COMMON TERRESTRIAL AND AQUATIC WILDLIFE FOUND WITHIN THE WATERSHED

Common Name	Scientific Name (Genus and Species)
White-tailed deer	*Odocoileus virginianus*
Black bear	*Ursus americanus*
Wild turkey	*Meleagris gallopavo*
Ruffed grouse	*Bonasa umbellus*
Bobcat	*Lynx rufus*
Fisher	*Martes pennanti*
Northern river otter	*Lutra canadensis*
American beaver	*Castor canadensis*
Common gray fox	*Urocyon cinereoargenteus*
Red fox	*Vulpes vulpes*
Coyote	*Canis latrans*
Common racoon	*Procyon lotor*
Virginia opossum	*Didelphis virginiana*
Eastern gray squirrel	*Sciurus carolinensis*
Eastern fox squirrel	*Sciurus niger*
Red squirrel	*Tamiasciurus hudsonicus*
Eastern chipmunk	*Tamias striatus*
Bald eagle	*Haliaeetus leucocephalus*
Osprey	*Pandion haliaetus*
Great blue heron	*Ardea herodias*
Canadian geese	*Branta canadensis*
Dace species	Family: *Cyprinidae*
Darter species	Family: *Percidae*

TABLE 13: COMMON TERRESTRIAL AND AQUATIC WILDLIFE FOUND WITHIN THE WATERSHED (continued)

Common Name	Scientific Name (Genus and Species)
Chub species	*Leuciscus spp.*
Bluegill	*Lepornis macrochirus*
Trout species (stocked)	Family: *Salmonidae*

B. VEGETATION

The Cowanshannock Creek Watershed mainly contains deciduous forest land comprised of the oak hickory forest type, with some northern hardwoods, cove hardwoods, and bottomland hardwoods. The proportions of each species in an oak hickory forest varies greatly. Species make-up depends on amounts of precipitation, and how water drains through the soils. Table 14 outlines characteristic species of an oak hickory forest. Additional forest types found within the watershed include some northern hardwood, cove hardwood, and bottomland hardwood. Dominant species that make up the northern hardwood forest include red maple, sugar maple, beech, black birch, basswood, white ash, and tulip poplar. Yellow poplar dominates the cove hardwood forest and the bottomland hardwood forest is dominated by sycamore, shingle oak, and various species of willow. In addition, pure hemlock stands can be found within the watershed (Armstrong Conservation District, 2001).

Trillium at Buttermilk Falls.

TABLE 14: CHARACTERISTIC SPECIES OF AN OAK HICKORY FOREST TYPE

Common Name	Scientific Name
TREES	
Northern red oak	*Quercus rubra*

TABLE 14: CHARACTERISTIC VEGETATIVE SPECIES OF AN OAK HICKORY FOREST (continued)

Common Name	Scientific Name
White oak	*Quercus alba*
Black oak	*Quercus velutina*
Scarlet oak	*Quercus coccinea*
Chestnut oak	*Quercus prinus*
Red maple	*Acer rubrum*
Shagbark hickory	*Carya ovata*
Pignut hickory	*Carya glabra*
Bitternut hickory	*Carya cordiformis*
UNDERSTORY PLANTS	
Dogwood species	*Cornus spp.*
Sassafras	*Sassafras albidum*
Serviceberry species	*Amelanchier spp.*
Eastern redbud	*Cercis canadensis*
Witch-hazel	*Hamamelis virginiana*
Blueberry species	*Vaccinium spp.*
Viburnum species	*Viburnum spp.*
Spicebush	*Lindera benzoin*
Mountain laurel	*Kalmia latifolia*
Rhododendron species	*Rhododendron spp.*
Virginia creeper	*Parthenocissus quinquefolia*
Greenbrier species	*Smilax spp.*
Poison-ivy	*Rhus radicans*
HERBACEOUS PLANTS	
Tick trefoil species	*Desmodium spp.*
Mayapple	*Podophyllum peltatum*
Trillium species	*Trillium spp.*
Black snakeroot	*Cimicifuga racemosa*
Aster species	*Aster spp.*
Cinquefoil species	*Potentilla spp.*
Goldenrod species	*Solidago spp.*

Source: David Beale, Armstrong County Conservation District and the Maryland Department of Natural Resources (MDNR).

C. THREATENED AND ENDANGERED SPECIES

No species of concern (threatened and endangered species) are currently or historically noted to inhabit the Cowanshannock Creek Watershed according to state and federal natural resource agencies. These natural resource agencies include: United States Fish and Wildlife Service, Pennsylvania Fish and Boat Commission, Pennsylvania Game Commission, and Pennsylvania Natural Diversity Inventory (cooperative project of the Department of Conservation and Natural Resources, The Nature Conservancy, and the Western Pennsylvania Conservancy).

D. IMPORTANT HABITATS

Riparian Forest Buffers and Wetlands

Riparian forest buffers and wetland habitats are very important areas in all watersheds for a number of reasons. 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 fish (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 (See Section IV. B., Wetlands).

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 fish. Riparian zones and wetlands assist in moderating environmental conditions for wildlife, fish, and humans. These areas are where temperature control occurs for the stream, where sediments, nutrients

(phosphorous and nitrogen), and pesticides are deposited, and where energy from flood waters are dissipated.

Generally, watersheds with healthy riparian zones will have greater environmental health than portions of the watershed with degraded riparian areas. Healthy riparian zones within the Cowanshannock Creek Watershed and areas that are in need of restoration are described in the FGM Study. Results indicate that many of the high priority areas for restoration shown in Figure 9 lack riparian zones. (Refer to Section IV. E. 2., Water Quality - Habitat Modification).

Important aquatic habitats and functionally important wetlands within the watershed include several areas owned by the Cowanshannock Creek Watershed Association (CCWA): White Lake and Wetland, Canfield-Holmes Sanctuary, and ponds along the Shamokin Path (See section VI-a, Recreational Resources, and Figure 10 for more information). The Cowanshannock Creek portion of the privately owned Buttermilk Falls area is part of the trout stocked stretch from Huskins Run to the mouth and is also an important aquatic habitat that cultivates abundant and diverse aquatic life. With the healthy riparian corridor surrounding this portion of the stream, aquatic vertebrates and macroinvertebrates are plentiful (CCWA, 2001).

Forests

A dominant land cover type within the watershed (covering approximately 51% of the entire watershed), forests provide habitat for a variety of species in the watershed and is an important habitat in need of protection (See Figure 4). In many locations of the watershed, upland or steep sloped forests continue downslope to riparian/wetland habitats thus adding to the ability of those important habitats in maintaining a healthy environment. 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, streams, and biological resources.

An important forest habitat within the watershed includes the Canfield-Holmes Sanctuary. This area has been timbered in the past and can be timbered in the future. It consists primarily of a mixed hardwood forest. Hardwoods such as oak and maple species, black locust, elm, hickory, and beech are found within this area. Pockets of hemlock trees and rhododendron thickets provide plentiful evergreen cover for wildlife. Cavity trees are moderately abundant (Beale, 1994).

Forest fragmentation, the continued carving up of large forest blocks by the creation of roads, houses, businesses, etc., (Blankenship, 1999), have left forest patches of various sizes throughout the watershed. These small, fragmented forests do not provide recreational value,

wildlife habitat, and adequate water quality protection. Although the watershed is not experiencing the typical definition of "urban sprawl," any amount of development chips away at the forests that comprise a significant amount of the watershed (i.e., new roads, a cabin in the woods). Since most of the forest land within the watershed is privately owned, an important forest conservation strategy would be to raise public awareness. Educating the public about the roles that forests play and the threats to woodlands will assist conservation efforts. Forestry techniques that involve conservation principals for future timbering activities should be encouraged.

VI. CULTURAL RESOURCES

A. RECREATIONAL RESOURCES

Recreational activities available within the Cowanshannock Creek Watershed include, but are not limited to, hiking, biking, hunting, fishing, swimming, bird watching, picnicking, nature observation, cross country skiing, camping, canoeing, kayaking, horseback riding, and photography. Recreational opportunities are being enhanced through a variety of rail to trail and water quality improvement projects. Recreational improvement projects are of great interest to the CCWA and other community members. Many of the landholdings of the Cowanshannock Creek Watershed Association offer and promote public recreational activity. Below is a more detailed description of existing recreational areas and ongoing projects (See Figure 10).

1. PARKS/RECREATIONAL AREAS

Parks/recreational areas are most important to the residents of the watershed (Refer to Appendix A, Public Participation). Passive recreational opportunities (utilizing rails-to-trails, visiting cultural/recreational areas, bird watching/nature observing) and active recreational opportunities (hunting, fishing) are available throughout the watershed. Parks/recreational areas found within the Cowanshannock Creek Watershed are summarized in Table 15.

TABLE 15: OUTDOOR RECREATIONAL AREAS WITHIN THE WATERSHED

Park/Recreational Area	Description	Activities
Bernard C. Snyder Picnic Area	7 acre tract of grass area with parking area	picnicking, outdoor games
PA Fish and Boat Commission Boat Launch	small boat launch	boating, fishing
White Lake and Wetland	2 ½ acre lake and wetland area, with 15 acres of surrounding land; public access available	picnicking, nature watching
Devil's Washbasin	1 ½ acre impounded lake located on a 4 acre parcel	fishing, picnicking, nature watching
Canfield-Holmes Sanctuary	300 acres of forested land	hiking, biking
Buttermilk Falls	forested area along the Cowanshannock Creek	camping, hiking, biking, fishing

Bernard C. Snyder Picnic Area & Boat Launch: Located near the mouth of the Cowanshannock Creek, this area owned by CCWA provides an approximately seven acre tract for picnicking and outdoor activities. It is adjacent to a boat ramp owned and installed by the Pennsylvania Fish and Boat Commission. Sedimentation on the boat launch inhibits its use and is in need of repair. The area is also located adjacent to a portion of the Allegheny Trail that links Kittanning with northern areas of Armstrong County and passes along the Canfield- Holmes Sanctuary.

White Lake and Wetland: White Lake and Wetland, located on the eastern end of the Great Shamokin Path, is a 2 ½ acre lake and surrounding 15 acres of open land with a series of adjacent wetlands that work as an AMD treatment system owned by the CCWA. The system treats an acid discharge from a buried spring with high acidity (pH at 3.4), high iron (35 mg/L), high manganese (5 mg/L), and high aluminum. Although the system has not performed as well as hoped and does not always meet state standards for pH and manganese, the treatment area does considerably decrease the amount of metals and acidity entering Cowanshannock Creek (Armstrong Conservancy Trust, 1993).

In addition to treatment, the area was also designed for recreation with provisions for public access, picnic areas, and a limestone beach. Efforts to encourage recreation, including planting of wildflowers and the installation of benches at the site, have been completed in past years, however, this area has been prone to vandalism. The lake was also intended to enhance habitat in the area. Within the lake is an island that provides a good nesting site for waterfowl, and surrounding forests provide cover and habitat for terrestrial wildlife. Currently, the lake shows high, visible levels of aluminum loadings and aside from a pair of nesting geese, the lake itself is devoid of all aquatic life.

The DEP Bureau of Abandoned Mining and Reclamation (BAMR) is currently

working on rehabilitation of the wetland system that will improve treatment of the discharge as well as enhance lake conditions for recreation (BAMR, 2001). Although no final plans are in place to date, the envisioned design is a simple system that will re-direct a nearby clean water drainage and the discharge into a series of ponds that will help precipitate the aluminum levels. The design is expected to be completed Winter 2001, with construction proposed for the construction probably next spring/fall.

Devil's Washbasin: The Devil's Washbasin, located on the western end of the Great Shamokin Path, is a 1 ½ acre impounded lake located on a 4 acre parcel owned by CCWA, with 30 acres of surrounding open land. The lake was designed by the Soil Conservation Service in 1987 to address stormwater impacts and AMD sources (Armstrong Conservancy Trust, 1993). In addition, the lake was designed to serve as fish and wildlife habitat. The area is currently stocked and is a popular fishing ground for anglers and Sportsmen's Clubs. The lake was named after a watering site close by that was historically used as a water source for steam powered trains passing through the area in the late 1800's.

Canfield-Holmes Sanctuary: This property consists of approximately 300 acres of forested lands at the mouth of the Cowanshannock, adjacent to the Bernie Snyder Picnic Area. Currently owned by Armstrong County, and managed by CCWA– the land has been set aside for protection. CCWA has developed a Stewardship Incentive Plan (SIP) for the property under the DCNR Bureau of Forestry Program to promote rehabilitation and natural plantings. As part of the stewardship plan, CCWA hopes to enhance habitat provided by two small ponds on the site. Within the area also sits a 2.9 acre natural wetland. The small stream draining this wetland sustains several species of macroinvertebrates and is of good quality. No maintained trails are currently located at the site.

Buttermilk Falls: Buttermilk Falls is primarily a privately owned area that has been used by the community for camping, fishing, swimming, hiking, etc. for many years. A small portion of the area is owned by CCWA and permitted camping is allowed in this area. The exact boundary of the areas known to the community as "Buttermilk Falls" is not clear, however ownership within the vicinity of Buttermilk Falls covers approximately 270 acres. A popular recreational area for local youth, this area is one of the highlights within the Cowanshannock Creek Watershed. Potential threats to the area include sedimentation and erosion caused by ATV traffic as well as littering and dumping on the property. Also, the property currently is not under any special conservation protection or zoning (e.g., conservation easement, public ownership). It will be important to acquire conservation protection of the area in order to maintain its recreational use for future generations.

Municipal and Other Recreational Parks: The Rural Valley Ballfield, Rural Valley Athletic Field, Kittanning Township Ballfield, athletic fields at West Shamokin High School, and Blanket Hill Speedway located in Kittanning Township are additional municipal areas that support recreation within the watershed. Also located in the watershed, Shamokin Community Park offers basketball courts, a baseball field, enclosed lodge, open pavilion, water and restrooms, tennis courts, volleyball courts, two small playgrounds, and a small walking path. Primary outdoor recreational activities are supported by properties owned by CCWA.

2. TRAILS

Recreational trails provide communities and environmental groups with areas for walking, biking, rollerblading, horseback riding, snow shoeing, and cross-country skiing. In particular abandoned railroad beds or rail trails offer safe recreational opportunities and alternatives to common recreational options 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

trails, (one rail trail, one hiking trail) one proposed and one trail currently under construction located within the Cowanshannock Creek Watershed. These four trails are summarized in Table 16.

TABLE 16: TRAILS WITHIN THE WATERSHED

Trail	Description	Status
Armstrong Trail	52.1 mile rail-to-trail, several miles completed	Partially open
Cowanshannock Trail	3 mile rail-to-trail	Open
Great Shamokin Path	4 mile rail-to-trail	Open
Great Shamokin Path Extension (Kavolchick Trail)	7.5 mile rail-to-trail	Proposed

Armstrong Trail: This rail-to-trail facility is currently being constructed in phases by Armstrong County with support from the Allegheny Valley Land Trust. The 52.1 mile hiking and biking trail will run along the east bank of the Allegheny River from Schenley, Armstrong County to Upper Hillville, Clarion County. The trail will pass through the communities of Rosston, Ford City, McGrann, Manorville, Kittanning, Templeton, and Phillipston. A portion of the trail crosses the mouth of the Cowanshannock Creek as it passes from Kittanning to Templeton. The Armstrong County Planning Commission has secured $500,000 for initial phases from the Intermodal Surface Transportation Act 91. To date, two miles have been completed in Ford City and two miles have been completed in Manorville and Kittanning.

Cowanshannock Trail: This 3 mile rail-to-trail along Cowanshannock Creek extends from the Bernard C. Snyder Picnic Area on S.R. 1033 north of Kittanning to Buttermilk Falls. The trail passes through various private land holdings. A walking bridge was installed by CCWA to facilitate use of the trail.

Great Shamokin Path: This hiking and biking trail runs for four miles between Numine and Rose Valley along an abandoned railroad right-of-way purchased by the CCWA in 1984. When acquired, the tract was severely eroded and needed extensive reclamation. CCWA worked with the SCS and the Pennsylvania Conservation Corps to stabilize the area. The effort involved development of a series of small pools to store runoff, and enhance habitat. More recently a bridge was installed to facilitate use of the trail with funding support from the PennDOT ISTEA program. Development of the trail has been a community effort from the start.

The trail itself consists of a long, narrow tract paralleling the Cowanshannock Creek and links the Devil's Washbasin with White Lake and is used for hiking and biking, nature observation, picnicking, cross-country skiing, and other similar activities. The trail was named after the path located along Cowanshannock Creek that was historically used by Native American tribes including the Delaware, Shawnee, and Iroquois (See section VI. B. 2. Historic Period Indians).

Proposed Great Shamokin Path Extension: This trail is a proposed hiking and biking trail from Margaret to Echo along an abandoned railroad line, also known as the Kavolchick line. The trail crosses Cowanshannock Creek at the eastern end. Eighty percent of the funding has already been attained by the CCWA for development of this rail-to-trail area. Currently members are seeking additional funding from Allegheny Energy and Dominion Resources so that the project can get underway.

B. ARCHAEOLOGICAL AND HISTORICAL RESOURCES

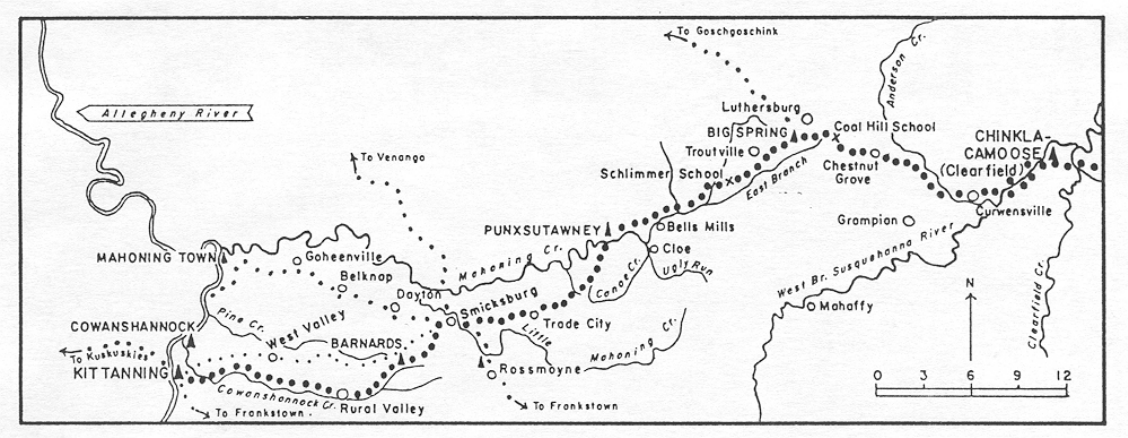
1. PREHISTORIC USE OF THE WATERSHED

Although no major archaeological investigations have occurred in the watershed, we know from professional surveys and amateur collections that this area of Armstrong and Indiana counties was heavily utilized in the prehistoric period. For example, the survey of portions of the Crooked Creek drainage to the south yielded evidence of use in all periods from the Paleoindian (*ca.* 10,000 B.C.) to the historic Indians. Pleistocene terraces, ridge noses above streams, and upland flats near springheads were favored locations for the hunter-gatherers of the Paleoindian, Archaic, and Early Woodland periods. In the Middle and Late Woodland periods (100 B.C. to A.D. 1050), wild and domesticated plants became increasingly important, and large, more permanent sites appeared on the terraces and broad floodplains. Major stockaded villages on floodplains and upland saddles in drainage divides were common in the Monongahela culture of the Late Prehistoric period (A.D. 1050-1630). In eastern Armstrong County and western Indiana County, much of the archaeological record has been lost to extensive coal mining, and it is presently unclear how many sites of what type have survived in the watershed.

2. HISTORIC PERIOD INDIANS

Signs of the historic Indian period are still present today. Farmers often turn up arrowheads in their fields from the period of Indian settlement (CCWA, 2001). "Cowanshannock" is apparently derived from the Delaware term, *Gawunschhanne*, meaning brier stream. The name appears in the Colonial records as early as 1774 (Donehoo 1995:51).

Donehoo (1995:82) reports that "the Indian village of Kittanning was the largest Indian settlement in Pennsylvania, west of Shamokin during the period from about 1730 until its destruction in 1756." It was apparently a Delaware village (Kittanning meaning "at the great stream" in Delaware), but Shawnee were also known to have lived in the village. A large number of English captives were rescued when the village was attacked and destroyed in 1756 (Donehoo, 1995).



Great Shamokin Path from the Susquehanna to Kittanning.
Source: Wallace. 1987. *Indian Paths of Pennsylvania.*

The Shamokin Path (also known as the Great Shamokin Path) ran from the forks of the Susquehanna to Kittanning. It was a major Indian path, and much of its course was later used for Euro-American roads. One branch of the Shamokin Path "kept to the

north side of the stream to the crossing, which was about two miles east of Kittanning: (Wallace 1987:70). This branch of the stream was completely within the Cowanshannock Creek Watershed, and would have brought large numbers of Delaware, Shawnee, and Iroquois through the area.

An Indian village was apparently present at Barnards, within the watershed. Wallace (1987:70) reports that this village may have survived as late as the 1820s.

3. HISTORIC SETTLEMENT

The relatively early settlement of the watershed and the early presence of a major thoroughfare suggests that numerous historic archaeological sites are probably present in the watershed. A review of the 1876 Atlas of Armstrong County (Nichols 1876) indicates that historic settlement was focused on the communities of Rural Village, Centreville, Barnards, and Greendale. The rural farms were most commonly located along the stage road running north of the creek. Numerous saw and grist mills are present along Cowanshannock Creek and its tributaries, especially on the southern branch of the creek.

4. HISTORIC RESOURCES

Historic resources are, or can, include standing structures (e.g., houses, barns, grist mills, etc.) and remnants of the built environments (e.g., dams, bridges, railroads, etc.). These resources are generally over fifty years old. Protection and preservation of historic resources helps to give a community its character. It can help promote economic development by enhancing tourist or local interest and activity in any given area. Three historic properties are known to be located within the watershed. Of these, one is in Armstrong County and two are in Indiana County (SPC, 2001). They are:

- LR 038068 Bridge in Rayburn Township, Armstrong County
- Baker, Royden Property in South Mahoning Township, Indiana County
- Crooks Log Springhouse in South Mahoning Township, Indiana County

None of these sites have been listed or recommended eligible for the National Register of Historic Places (PHMC, 2001). Other potential historic properties may exist within the watershed, but have yet to be identified for such a designation. See Figure 10 for locations of these historic properties.

VII. ISSUES, OPPORTUNITIES, AND MANAGEMENT OPTIONS

A. MAJOR ISSUES WITHIN THE WATERSHED

Major issues within the Cowanshannock Creek Watershed are typical of water quality and river protection concerns throughout rural areas in Pennsylvania. For example, non-point source water pollution from agriculture is a significant concern. Also, proper use and management of septic systems and proper disposal of municipal waste is a large concern. Abandoned mine discharges still remain within the watershed. And, typical of many rural areas, zoning, which can help guide land use management that will protect the watershed over the long term, is non-existent at the municipal level. In addition to major issues and concerns, a number of opportunities for improving and expanding recreational and educational activities are available throughout the watershed. Taking steps to secure these opportunities is important for developing a stronger interest and support among community members who currently are not involved or interested in watershed protection efforts. The data collected and analyzed in Sections I through VI point to the following six (6) major issue areas as critical to improving and protecting the Cowanshannock Watershed and enhancing quality of life.

(1) Implementation of local planning and zoning to protect farmland and forest resources, the riparian corridor, floodplains, and wetlands;

(2) Water quality improvement and protection efforts that focus on agricultural pollution sources, sewage management, riparian buffers, key areas for streambank stabilization, and impacts from abandoned mine drainage;

(3) Collection of information on existing biological resources within the watershed needed to identify key areas for long term protection;

(4) Waste management;

(5) Protection and enhancement of natural recreational resources; and

(6) Additional watershed education opportunities.

Issues and concerns noted by the general public and community mirror findings of the data collection effort. A public visioning session held on November 30, 2000 identified similar positive and negative aspects of the watershed and water quality concerns as identified by the study (See Appendix A). Some of the positive aspects that were noted included improved water quality in recent years, availability of a variety of recreational opportunities, farmers interested in improving their land, reduction of untreated sewage in the stream in recent years, and easy access to natural areas. Among the list of negative aspects noted during the session

were illegal dumping, lack of community interest in watershed issues, streambank erosion, poor habitat for fisheries such as trout, need for riparian buffers, and lack of zoning. In addition, physical alteration of the streambanks, sediment loadings in streams, and sewage and agricultural runoff in streams were identified as "prevalent concerns" by most attendees based on a questionnaire distributed at the public meeting.

The key areas listed above serve as the basis for the management options considered and recommended in this plan for the watershed. Below is an overview of each issue area and recommended management actions based on the collected data and identified public concerns. The Management Matrix (page 83) presents a summary of prioritized management options discussed in this section. It also includes key partners, potential funding sources, and proposed timetables for recommended options. Potential assistance sources for watershed projects are included in Appendix G.

B. MANAGEMENT OPTIONS

(1) Local Planning and Zoning

As communities grow and change, zoning will play an increasing role in the status of resources within the watershed. Zoning and comprehensive plans are important tools for sound land management, especially at the municipal and county levels where zoning and planning tools can be enforced. A lack of zoning that adequately protects natural resources in the watershed is a major concern, especially in areas where larger levels of growth are projected. Development of new and updated comprehensive plans for both Indiana and Armstrong Counties using current conservation planning and zoning tools will be an important guide for many municipalities in the watershed. In addition to protection of critical areas, comprehensive planning efforts at the municipal level can encourage and enforce use of best management practices for agricultural operations, timbering, and sewage management that have major impacts on Cowanshannock Creek and its tributaries. Overall it will aid communities in balancing economic development with protection of local, natural, recreational, and cultural resources. Examples of model ordinances are included in Appendix C.

Recommended management options for consideration are described below:

A. *CCWA and interested citizens should provide public input on the new comprehensive plan being developed in Armstrong County and the updated plan proposed for Indiana County.* Armstrong County is at the very initial stages of developing a comprehensive plan and Indiana County has submitted a funding proposal to update their existing comprehensive plan. Public input in the planning process encourages strong conservation zoning in both

counties.

Also, an update of the *Armstrong County Subdivision and Land Development Ordinance* should be encouraged as part of the comprehensive planning process. Additional provisions could be added to the ordinance to improve protection of the watershed. For instance, cluster development (where large areas within developments are kept in their natural condition), and protection of the riparian corridor could be encouraged. Also, standards to limit road widths and parking lot areas to minimize impacts from increased stormwater and impacts to natural areas could be added.

B. *All municipalities in the watershed should develop current comprehensive plans that use applicable conservation zoning tools.* Development of a current comprehensive plan at the municipal level enables communities to address specific issues such as growth, sewage management, recreational resource enhancement, forest resource management, transportation, etc. In developing a municipal comprehensive plan, municipal governments can better meet the needs of the community. Each municipality must consider what areas are most important in their locality and what types of zoning tools may be most applicable.

Several different types of conservation zoning tools that protect critical areas, such as floodplains, riparian corridors, wetlands, forests, and open space, are available. A list of conservation zoning tools and several examples are included in Appendix C.

- Zoning tools applied within planned developments: One way to implement conservation zoning focuses on protection of large natural areas within planned developments. Developers can be required to set aside a specified percentage of any development site as permanently protected open space, or be encouraged to use cluster development. Cluster development involves compact development through variations in lot size that maximizes the area of protected open space.
- Protection of important areas: Other types of conservation zoning require overview and long term planning of the entire municipality. Specified sensitive areas such as buffers along streams or floodplain areas could be restricted from development through use of various ordinances. Examples include riparian buffer ordinance, floodplain overlay districts, and forest resource ordinances.

- Encouraging development in areas with existing infrastructure: Incentives that steer development away from rural and sensitive resources and toward areas that are already developed reduces potential for sprawling development patterns. One method is through use of Transferable Development Rights (TDRs). TDRs use a compensation system set up to allow landowners in rural or sensitive resource areas to sell development rights to individuals interested in developing in predetermined locations in the municipality suitable for more intense development. The seller of the rights retains use of their property with restricted uses (e.g., housing plans, strip malls) and the purchaser of the rights

is able to develop another parcel more intensely than they would have otherwise been allowed. Areas such as Rayburn Township, where projected growth is high should consider application of TDRs or other similar zoning tools.

C. *Education and outreach to municipal officials on needs, benefits, and available tools for planning and zoning efforts.* Municipal officials have the ability to promote development and implementation of zoning and planning in their municipalities. Education of municipal officials on planning tools is needed if municipal zoning and planning is to become a reality.

D. *CCWA should work in cooperation with landowners to secure conservation easements of critical areas.* A conservation easement allows a landowner to give away certain rights to a qualified conservation organization, such as CCWA. The landowner could prohibit various features (farmlands, forested tracts, wetlands, etc.) from inappropriate development and assure long term conservation in exchange for income tax, property tax, and estate tax benefits. Conservation easements promote long term planning and protection of sensitive resources without the high costs associated with acquisition. The Pennsylvania Farmland and Forest Land Assessment Act of 1974 (Clean and Green, Act 319) programs are examples of conservation easement programs for farmland in Pennsylvania. The municipality could develop special tax-based incentives. One are in need of a conservation easement, or acquisition is the Buttermilk Falls recreational area.

(2) Water Quality Improvement and Protection

Water quality improvement within the watershed will entail overcoming challenges associated with addressing non-point source pollution issues. The individual sources stem from a variety of issues and are many. Often individuals responsible for the pollution are unaware that their practices are damaging to water quality. Education and cooperation of individuals, municipalities, and the general community will be an important part of improving and protecting water quality in the watershed.

Below are more detailed descriptions of major pollution sources within the watershed and recommended management options to address each issue.

A. Nutrient Enrichment from Agricultural Sources

Nutrient runoff from both cropped land and livestock operations is prevalent

throughout the watershed. In some areas streamside fencing is needed to keep animals out of waterways where animal waste collects and streambank erosion results. In other areas, application of conservation practices for cropped land and pasture land management are needed. Various techniques can help minimize erosion and minimize water runoff fertilizer from cropped land, as well as help reduce impacts from animal waste. High priority areas for implementation of nutrient management strategies include the portions of the Cowanshannock Creek in Indiana County (Armstrong County Conservation District, 1994; FGM Study, 2001). A major issue in addressing nutrient sources from agricultural operations is landowner cooperation. Many landowners within the watershed have already been contacted regarding use of conservation practices. Most of the interested landowners have already implemented conservation practices. Individuals not already approached by the conservation district, and those individuals posing the largest impacts can be targeted for use of conservation practices. The following management actions are recommended.

1. *Promote use of various Best Management Practices (BMPs) to address nutrient enrichment from agricultural sources through demonstration and cost-sharing projects.* BMPs are conservation practices and 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. Consult your local county conservation district or USDA office for more information:

Armstrong County Conservation District
Armsdale Administration Building
R.D. #8, Box 294
Kittanning, PA 16201
Phone: (724) 548-3425
Fax: (724) 548-3413
armstrong.county@dep.state.pa.us

Indiana County Conservation District
251 Route 286 North
Agriculture Service Center
Indiana, PA 15701-9203
Phone: (724) 463 -8547 ext. 4
Fax: (724) 463 -9181
indiana.county@dep.state.pa.us

USDA NRCS- Armstrong County
Armsdale Administration Building
R.D. #8, Box 294
Kittanning, PA 16201
Phone: (724) 545-1022
Fax: (724) 545-9012

USDA NRCS - Indiana County
Agricultural Service Center
251 Route 286 North
Indiana, PA 15701-9011
Phone: (724) 463-8547 ext 3
Fax: (724) 463-1939

2. *Aid farmers in completing nutrient management plans for both cropped land and livestock operations in headwaters and other priority areas.* Nutrient Management Plans provide farmers with guidelines on fertilizer application, pesticide application, animal waste management, controlling erosion on their properties, application of appropriate BMPs, etc. Overall if followed these plans help reduce the amount of nutrients entering waterways. Study findings indicate that many farmers within the watershed may not have nutrient management plans in place (Armstrong County Conservation District, 1994). Farming operations where nutrient enrichment is a major issue, such as the headwaters of Cowanshannock Creek, should be encouraged to develop nutrient management plans for their operations.

3. *Promote streambank fencing, especially in the headwaters of the Cowanshannock Creek and other areas where needs are greatest.* Streambank fencing blocks animals from passing through streams. It helps reduce erosion and nutrient impacts from livestock watering and grazing along streambanks. Targeted outreach and education to livestock owners in the Upper Cowanshannock on financial and technical assistance programs available through the USDA-NRCS, Pennsylvania Fish and Boat Commission, and Pennsylvania Game Commission, etc. is recommended. As part of the promotion and education effort, demonstration sites could be utilized to educate landowners on conservation options and opportunities.

B. Nutrient enrichment from sewage

Lack of sewage treatment and failing septic systems have been a major issue within the watershed for many years. Even with newly constructed sewer service in Cowanshannock Township and Rural Valley Borough, and planned expanded sewer service in Rayburn Township, households within the middle of the watershed and located to the east will remain unserved by any sewer treatment service. Therefore, sewage discharge is expected to continue to pose some problems within the watershed. Major issues are direct discharge of sewage to

streams as well as lack of maintenance of private septic systems. Because of inadequate soils in the area, need for special systems is an additional problem. The high cost of centralized sewer treatment service in this rural watershed with a low average income is also of concern. Many of the residents are not able to afford or are unwilling to pay for treatment. The following management options are recommended.

1. *Municipalities with large areas not currently served by sewage treatment systems should update their Act 537 Sewage Facilities Management Plan and consider implementation of a sewage/septic management ordinance.* Development or update of an Act 537 plan allows a municipality to study sewage issues and develop a plan of action. In addition to expansion or development of new treatment facilities, the plan can be used to promote and enforce septic systems management. Municipalities should consider implementation of an ordinance. Sewage/septic management ordinances can provide residents and businesses with guidelines on proper septic system management. They could also require individuals discharging sewage directly into the watershed to install a septic system. Townships that have not completed or recently updated their Act 537 plans include: Valley T., Kittanning T., South Mahoning T., Manor T., Wayne T., West Mahoning T. and Plumcreek T.

2. *Promote septic system upgrades and installation or maintenance of septic systems through outreach, and education efforts in areas not served by sewer systems. Work with the Armstrong County Sewage Enforcement Agency (SEA).* Develop a program to educate landowners on cost effective options for septic system upgrades (e.g., replacement of smaller tanks with larger 1,000 gallon per day duel compartment tanks costing less than $1,000), or installation of new systems. The SEA which has a board of Township Supervisors, along with interested community groups should work closely on a coordinated community outreach effort. Focus on public health impacts of sewer discharge and improper septic system management. Include information on proper maintenance steps. Disseminate information that identifies technical and financial assistance programs.

3. *Secure funding or cost share assistance for installation of special septic systems on existing properties lacking sewage facilities with low income owners.* Highlight demonstration projects that promote installation of new systems through the media and

education and outreach efforts. Because many existing property owners may not be able to afford installation of sand mound systems or special septic systems (e.g., drip irrigation, spray irrigation, chlorinated discharge) required due to inadequate soils in the area, financial assistance may help promote responsible sewage management.

4. *Support and promote research efforts for development of affordable septic systems that are effective in areas with permeable soils, such as the Cowanshannock Creek watershed.* Because technologies currently available for special situations, such as the highly permeable soils, is too costly for many homeowners research to create more affordable options is important. CCWA, municipalities, and homeowners should support and encourage any research efforts.

C. Acidity and metals from abandoned mine discharge (AMD) sources

AMDs can be treated with application of management practices, such as re-mining, constructed wetlands, and passive treatment systems. Assessment of various water quality parameters and seasonal discharge flow data is needed to fully understand, and thus, treat a discharge properly. Additionally, AMD remediation projects can involve multiple private property owners. Getting landowner cooperation is often difficult. Liability concerns now can be addressed with Good Samaritan legislation that takes away any liability from property owners (see Appendix H). In addition, potential tax incentives for use of property requires explanation. All these factors make treatment at each site unique. Many of the major AMD discharges in the watershed have been addressed through remining or treatment efforts. Current sampling and flow information on many known, untreated AMD sites is unavailable. Some of the known AMD sites have been viewed for passive treatment options, but due to lack of landowner cooperation or limited space for treatment systems have not been treated.

The following management strategies are recommended to address AMD issues in the watershed:

1. *Identify and implement treatment opportunities at known AMD sites for potential reclamation and development, with current priority on the Medredith 1 and Meredith 2 discharges at the Manjerovich property (previously the Wilson Farm).* Flow from Meredith 1 and Meredith 2 is noted to have high estimated flows greater than 100 gpm, with one sampling indicating a flow rate of 600 gpm. Visual observations, as well as water samples, indicate that Meredith 1 and Meredith

2 (AMD-3 and AMD-4) are high flow rate, net alkaline, iron containing discharges. The current owner of approximately 100 acres of surrounding land is considering sale of the property and should be approached about sale to CCWA for use as a treatment area for the discharges. Other known AMD sites currently not treated and with limited data, especially at Buttermilk Falls (AMD-6 and AMD-7), the junkyard (AMD-8), and discharges along Mill Run (AMD-9 and AMD-10) should be sampled and evaluated for treatment opportunities.

2. *Complete the rehabilitation design and construction of the passive AMD treatment system at WhiteLake (AMD-11) conducted by the Bureau of Abandoned Mine Reclamation (BAMR).* Wetlands are currently being redesigned and re-constructed by BAMR. Rehabilitation of the wetland system will aid recreational enhancement of the area. The area should be monitored for progress and availability for further recreational enhancement.

3. *Complete installation of diversion well at the AMD fed trout nursery (AMD-12) to improve water quality at the facility.* Treatment of the AMD fed trout nursery is needed to address declining water quality at the facility. Currently application for a Growing Greener Grant to fund the project is being considered. Funding should be acquired for the project to assure continued use of this recreational resource within the watershed.

D. Habitat modification

Addressing existing habitat modification problems within the watershed, including streambank erosion, can be done through implementation of streambank stabilization projects, and streambank planting projects. Application of bio-engineering techniques as opposed to traditional stabilization methods (e.g., rip-rap) should be considered as they allow the stream to maintain its natural path and structure, and will help prevent impacts over the long term. Some projects may have high associated costs and prioritization of sites will be important.

In order to work toward prevention of impacts of habitat modifications including stream bank erosion, special attention should be paid to stormwater management especially in areas projected for growth. Sedimentation impacts from agricultural sources, and dirt and gravel road networks within the watershed should also be minimized through use of BMPs and proper maintenance. Major challenges include educating municipalities, developers, and citizens alike on the need for incorporating appropriate and adequate stormwater controls. For example, designing compact parking lots and garages, as well as including vegetated buffers within large parking lots can do a lot to improve impacts from stormwater runoff.

The following actions are recommended:

1. *Implement all feasible high priority streambank stabilization projects identified through the FGM Study.* 26 high priority areas for stream restoration were identified in the

FGM Study (See Figure 9 and Appendix F). As many feasible projects as are possible are recommended for implementation. Landowner cooperation will be a key to identifying potential projects. Any implemented projects should be highlighted in the community as examples of natural stream design techniques, and monitored for success.

2. *Encourage landowners through education, outreach, and promotion of cost-sharing programs to vegetate stream banks, particularly along the main stem of the Cowanshannock Creek.* Riparian cover is critical to maintaining good habitat for aquatic species, especially cold water fisheries such as trout. Shaded waterways cool the temperatures allowing for more diverse aquatic life. Many areas along the main stem of the Cowanshannock Creek are in need of revegetation. Additional areas in need of riparian cover include those segments ranked low on the USDA riparian assessment applied in the FGM Study.

3. *Encourage use of Stormwater Best Management Practices (BMPs), especially in muncipalities with high projected population growth.* Stormwater BMPs involve use of natural or engineered structures to catch and/or retain precipitation during storm events. A variety of best management practices are available to address stormwater runoff issues that may arise with increased development (e.g., grass swales, stormwater ponds, bioretention areas). In addition, protection of vegetated buffers along streams that can filter pollutants and slow stormwater flows will be important. Any new developments should consider incorporating stormwater BMPs in their designs. Municipalities with high projected population growth, including Rayburn, Manor, Plumcreek, and Cowanshannock Townships, should evaluate adoption of stormwater management ordinances and plan. The Pennsylvania Stormwater Management Act (Act 167) provides technical guidance and financial support to local governments in stormwater management planning efforts.

4. *Protect waterways from sediment loadings carried from dirt and gravel roads in Armstrong County with funding support from the Armstrong County Dirt and Gravel Road Program.* As described, Armstrong County has approximately 489 miles of dirt and gravel road networks, (Indiana County does not have any dirt and gravel roads within the watershed). Lack of proper maintenance of these roads can result in increased sediment loadings to waterways. Funding to reduce water quality impacts from dirt and gravel roads is available under section 9106 of the

Pennsylvania Vehicle Dirt and Gravel Road Maintenance Program. Armstrong County currently has $93,000 available to support maintenance of local dirt and gravel roads. Funding should be used to maintain dirt and gravel roads within the watershed and minimize sediment loadings from this source.

E. Additional recommendations to improve ground and surface water resources within the watershed.

In addition to the above mentioned issues, the following management measures throughout the watershed are recommended:

1. *Create a volunteer group led by the Cowanshannock Creek Watershed Association to participate in a water quality monitoring program for the entire watershed.* Because no recent comprehensive data is available for the watershed, data needs to be collected to monitor progress toward meeting various water resource protection goals. A volunteer water quality and biological (e.g., macroinvertebrate, fisheries survey) sampling program could be developed with help from the Environmental Alliance for Senior Involvement (EASI) program, the Alliance for Aquatic Resource Monitoring (ALARM), or DEP's Bureau of Watershed Management with leadership from CCWA. Other monitoring program ideas include holding a family stream day where participants would adopt an area for long term monitoring in the watershed.

2. *Additional investigation on groundwater quality and supply is needed.* Data indicates possible declining groundwater supplies and declining groundwater quality. Research that evaluates groundwater quality and quantity- past and current condition, and current pollution sources is needed.

(3) Identification and Conservation of Important Biological Resources

Conservation of the large forested tracts within the watershed from improper management will be important. Also, identification of sensitive and unique natural areas is an important first step toward protection of biological integrity of the watershed. These areas serve as habitat for wildlife and aquatic species and provide important functions including flood control and pollutant removal. To date, no significant study or survey of the watershed has been completed. In particular, areas such as Buttermilk Falls appreciated by the community for its aesthetic and natural values, have not been evaluated. In order to adequately protect these

areas, detailed inventory of existing flora and fauna and natural functions is needed. The following management options are recommended to support protection of existing biological resources within the Cowanshannock Creek Watershed:

A. *Encourage forestry techniques that involve conservation principals for future timbering activities.* With forests a dominant cover type and nearly 100% of the land being privately owned, education on proper management of forest resources is critical. There are three accepted Forest Management Systems utilized within the Cowanshannock Creek Watershed. These include: silviculture of upland central hardwoods (system developed in the 1960s), silva - for northern hardwood types that also include central hardwoods (North Eastern Forest Experiment Station in Warren, PA), and Crop Tree Management. All three of the systems have been developed by the U. S. Forest Services (Beale, 2001). For advice on Forest Management Systems, the following associations can be contacted: Pennsylvania Bureau of Forestry - Service Forester Program, Pennsylvania Forestry Association, Association of Consulting Foresters (Pennsylvania Chapter), Penn State Agricultural Extension Service.

B. *Complete vegetation and aquatic surveys of important biological areas in the watershed.* Vegetation and aquatic surveys can be completed in known areas of biological significance, including Buttermilk Falls. The general community, students, and other volunteers could be involved in the inventory through community bio-blitz days where general surveys of the area are completed. Collection of this information is important to identifying areas of special value where conservation plans could be prioritized and implemented. In addition, universities and schools should be approached and encouraged to conduct research and inventory projects within key areas in the watershed.

C. *Complete migratory bird counts within the watershed.* Tracking of migratory birds in the watershed helps identify important habitat for bird populations. Coordination with other environmental groups in the area such as Audubon Society and Western Pennsylvania Conservancy with interest in tracking migratory bird populations can support collection of important biological information within the watershed.

D. *Encourage development of Natural Heritage Inventory of Armstrong and Indiana Counties.* The Western Pennsylvania Conservancy is currently preparing a Natural Heritage Inventory (NHI) for counties in western Pennsylvania. The NHI identifies and maps the county's most significant natural places. Plant and animal species that are unique or uncommon to the county are investigated, and sensitive biological resources within the watershed will be outlined. The NHI for Armstrong and Indiana Counties are not currently on WPC's list of counties to be inventoried within the near future. Communities within the watershed should encourage NHI development so that they can work toward the next step of protecting identified important areas.

E. *Establish natural and protected areas based on inventory information.* Once the biological surveys are conducted, establish natural and protected areas for long term conservation of these areas.

(4) Waste Management and Clean-up

Although public waste pickup is available throughout the watershed, there are some residents who feel that it is legal and safe to dump waste in their backyards. Changing residents' attitudes through education will encourage them to take better responsibility for disposing of their waste. In turn, this will make for a cleaner and healthier environment. Below are some suggestions to help regulate waste within the watershed.

A. *Control unregulated wastes through zoning and ordinances.* Municipalities, through zoning and ordinances, can control unregulated waste sites at the local level. Enforcement of high fines and penalties outlined in the ordinance must be applied if ordinances are to be effective and changes in behavior are going to be observed.

B. *Complete inventory and prioritize unregulated waste sites for clean-up activities and coordinated clean-up efforts with annual recycling days.* Inventory, map, and prioritize unregulated waste sites within the watershed for clean-up. Coordinate clean-up efforts with existing "Hard to Recycle Days" held by Armstrong County and the Progressive Workshop at the Armstrong Recycling Center (within the watershed). The annual spring clean-up and recycling day can be held in

cooperation with municipalities to focus on clean up of priority waste sites and on private properties. Involve property owners at priority clean-up sites to help foster stewardship and assure that future dumping is prevented. Local citizens, conservation groups (Pennsylvania Cleanways, Ohio River Clean Sweeps, and Cowanshannock Creek Watershed Association), scout troops, and schools can assist with these projects that will help eliminate promiscuous solid waste sites.

C. *Control unregulated waste through implementing a Neighborhood Watch Program.* A Neighborhood Watch Program can be implemented within each community to report violators and encourage neighbors to take responsible actions for disposing of waste.

D. *Educate the public regarding waste regulations, community involvement in enforcement, and recycling iptions.* Educating the public regarding waste regulations, and the detriment to the environment and the entire community will help to instill awareness and stimulate solutions. In addition, understanding how the community can get involved in enforcement of the regulations (e.g., who to call, anonymous reporting) will aid in creating community awareness and improvement regarding waste management (See Appendix E). Outreach on recycling options will educate the community on opportunities to reduce waste. Outreach efforts should be coordinated with existing efforts of the Armstrong County Recycling Center and Armstrong County Department of Planning and Development.

E. *Utilize PA Clean Ways in Indiana County and re-establish a Pennsylvania CleanWays Chapter in Armstrong County.* Pennsylvania CleanWays is a statewide organization that strives to battle illegal dumping and littering. PA Clean Ways has a state board that oversees and provides assistance to local county chapters. Chapters are run by volunteer advisory boards who build community teams and set local priorities. By working with the Indiana County Clean Ways where possible and re-establishing a Pennsylvania Clean Ways chapter in Armstrong County, the Cowanshannock Creek Watershed community will benefit from cleaner roads, waterways, and other areas where dumping has occurred. The community will also benefit from increased citizen involvement in caring for the environment. Appendix E outlines information about becoming a PA CleanWays Chapter

and includes a copy of a Draft Pennsylvania CleanWays Pre-Chapter Agreement. See www.pacleanways.org for more information on the organization.

F. *Develop county waste enforcement program to help municipalities enforce waste management regulations.* Currently Indiana County's Solid Waste Authority has a program that provides staff support to municipalities to enforce waste management ordinances. West Mahoning and South Mahoning Townships currently do not hold cooperative agreements with the county to receive services through this program and should be encouraged to do so. Armstrong County currently does not have this program in place and should work toward developing this type of enforcement assistance program.

(5) Protection and Enhancement of Natural Recreational Resources

Recreational opportunities are one of the best assets and greatest potentials within the watershed. They provide the chance for everyone to experience and gain a stronger appreciation and understanding of the importance of nature within the watershed. Protecting, enhancing, expanding, and promoting the existing opportunities will help build support within the watershed. A major concern in the area is vandalism and littering, which have been observed at many of the existing recreational sites. A shift in attitude is needed within the community. Although these issues cannot be addressed in any one project or program, a community ethic and value for the surrounding area can be cultivated over time. Continued education and support for recreational activities will be needed to change behavior and attitude. This will, in turn, add to overall understanding and long-term viability of the watershed.

Management strategies for the protection and enhancement of recreational resources are outlined below.

A. Holistic Planning

1. *Develop a holistic watershed recreational plan that incorporates the projects listed in this section as well as visioning and long-term recreational goals.* The RCP can serve as the basis for visioning of future recreational and cultural resource activities and projects in the watershed. The plan can also be coordinated with recreational and cultural resource features developed or planned in neighboring watersheds.

B. Recreation Facilities & Activities

1. *Promote and enhance existing recreational facilities.* Some of the existing facilities could be improved and promoted for greater use by the community.

   - *Improve the boat launch at Bernard C. Snyder Picnic Area.* Adjacent to the Bernard C. Snyder Picnic Area, there is a boat launch owned by the Pennsylvania Fish and Boat Commission. Presently, the launch is unusable due to a build-up of sediment. In order to make this a usable launch, a dock could be extended from the land into deeper parts of the creek. If the dock is not feasible, deflectors could be built to reduce sedimentation or the launch could be moved to a different location where sediment build-up is less likely.

   - *Promote use of Devil's Washbasin by various groups for outings and fishing competitions.* This lake is stocked with a variety of warm water fish species. Individual anglers as well as Sportsmen's Clubs take advantage of the plentiful stock. The lake can be promoted to additional sportsmen's groups as well as other groups for outings and competitions. Promoting use of the area by different organizations can help develop a greater sense of ownership and a desire to maintain this and other areas.

   - *Improve water quality at White Lake and Wetland.* The 2 ½ acre lake and series of wetlands are degraded by runoff from an abandoned coal refuse. Measures need to be taken to improve the water quality to the point where it can sustain aquatic life (See section IV. E. 1. Pollution from Abandoned Mine Drainage). Once this has been accomplished, the lake can be stocked with fish and used as a fishing area and a desirable location for picnicking and nature watching.

2. *Prevent littering, graffiti and other vandalism at Buttermilk Falls, White Lake and Wetland, Devil's Washbasin, Bernard C. Snyder Picnic Area, and along the Shamokin Path.* Littering and graffiti are issues at these sites and can be controlled and managed using a variety of strategies. Litter and graffiti clean-up teams can be formed utilizing local individuals, students at local schools and universities, and individuals seeking community service work. Trash containers can be placed throughout the sites and along the Shamokin Path, especially in heavily used areas/sections. Signs promoting a clean, healthy environment and discouraging litter and graffiti can be placed throughout the sites and along the trail. Monitoring these areas on a regular basis will prove beneficial by deterring violators. Some preventive measures include: use durable signs and structures, place signs out of convenient reach, and place signs and structures in a highly

visible area.

3. *Prevent destruction and high sedimentation in streams by all-terrain vehicles at Buttermilk Falls and along the Shamokin Path.* All-terrain vehicle use in these areas is difficult to manage, especially since these vehicles are difficult to track. However, some strategies can be implemented to reduce impacts. Some of these include: restrict vehicle access using signs, posts, or other deterrent structures; encourage visitors to report sightings of all-terrain vehicle use; and use volunteers to monitor the areas. Another strategy would be to coordinate an ATV watch with the guard who patrols the sewage plant located near a section of the trail. While patrolling the sewage plant, the guard can report any all-terrain vehicles using the trail.

4. *Hold annual recreational/athletic events in the watershed during a community festival in coordination with local groups.* Recreational/athletic events such as a Shamokin Path Fun Run, Cowanshannock Creek Watershed Bike-a-Thon, or Armstrong Trail Mountain Bike Race will raise awareness and visibility of activities and protection efforts in the watershed. Coordination with a particular community festival and existing local groups will promote the event and raise exposure. The event can also serve as a fundraiser for additional recreational or watershed improvement activities.

5. *Obtain easement or public acquisition of the Buttermilk Falls recreation area.* The area has been popular among generations of local residents for passive recrational activities. Since the property is privately owned, obtaining an easement for the area (or acquisition by a public entity) would assist in conservation efforts and assure public access for future generations.

6. *Develop bike pathway through the watershed that connects recreational and natural resources within the watershed and surrounding areas.* Existing and proposed rail-to-trail projects could be connected by a bike pathway through the center of the watershed connecting the mouth of the Cowanshannock Creek and the Armstrong Trail to the Great Shamokin Path along route 85 to the eastern portion of the watershed. On the eastern end, the bike pathway could connect to the proposed bike pathway in Indiana County and serve as a connection to

major features in the watershed and surrounding areas.

7. *Promote Ecotourism.* Ecotourism will increase in the project area as cultural, recreational, and educational opportunities expand. Many of these opportunities will be tied to the rail-to-trail networks along with the environmental educational facilities that are proposed. Additional actions that will help promote ecotourism include:

- *Development of a recreational activity map brochure.* The brochure could highlight important recreational, educational, and cultural resources within the watershed. It would also help promote portions of the watershed as attractions for local visitors and community members alike.

- *Preservation of historical sites.:* Historical properties should be identified and where applicable preserved as destination points for recreators. Within the watershed three historical sites were identified. Preservation and use of these sites would contribute to existing recreational and natural resources in the watershed.

C. Trails

1. *Secure remaining funds for Rails-to-Trails, Margaret to Echo.* At the present time, grant applications have been submitted by the Cowanshannock Creek Watershed Association to obtain the remaining 20% ($12,000) of the $60,000 land acquisition from Kovalchick Salvage, Inc. for the Margaret to Echo trail. Allegheny Energy and Dominion Resources have agreed to contribute some level of funding for the project. Work should continue with this project and when land acquisition funds are achieved, another TEA-21 grant should be pursued for trail construction monies.

2. *Place interpretive signage along the Shamokin Path.* Interpretive signage could be placed at selected locations on the Shamokin Path. This will encourage more individuals to use the trail, promote education about the local environment, and develop an appreciation for nature within those who use the trail.

3. *Extend the Shamokin Path from the Nu Mine sewage plant to West Shamokin Junior/Senior High School.* To obtain a property easement and expand the Shamokin Path to the West Shamokin Junior/Senior High School would be advantageous. This would provide an additional hiking/biking area, plus, it

would provide a natural route to the school. Educators at the high school can utilize the trail for nature walks - art, science, and other classes - or even trail maintenance projects.

4. *Cooperate with the development of the Armstrong Rails-to-Trails project.* This project is in its infant stages and is on-going. Cooperation with rail-trail coordinators should occur with the small portion of the trail that passes through the watershed at Canfield-Holmes Sanctuary.

(6) Improve Watershed Education and Outreach

Community organizations and individual community members of all ages are targeted audiences for environmental education. As noted already, some of the major challenges in the watershed arise from attitudes of local citizens concerning dumping, the value of healthy ecosystems, the protection of natural areas, and the value of clean water. Through education, these attitudes can change. Education and outreach activities are important to the future condition of the watershed.

An abundance of potential environmental education opportunities exists within the watershed for both youth and adults. For example, local schools, e.g. West Shamokin Jr./Sr. High School, Dayton Elementary School, Rural Valley Elementary School, Lenape Vocational-Technical School, Kittanning Senior High School, and Indiana University of Pennsylvania at Kittanning, are communities that may be interested in participating in educational opportunities within the watershed.

The following is a list of activities to improve watershed education and outreach:

A. *Develop and promote use of environmental education facilities.*

- *Obtain funds and construct an Environmental Education Facility at West Shamokin Junior/Senior High School.* The West Shamokin Junior/Senior High School is located alongside a 10 acre National Wetland Inventory (NWI) wetland. This valuable resource can be utilized for environmental education studies for both the students of the junior/senior high school and the community. In addition, various organizations, i.e., scouts, watershed groups, and clubs would benefit from the center. A recent grant application was submitted for development of this environmental education center and was not funded. However other funding opportunities for this project should continue to be sought.

- *Utilize a primitive outdoor classroom at the old Shannock Valley High School.* This facility can be renovated and expanded to be used as a working outdoor classroom. A nature trail can be constructed at this location with interpretive signage posted throughout.

B. *Promote beautification projects at Devil's Washbasin and White Lake and Wetland.* Although beautification projects can take place at any location throughout the watershed, these recreational sites should be targeted. Planting projects can help the health and aesthetics of these sites. Organizations such as the Pennsylvania Forestry, the Western Pennsylvania Conservancy, and the

Cowanshannock Creek Watershed Association can donate or aid in the purchase of trees and flowers to be planted by community groups, schools, or individuals.

C. *Prepare and implement public relations campaign regarding watershed issues.* As part of the continued promotion of the activities in this plan, it is important to utilize the media for educating the general public about the watershed. This plan discusses implementation activities that can be moved forward by numerous organizations and community members. Public relations can assist with moving these activities forward through promotion and education.

D. *Promote Buttermilk Falls, Canfield-Holmes Sanctuary, Devil's Washbasin, White Lake and Wetland, and other areas of interest for education and research.* Educators from public schools, colleges, and universities can take field trips to these area for science and art education. Groups can learn about proper forest management at Canfield-Holmes and natural water quality improvement systems at Devil's Washbasin and at White Lake and Wetland. Various types of research activities, especially evaluation of terrestrial and aquatic flora and fauna where no up-to-date research on the watershed is available, will expand knowledge of the watershed and serve as an educational resource to the community.

Management Recommendations Matrix

Management Issue	Management Recommendation	Responsible Entity	Potential Assistance Sources	Implementation Schedule
A. Local Planning and Zoning				
1. County Comprehensive Plans	Develop/update county comprehensive plans in Armstrong and Indiana Counties that promote protection of key resources and use of conservation zoning.(Armstrong County is currently in initial development stages, Indiana County is seeking funding to update their plans).	Armstrong County Planning Commission, Indiana County Planning Commission, CCWA, citizens, county wide conservation organizations.	State Planning Assistance Program (SPAG), The World Class Communities Program (WCCP), and Small Communities Planning Assistance Program (SCPAP)	2001-2003
2. Model Zoning Ordinances (Refer to Section VII-D/Page 59 and Figure 8)	2A. Develop example zoning and ordinances that are protective of forest resources, agricultural soils, steep slopes, land, riparian, and floodplain resources. These are especially important to municipalities with high projected growth rates. 2B. Update Armstrong County's Subdivision and Development Ordinance to promote cluster development, protect riparian areas, promote on-site septic maintenance, application of stormwater BMPs and protect development of critical areas as identified in the comprehensive plan.	2A. Local municipal officials, conservation organizations 2B. Armstrong County Planning Commission, municipalities	Pennsylvania Department of Community and Economic Development (DCED) and PADCNR Keystone Funds.	2A. 2001+ 2B. 2003-2005
3. Conservation Easements	Secure conservation easements of areas with biological, water resource protection, cultural, and/or recreational importance including large tracts of forested land, riparian areas, and other areas of special value.	CCWA, private landowners, municipalities, conservation organizations	Pennsylvania Department of Community and Economic Development (DCED), PADCNR Keystone Funds, USDA -Forestry Incentives Program, USDA-Wildlife Habitat Incentives Program (WHIP), USDA-Farm Service Agency Programs, Pennsylvania Organization of Watersheds and Rivers (POWR)	2001-2011+
4. Educate municipal officials	Promote and educate municipal officials on need and benefits of local zoning and conservation ordinances.	Municipal officials, county planning agencies, conservation organizations	Pennsylvania Department of Community and Economic Development (DCED)- Land Use Education Program, Armstrong and Indiana County Planning Commission, and Nonpoint Education for Municipal Officials (NEMO)	2001-2005+
B. Water Resources				
1. Promote use of Best Management Practices (BMPs) from agricultural sources	1A. Promote use of agricultural Best Management Practices on cropped lands and areas with concentrated livestock. 1B. Aid farmers in completing nutrient management plans in priority areas. 1C. Promote use of stream bank fencing in priority areas.	County Conservation Districts, NRCS, farmers	1A and 1C. USDA - Environmental Quality Incentives Program (EQIP), USDA - Resource Conservation and Development (RC&D) Program, USDA- Conservation Technical Assistance Program, PA State Conservation Commission - Agriculture Linked Investment Program (AgriLink) 1B. PA State Conservation Commission - Plan Development Incentives Program (PDIP), Pennsylvania Department of Agriculture	1A. 2002+ 1B. 2002+ 1C. 2002+
2. Act 537 updates for Sewage/Septic management	Municipalities with large areas not served by sewage treatment systems should update their Act 537 Sewage Facilities Management Plan to evaluate opportunities and need for treatment plants and/or sewage/septic management ordinances.	Municipalities, Sewage Enforcement Agency, Armstrong and Indiana County Planning Commissions	PennVEST, PADEP- Bureau of Water Quality Protection, US Environmental Protection Agency (EPA) Office of Wastewater - Small Communities Assistance Program	2003+

3. Septic system upgrades and maintenance	3A. Promote proper installation, retrofit, and maintenance of septic systems in areas not currently provided with sewer service through targeted education and outreach. 3B. Identify financial assistance sources to support demonstration projects to install new septic systems on existing properties lacking sewage facilities. 3C. Support research efforts to identify cost effective septic systems in areas with limiting conditions (e.g., highly permeable soils).	PADEP, County Conservation Districts, NRCS Sewage Enforcement Agency, County Planning Commissions, municipalities, and conservation organizations, citizens.	USDA - Rural Development Program, PADEP-Bureau of Water Quality Protection, Small Flows Clearinghouse, League of Women Voters(LWV)-Water Resources Education Network (WREN), EPA	2002-2007+

Management Issue	Management Recommendation	Responsible Entity	Potential Assistance Sources	Implementation Schedule
B. Water Resources (continued)				
4. Stream bank stabilization/ Natural stream design	Implement high priority stream bank stabilization/natural stream design restoration projects identified by the Fluvial Geomorphology Study, as outlined in Figure 9 and described in Appendix F.	PADEP, County Conservation Districts, conservation organizations	PADEP- Stream Improvement Plan, PADEP-Growing Greener Program, PADEP-Stream Releaf Program, PennDOT Stream/wetland mitigation funds, USEPA-Five Star Restoration Program, US Fish and Wildlife Service - Partners for Wildlife, McKenna Foundation, Pittsburgh Foundation, Mellown Foundation, CVI, etc.	2002-2007
5. Riparian buffer enhancement	Encourage stream bank planting activities in riparian areas through education and outreach on benefits and cost sharing programs, especially along areas identified in the FGM Study.	PADEP, county planning agencies, municipalities, local schools, conservation organizations	PADEP- Stream Improvement Plan, USACOE, USGS, USDA Public Law 566 Program, PADEP-Stream Re-leaf, USEPA-Five Star Restoration Program, National Tree Trust, PA Urban and Community Forestry Program, McKenna Foundation, Pittsburgh Foundation, Mellon Foundation, CVI, etc..	2002-2007
6. AMDs Remediation Activities	6A. Identify and implement treatment opportunities at known AMD sites for potential reclamation and development, with current priority on the Medredith 1 and Meredith 2 discharges (AMD-3, AMD-4). 6B. Rehabilitate constructed wetland at White Lake (AMD-11). 6C. Treat declining water quality of AMD fed Trout Nursery (AMD-12).	6A. PADEP, BAMR, Armstrong County Conservation District, Landowners 6B. BAMR 6C. Armstrong County Conservation District, PFBC, Arrowhead Chapter of Trout Unlimited, Shannock Valley Sportsmen's Club, CCWA	6A. PADEP, PADCNR: Keystone Funds, and EPA. 6B. PADEP 6C. PADEP- Growing Greener Program, PADCNR, PFBC	6A. 2002-2004 6B. Current 6C. 2002-2004
7. Water quality monitoring	7A. Develop a volunteer group headed by the Cowanshannock Creek Watershed Association to participate in an ongoing water quality monitoring program (e.g., water sampling, macroinvertabrates) for the entire watershed. One ideas is to hold a family stream day to have families adopt a monitoring location to collect water quality data in an area near them throughout the year. 7B. Schedule and complete water quality monitoring and assessment of the Cowanshannock Watershed under the 305(b) program.	7A.. Local schools, conservation organizations, community members, municipalities, CCWA 7B. PADEP	7A. CCWA, Alliance for Aquatic Resource Monitoring (ALARM), Canaan Valley Institute (CVI), Environmental Alliance for Senior Involvement (EASI), PADEP- Citizen's Volunteer Monitoring Program, Isaac Walton League (IWL)- Save Our Streams Program, League of Women Voters (LWV)- Citizen Education Fund, Western Pennsylvania Conservancy, conservation districts, DCNR 7B. PADEP- 305(b) Water Quality Assessment Program	7A. 2002+ 7B. 2002-2005
8. Ground water survey and protection program	Assess ground water quality and supply trends within the watershed. Based on the study, identify opportunities and actions for protecting and ground water resources for community members.	Municipalities, PADEP, County Conservation Districts, conservation organizations.	USEPA, Groundwater Foundation- Groundwater Guardians Program, PADEP-Well-head Protection Program, PA Rural Water Association	2002+
9. Stormwater BMPs	Encourage use of stormwater Best Management Practices (BMPs) through development of incentive programs or ordinances, especially in municipalities with high projected growth. Utilize technical and financial assistance provided for stormwater management planning activities under the Pennsylvania Stormwater Management Act (Act 167).	Municipalities, County Conservation Districts, County Planning Commissions	PADEP- Stormwater Management Program (Act 167), Center for Watershed Protection	2002+
10. Sedimentation from Dirt and Gravel Roads	Protect waterways from sediment loadings carried from dirt and gravel roads with funding support from section 9106 PA Vehicle Dirt and Gravel Road Maintenance Program.	Municipalities, County Conservation Districts, conservation organizations	PA Dirt and Gravel Road Program- Armstrong County.	2002+
11. Farmland Protection	Develop a farmland preservation program by inventorying watershed farmland, prime soils, farmland of statewide importance, 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, county conservation districts, local municipalities, and conservation organizations.	US Department of Agriculture (USDA) Public Law 566 Program, PADEP, PADCNR: Keystone Funds, and county conservation districts.	2003+

Management Issue	Management Recommendation	Responsible Entity	Potential Assistance Sources	Implementation Schedule
C. Biological Resources				
1. Forest management	Encourage forestry techniques that involve conservation principles for future timbering activities in the watershed.	Private landowners, County Conservation Districts, CCWA, conservation organizations	Pennsylvania Bureau of Forestry: Service Forester Program, Pennsylvania Forestry Association, Association of Consulting Foresters, Penn State Agriculture Extension Service	2002+
2. Vegetation and aquatic inventory	2A. Complete a vegetation inventory, aquatic survey and/or fisheries evaluation of important biological areas in the watershed (e.g., Buttermilk Falls) by holding a Bio-blitz day where community members, volunteers and students can participate in collecting inventory data. 2B. Encourage and coordinate with universities and local schools to conduct research and inventory projects within the watershed.	2A. CCWA, Pennsylvania Fish and Boat Commission (PFBC), PADEP, US Geological Survey (USGS), US Army Corps of Engineers (Corps), Western Pennsylvania Conservancy, DCNR, regional colleges/universities, and local conservation organizations. 2B. CCWA, regional colleges/universities, and local schools.	2A PADCNR: Keystone Funds, Fish American Foundation. 2B. Not Applicable	2A. 2002 2B. 2003+
3. Migratory Bird Count	Identify and coordinate with environmental groups in the area (e.g., Audubon Society, Western Pennsylvania Conservancy) with expertise and interest in tracking migratory bird population in the area.	Local conservation organizations.	Not Applicable	2003+
4. Encourage development of a Natural Heritage Inventory for Armstrong and Indiana Counties	Encourage the Western Pennsylvania Conservancy to complete Natural Heritage Inventory that identifies important biological resources county-wide for Armstrong and Indiana Counties.	Western Pennsylvania Conservancy, local conservation organizations, residents.	Western Pennsylvania Conservancy	2001
5. Identify and Protect Important Habitats	Establish Natural and Protected Areas in watershed based on biological resource inventories to be conducted.	County 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.	2002-2007
D. Waste Management				
1. Zoning and Ordinances	Counties and municipalities, through zoning and ordinances, can control illegal dumping at the local level.	Counties, municipalities	PADEP- Recycling Program	2002+
2. Hold Annual Community Spring Clean-up and Recycling Activities for Priority Waste Sites	2A. Identify and prioritize sites for clean-up. 2B. Hold annual community spring clean-up. Coordinate with municipalities to hold clean up activities that encourage residents to properly dispose of and recycle waste materials on private properties and support clean-up of priority sites.	County planning commission, county recycling centers, county solid waste authority municipalities, local citizens, conservation organizations, scout troops, and schools	Pennsylvania CleanWays, Ohio River Sweep Program, PA DEP, PA DCNR: Keystone Funds, US EPA, Armstrong County	2A. 2002+ 2B. annually
3. Implement Neighborhood Watch Program	A Neighborhood Watch Program can be implemented within each community to report violators and encourage neighbors to take responsible actions for disposing waste.	Local citizens, municipalities, conservation organizations	Not applicable	2003-2005
4. Education and Outreach on Waste Regulations, Enforcement, and Recycling the	Educating the public on waste regulations, enforcement procedures, and recycling options and benefits. Education and outreach will help foster awareness and stimulate solutions.	County recycling centers, county solid waste authority, local citizens, conservation organizations, municipalities, county planning commissions, county conservation districts	PA CleanWays, PA DEP- Recycling Program	2002+
5. Re-establish a Pennsylvania Cleanways Chapter in Armstrong County	Contact the Pennsylvania Cleanways main office in Greensburg, Westmoreland County (724-836-4121). Follow through with pre-chapter requirements for the establishment of a county chapter.	Local citizens, conservation organizations, municipalities, county planning commissions, county conservation districts	PA Cleanways	2002+

Management Issue	Management Recommendation	Responsible Entity	Potential Assistance Sources	Implementation Schedule
E. Recreational and Cultural Resources				
1. Promote and Enhance Existing Recreational Sites	1A. Repair sediment build-up rendering the PFBC boat launch near the Bernard C. Snyder Picnic Area unusable. 1B. Promote passive recreational activities (hunting, fishing, picnicking, nature observing) at Devil's Washbasin through aesthetic enhancements to attract individuals and organizations to the area. 1C. Improve water quality at White Lake and Wetland so that it can sustain aquatic life and thus be promoted as a fishing/recreational area (see water quality section).	Pennsylvania Fish and Boat Commission (PFBC), CCWA, County Conservation District, PADEP	1A. PFBC, PADCNR- Keystone Funds 1B. PADCNR- Keystone Funds 1C. PADEP- BAMR	1A. 2002+ 1B. 2002-2005 1C. 2002 Current
2. Expand and enhance Rails-to-Trails Network	2A. Obtain remaining funds for the Great Shamokin Path Extension rails to trails project on abandoned rail lines extending from Margaret to Echo. 2B. Extend the Shamokin Trail from White Lake and Wetlands to the West Shamokin High School and enhance the trail by placing interpretive signage along its route. 2C. Explore opportunities to enhance and connect the Armstrong rails-to-trails project with activities in the Cowanshannock Creek watershed.	CCWA, county planning commissions, county conservation districts, other conservation organizations	2A. Allegheny Energy, Dominion Resources 2B/2C. PA DCNR- Keystone Funds, TEA-21, Rails to Trails Conservancy, County Planning Commissions, Armstrong Rails to Trails Association, PADEP Environmental Education Grant Program	2A. 2001 Current 2B. 2002-2005 2C. 2002+
3. Encourage Prevention of Littering, Graffiti, and Vandalism at Recreational Areas	Possible management strategies include: forming litter and graffiti clean-up teams; placing trash containers and durable signs promoting a clean, healthy environment; and monitoring heavily used areas.	CCWA, local citizens, students at local schools, individuals seeking community service work	Not applicable	2002-2005
4. Prevent ATV Destruction at Recreational Areas	Possible management strategies include: restricting vehicle access using signs and posts; encouraging visitors to report sightings of all-terrain vehicle use; coordinating volunteers to monitor areas.	Local citizens, CCWA	Not applicable	2002-2005
5. Obtain Easement for Buttermilk Falls	Obtaining an easement for Buttermilk Falls will protect the area for public recreation and conservation for future generations.	Cowanshannock Creek Watershed Association, private land owner of property, conservation organizations	PADEP, PADCNR: Keystone Funds	2005+
6. Recreational Watershed Events coordinated with Community Festivals	Hold recreational/athletic events (e. g. watershed bike-a-thon, mountain-bike race along the Armstrong Trail, Shamokin Trail Fun Run) during annual community festivals such as the Rural Valley Festival in coordination with other local groups. Event fees could be used toward maintaining trails and improving the watershed.	Cowanshannock Creek Watershed Association, Armstrong Rails-to-Trails Association, municipalities, local biking clubs and running clubs, schools, etc.	Not applicable	2002+ annual
7. Bikeway/Trail Feasibility Study/Plan	Develop a bikeway/trail along Cowanshannock Creek. This pathway could connect with bikeway plans being developed for Indiana County.	Armstrong County Planning Commission, Indiana County Planning Commission, Cowanshannock Creek Watershed Association, conservation organizations	PADCNR: Keystone Funds and NPS - Rivers, Trails, and Conservation Assistance program.	2002+ Include in County Comprehensive Plans
8. Land Acquisition and conservation easements for Conservation	Purchase or obtain easements for properties (e.g., Important Habitats, Natural Heritage Areas, Critical Areas, and Potential Remediation Sites) for conservation, preservation and/or remediation opportunities.	Allegheny Land Trust, Western Pennsylvania Conservancy, and local conservation groups.	PADCNR: Keystone Funds and NPS - Rivers, Trails, and Conservation Assistance program. Appendix 1, 4, and 5.	No Final Implementation Date. This can be an on going activity.

9. Promote EcoTourism	9A.	Develop recreational ("passive") activity map and brochure that would assist promoting the ecotourism in the watershed and help create a vision for recreation and cultural resource protection in the future.	9A.	Local Chamber of Commerce, municipal officials, small business/facility operators, Community athletic associations, local chamber of commerce, Three Rivers Paddlers Club, and local sportmens clubs.	9A.	Local Chamber of Commerce, Municipalities, small business, PADCNR: Keystone Funds, and community and regional foundations. Community and Regional Foundations, NPS - Rivers, Trails, and Conservation Assistance program, and PADCNR: Keystone Funds.	9A. 2002+
	9B.	Identify and preserve historical properties so they are destination points for recreators.	9B.	Historic property owner, community historical societies, local chamber of commerce.	9B.	PADCNR: Keystone Funds, PennDOT/PTC cultural resource mitigation funds, community and regional foundations.	9B. 2003+

Management Issue	Management Recommendation	Responsible Entity	Potential Assistance Sources	Implementation Schedule
F. Educational Resources				
1. Obtain Funds for Environmental Education Facilities	The proximity of the West Shamokin Junior/Senior High School to the Cowanshannock Creek makes the school an ideal location for an environmental education center. Additionally, the outdoor classroom at the Old Shannock Valley High School can be renovated and expanded to be used as a working outdoor classroom.	Department of Environmental Protection, Armstrong County School District, West Shamokin Junior/Senior High School	PADCNR: Keystone Funds, PADEP - Growing Greener Program, PA DEP- Environmental Education Grant Program, CVI, and LWV - Citizen Education Fund	2001-2003
2. Promote beautification projects	Devil's Washbasin and White Lake and Wetland would be ideal locations for beautification projects to take place. Tree and flower planting projects can help the health and aesthetics of these sites.	Pennsylvania Forestry, Western Pennsylvania Conservancy, and Cowanshannock Creek Watershed Association	PA DEP Environmental Education Grant program, PADCNR: Keystone Funds, Pennsylvania Department of Education (PADE), Environmental Education Program, LWV - Citizen Education Fund, and school district funded.	2001-2006+
3. Public Relations	Provide year round continuing education to watershed stakeholders through the use of various forms of the media. (e.g., local and regional papers, magazines, and regular, cable, and satellite television providers.)	Local school districts, local TV stations and newspaper, local communities, and conservation groups.	GreenWorksChannel.org, Pennsylvania Center for Environmental Education, school districts, county conservation districts, conservation organizations, and the newspapers (e.g., Leader Times)	2001+ ongoing
4. Promote various recreational sites for educational purposes	Buttermilk Falls, Canfield-Holmes Sanctuary, Devil's Washbasin, and White Lake and Wetland are locations that can be used by a variety of classes or individuals for educational purposes.	Cowanshannock Creek Watershed Association, other conservation organizations, conservation district, school district, colleges, and universities	Not applicable.	2002+ ongoing

Management Issue	Management Recommendation	Responsible Entity	Potential Assistance Sources	Implementation Schedule
ADDITIONAL RECOMMENDATIONS				

GLOSSARY

Abandoned Mine Drainage (AMD): Water discharges contaminated by high metal loadings and/or acidity caused by chemical reactions taking place when mined areas are exposed to air and water.

Aquatic Biological System: The community of life including plants, animals, fungi, and microorganisms occupying aquatic habitat.

Atmospheric Deposition: The depositing of airborne contaminants on water bodies, structures, and land.

Attainment: The act of reaching a goal or threshold. Attainment of a particular standard is met when the level of air pollution in a representative sample meets health-based standards for that pollutant.

Beneficial Use: Placement or utilization of waste material for some productive purpose as opposed to being disposed of in a landfill.

Best Management Practices: A series of practices and management techniques designed to control point and non-point pollution.

Brownfield: Property that has been taken out of productive use as a result of actual or perceived risks from environmental damage.

Conservation Easement: A legal agreement between a landowner and a land trust where landowners voluntarily restrict the type and amount of development that may take place on their property without giving up ownership of the land.

Environmental Justice: Ensuring equal protection under all environmental statutes and regulations for all citizens without regard to race, ethnicity, and/or socioeconomic status.

Eutrophication: The natural and artificial addition of nitrogen and phosphorous to bodies of water, often to the extent that dissolved oxygen is decreased, as is the capacity of the water to support animal life.

Fossil Fuel: Natural gas, petroleum, coal, and any form of solid, liquid, or gaseous fuel derived from such materials for the purpose of creating useful heat or energy.

Fluvial GeoMorphology: Pertaining to how running waters shape land formation.

Geographic Information System (GIS): A computer system for capturing, storing, checking, integrating, manipulating, analyzing and displaying data related to positions on the Earth's surface.

Greenfield: Land that has not been previously used for industrial purposes.

Greenway: 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.

Ground Water: Subsurface water that fills available openings in rock, aquifers, or soil materials to the extent that they are considered water saturated.

Habitat: The native environment or specific surroundings where living things naturally grow or live. These surroundings include physical factors such as temperature, moisture, and light together with biological factors such as the presence of food or predator organisms.

Hazardous Waste: Is any solid, liquid, or contained gaseous material that you no longer use, and either recycle, throw away, or store until you have enough to treat or dispose of.

Holistic: Relating to the study of complete living systems, rather than their component parts in isolation.

Inter-Municipal Framework: This is a process that can be utilized by municipal governments and local organizations to work together in an attempt to improve local environmental, infrastructure, educational, and cultural resource issues.

Multiple Non-Point Pollution Sources: This category of water quality pollution entails a number of water pollution types (i.e., abandoned mine drainage, sewage, nutrient enrichment, urban impacted, etc.).

National Priorities List (NPL): Is EPA's database of uncontrolled or abandoned hazardous waste sites identified for priority remediation under the Superfund program.

Natural Diversity: Plants, animals, fungi, and microorganisms that make up the web of life and that work together to maintain the vital processes and products that sustain all life on Earth.

Natural Resource: A material source of wealth, such as timber, fresh water, or a mineral deposit, that occurs in a natural state. Natural resources are considered nonrenewable when they do not naturally replenish themselves within the limits of human time or renewable when they are more or less continuously replenished in the course of natural events within the limits of human time.

Non-Point Source: Causes of water pollution that are not associated with point (fixed) sources. Non-point sources include runoff from agricultural, urban, construction, and mining sites, as well as septic systems and landfills.

Nutrient Enrichment: Nutrient enrichment is 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 enriched streams can lead to eutrophic conditions.

Particulate Matter: Any airborne material with a diameter smaller than 100 micrometers.

Pennsylvania Natural Diversity Index (PNDI): This is a list of species of special concern (rare, threatened, and endangered) that are tracked by the state and federal natural resource agencies as per the Endangered Species Act.

Point Source: Stationary location where pollutants are discharged, usually from industry or municipal sewage facilities.

Remining: The process of extracting additional minerals from a previously mined site.

Restoration: The act or process of bringing something back to a previous condition or position. For example, the establishment of natural land contours and vegetative cover following extensive degradation of the environment caused by activities such as Surface Mining. Under this condition, the term is interchangeably with Reclamation.

Riparian Buffer: The land that borders and interacts with river, stream , lake, or coast.

Runoff: Water that is carried off an area by streams and rivers after having fallen as precipitation: the water itself: also, water that runs straight off the ground without first soaking into it.

Sewage: Sewage is composed of wastewater, feces, and particulate matter.

Sprawl: A spreading, low-density, automobile dependent development pattern of housing, shopping centers, and business parks that wastes land needlessly.

Stewardship: The careful and responsible management of something entrusted in one's care.

Stormwater Management: Involves the control of water that runs off the surface of the land from rain, melting ice, or snow.

Sustainable Development: To meet the needs of the present without compromising the ability of future generations to meet their own needs.

Sustainable Yield: The withdrawal or use of a resource at such a rate that is consistent with its natural growth rate.

Transfer of Development Rights (TDR): A land use zoning technique used to preserve public resources, such as open space, farmland, historical landmarks, and environmentally sensitive lands. A person who wants to preserve land can sell the development rights to a developer who, by purchasing these rights will then be permitted to develop above the density currently permitted in another area.

Transport: To carry particles or dissolved substances, in this context by air, from one geographic location to another.

Urban Impacted (Habitat Modification): Urban impacted is a designation given to streams that are impacted due to one or more water quality parameters that alone or together impact the habitat, stream structure, and the environment for benthic organisms and fish.

Watershed: Land area that drains into a stream, river, or lake.

Wetland: In order for an area to be considered a wetland, the area must exhibit wetland hydrology (the area must show the presence of water), a dominance of hydrophytic (water-loving) vegetation, and hydrophytic (wet/moist) soils.

Zoning Ordinance: Zoning ordinances manage development by determining the type of uses (i.e., residential, commercial, industrial, etc.) that will be allowed in any given area within a municipality.

References:

American Fisheries Society, 1997,
Pennsylvania 21st Environment Commission, 1998, and
The Environmental Institute, 1991

LIST OF ACRONYMS

ALD	Anoxic Limestone Drains
AMD	Abandoned Mine Drainage
AML	Abandoned Mine Land
BDA	Biological Diversity Area
BMP	Best Management Practice
CCWA	Cowanshannock Creek Watershed Association
CEG	Conditionally Exempt Generator
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CVI	Canaan Valley Institute
DA	Dedicated Area
DOT	Department of Transportation
EASI	Citizens Volunteer Monitoring Program
EP	Extraction Procedure
EPA	U.S. Environmental Protection Agency
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
ML	Managed Land
MCL	Maximum Concentration Limit
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
OHA	Other Heritage Area
OLC	Open Limestone Channel
PADCED	Pennsylvania Department of Community and Economic Development
PADCNR	Pennsylvania Department of Conservation ans Natural Resources
PADE	Pennsylvania Department of Education
PADEP	Pennsylvania Department of Environmental Protection
PADER	Pennsylvania Department of Environmental Resources
PCB	Polychlorinated biphenyls
PennDOT	Pennsylvania Department of Transportation

LIST OF ACRONYMS (continued)

PFBC	Pennsylvania Fish & Boat Commission
PGC	Pennsylvania Game Commission
PHMC	Pennsylvania Historic and Museum Commission
PNDI	Pennsylvania Natural Diversity Inventory
POWR	Pennsylvania Organization of Watersheds and Rivers
PRD	Planned Residential Development
PTC	Pennsylvania Turnpike Commission
RCP	Rivers Conservation Plan
RCRA	Resource Conservation Recovery Act
SEA	Armstrong County Sewage Enforcement Agency
SAPS	Successive Alkalinity Producing System
SGL	State Game Land
SPC	Southwestern Pennsylvania Commission
SPL	State Priority List
SQG	Small Quantity Generator
SWRC	Stroud Water Research Center
TDR	Transferable Development Rights
TEA	Transportation Equity Act
TIP	Transportation Improvement Plan
TMDL	Total Maximum Daily Load
USACOE	United States Army Corps of Engineers
USDOE	United States Department of Energy
USDA	United States Department of Agriculture
USGS	United States Geological Survey
WPCAMR	Western Pennsylvania Coalition for Abandoned Mine Reclamation
WPWPP	Western Pennsylvania Watershed Protection Program

LIST OF REFERENCES

A Reference Guide: Your Septic System for Homeowners. 1990. Published by the Northern Virginia District Commission with assistance from National Small Flows Clearinghouse, Northern Virginia Health Departments, Virginia Water Control Board assisting.

Allen, J. David. 1999. *Stream Ecology: Structure and Function of Running Water*. Chapman and Hall. New York, New York.

Allegheny Land Trust. 1995. Pennsylvania Land Conservation Handbook. Edited by Andrew M. Loza. Pittsburgh, PA.

American Fisheries Society. 1997. Watershed Restoration: Principles and Practices. Jack E. Williams, Christopher A. Wood, and Michael P. Dombeck, Editors. Bethesda, MD.

Arendt, R. 1994. *Rural by Design*. American Planning Association Press.

Armstrong Conservation District and the Indiana County Conservation District. 1994. *Assessment of Nonpoint Source Pollution for the Crooked Creek and Cowanshannock Creek Watershed in Southwestern Pennsylvania*.

Armstrong Conservation District. 2001. Correspondence with Dave Rupert general conditions and educational resources in the watershed.

Armstrong Conservation District. 2001. Correspondence with David Beale regarding local geology, clay mining, forestry resources and sewage management in Armstrong County.

Armstrong Conservation District. 2001. Correspondence with Tom Clark and Sharon Cockroft regarding the dirt and gravel road program in Armstrong County.

Armstrong County Conservancy Trust, Armstrong County Conservation District, Cowanshannock Creek Watershed Association, Pennsylvania Department of Environmental Resources, and United States Soil Conservation Service. *1993. Cowanshannock Creek: An Alternative Penalty Assessment Project Report*.

Armstrong County, Pennsylvania Subdivision and Land Development Ordinance. 1992. Armstrong County Commissioners and the Armstrong County Planning Commission.

Armstrong County Planning Commission. 2000. *2000 Long Range Economic Development Program*.

Armstrong County Planning Commission. 2001. Correspondence with Carmen Johnson regarding development, recreational planning, socio-economic conditions, sewage planning, and recycling in Armstrong County.

Armstrong County Sewage Enforcement Agency (SEA). 2001. Correspondence with Carl Rotman regarding septic system management and enforcement in Armstrong County.

Armstrong County Tourist Bureau. 1993. *Discover the Trails in Armstrong County*.

Beale, David E., 1994. Forest Stewardship Plan, Canfield Holmes Sanctuary. David E. Beale, Consulting Forester, Elderton, PA.

Berg, T.M., and C.M. Dodge, 1981. *Atlas of Preliminary Geologic Quadrangle Maps of Pennsylvania.* Commonwealth of Pennsylvania, Department of Environmental Resources, Bureau of Topographic and Geologic Survey. Pennsylvania Geological Survey, Fourth Series, Harrisburg.

Berg, T.M., W.E. Edmunds, A.R. Gyer, A.D. Glover, D.M. Hoskins, D.B. MacLachlan, S.I. Root, W.D. Sevon, and A.A. Socolow, 1980. Geologic Map of Pennsylvania. Department of Environmental Resources, Commonwealth of Pennsylvania, Harrisburg.

Blackenship, Karl. 1999. *Bay Forests Losing Ground to Fragmentation/Recreation, Habitat Value Lost as Woods Get Smaller.* Alliance for the Chesapeake Bay - Bay Journal, Volume 8 - Number 6.

Bureau of Abandoned Mine Reclamation. 2001. Correspondence with Max Sheeler regarding treatment system at White Lake and Wetlands.

Bureau of Abandoned Mine Reclamation. 2001. Correspondence with Pam Milavec and Brian Bradley regarding completed and planned reclamation within the Cowanshannock Creek Watershed.

Bureau of Abandoned Mine Reclamation. 2001. Abandoned Mine Land Features GIS Database.

Bureau of Abandoned Mine Reclamation. 2001. Bond Forfeiture Projects GIS Database.

Carson Engineers. 1972. *Cowanshannock Creek Mine Drainage Pollution Abatement Project. Operation Scarlift.* Commonwealth of Pennsylvania, Harrisburg, PA.

Center for Watershed Protection. 2001. Various Model Ordinances and Conservation Guidelines available at http.www.cwp.org. Ellicott City, MD.

CH2MHill. 1998. Pennsylvania Handbook of Best Management Practices for Developing Areas. Pennsylvania Association of Conservation Districts, Keystone Chapter, Soil and Water Conservation Society, Pennsylvania Department of Environmental Protection, and the Natural Resources Conservation Service

Cowanshannock Creek Watershed Association, 2001. Interviews with Association Members, Kittanning, PA.

Donehoo, G.P. 1995. *Indian Villages and Place Names in Pennsylvania.* Gateway Press, Baltimore.

Dunne, Thomas and Luna B. Leopold. 1978. *Water in Environmental Planning.* W. H. Freeman and Company, New York.

Environmental Institute. 1991. Conducting Environmental Evaluations: Assessment and Audits. Atlanta, GA.

Hawley, Dennis. 2001. *Benthic Macroinvertebrates as Stream Quality Indicators of Three Streams in the Cowanshannock Creek Watershed.* Advanced Entomology, Indiana University of Pennsylvania.

Indiana County Planning Commission. 2001. Correspondence with Brett Barneck and Lee Anne Cheney regarding development, recreational planning and sewage management in Indiana County.

Indiana County Conservation District. 2001. Correspondence with Jim Resh regarding dirt and gravel road program in Indiana County portion of the Cowanshannock Creek Watershed.

Kinsley, M. J. and L. H. Lovins. 1998. *Paying for Growth, Prospering from Development.* Rocky Mountain Institute. pp. 1-9.

Labaree, J. M. 1992. *How Greenways Work: A Handbook on Ecology. 2nd Edition.* Ipswich, MA: National Park Service and Atlantic Center for the Environment.

Land Use in Pennsylvania: Practices and Tools- An Inventory. 2000. Prepared by Governor's Center for Local Government Services with assistance from Governor's Sound Land Use Committee. Produced by McCormick, Taylor & Associates, Inc.

McHarg, I. 1969. *Design With Nature*, The Natural History Press.

National Park Service, 1990. *Economic Impacts on Protecting Rivers, Trails, and Greenway Corridors.*

Natural Lands Trust, Inc., November 1997. *Growing Greener: Putting Conservation Into Local Codes.* Media, PA.

Nichols, B. 1876. *Atlas of Armstrong County, Pennsylvania.* Pomeroy, Whitman & Co., Philadelphia.

Novak, J. M. and W. H. Woodwell, Jr., 1999. A Watershed Primer for Pennsylvania: A Collection of Essays on Watershed Issues. Pennsylvania Department of Environmental Protection, Pennsylvania Environmental Council, and the Allegheny Watershed Network.

Pennsylvania Clean Ways. 2001. Background information on the program found at www.pacleanways.org.

Pennsylvania Code, Title 25. Environmental Resources, Chapter 93. Water Quality Standards, Commonwealth of Pennsylvania, 1998.

Pennsylvania Conservation Partnership. 1999. *A Conservation Catalog: Practices for the Conservation of Pennsylvania's Natural Resources.*

Pennsylvania Department of Conservation and Natural Resources (DCNR). 2000. *Limestone and Dolomite Distribution in Pennsylvania.* Prepared by the Bureau of Topographic and Geologic Survey.

Pennsylvania Department of Conservation and Natural Resources (DCNR). 2001. Pennsylvania Natural Diversity Inventory – Correspondence for Species of Special Concern. Harrisburg, PA.

Pennsylvania Department of Conservation and Natural Resources - Forestry, 2001. E-mail correspondence from Gregory Rearick, Armstrong County.

Pennsylvania Department of Conservation and Natural Resources (DCNR). *Working Together to Fight Littering and Illegal Dumping: A guide to working with enforcement agencies in Pennsylvania.*

Pennsylvania Department of Environmental Protection. January 1997. Bureau of Watershed Conservation, Division of Water Use Planning. Fact Sheet – Stormwater Management in Pennsylvania.

Pennsylvania Department of Environmental Protection. 2001. Correspondence with Thomas Mccaffrey and Eugene Dutko regarding public drinking water wells and ground water quality in the Cowanshannock Watershed.

Pennsylvania Department of Environmental Protection. 2001. *2000 Annual Report: Pennsylvania's Non-point Source (NPS) Management Program.* Bureau of Watershed Conservation, Division of Watershed Support, Non-point Source Management Section. Harrisburg, PA.

Pennsylvania Department of Environmental Protection. 2001. *Pennsylvania Landfill List.* http://www.dep.state.pa.us/dep/deputate/airwaste/wm/mrw/Docs/Landfill_list.htm

Pennsylvania Department of Environmental Protection. *2000. 303(d) Part A List of Streams and Rivers, State Water Plans 14 to 17E.*http://www.dep.state.pa.us/dep/deputate/watermgt/wqp/wqstandards/303_water00_1A11.htm.

Pennsylvania Department of Environmental Protection, Bureau of Water Quality Management. 2001. Correspondance regarding completed or planned assessment for Cowanshannock Creek Watershed.

Pennsylvania Department of Environmental Protection, Bureau of Water Quality Management. *May 2001. Direct and Indirect Dischargers List to Cowanshannock Creek (Watershed17 E).*

Pennsylvania Department of Environmental Protection, Greensburg District Mining Office. 2001. Correspondence with Bob King regarding mining activities within Cowanshannock Creek Watershed.

Pennsylvania Department of Environmental Protection, Bureau of Land Recycling and Waste Management. 2001. http://www.dep.state.pa.us/dep/deputate/airwaste/wm/default.htm

Pennsylvania Department of Environmental Resources (PDER), Bureau of Forestry. *State Forest Natural and Wild Areas in Pennsylvania.* 1979.

Pennsylvania Department of Environmental Resources (PDER). *Pennsylvania Gazetteer of Streams – Part II, Water Resources Bulletin, Bulletin #16.* 1984.

Pennsylvania Department of Transportation (PennDOT). May 2001. Correspondence with Tom

Baltz regarding S.R. 422 Kittanning Bypass.

Pennsylvania Department of Transportation (PennDOT). 1998. The Transportation Project Development Process – Agricultural Resource Handbook Volume I, Publication No. 324. Harrisburg, Pennsylvania.

Pennsylvania Fish and Boat Commission (PFBC), 2001. Correspondence for Species of Special Concern. Bellefonte, PA.

Pennsylvania Fish and Boat Commission (PFBC), 1988. *Species Occurrences in the Allegheny River*. Pennsylvania Fish and Boat Commission. Somerset, PA.

Pennsylvania Game Commission (PGC), 2001. Correspondence for Species of Special Concern. Harrisburg, PA.

Pennsylvania Game Commission (PGC), 2001. Wildlife Habitat Tour with Larry Delaney. Kittanning, PA.

Pennsylvania Greenways Partnership. 1998. *Creating Connections, The Pennsylvania Greenways and Trails How-to- Manual*.

Pennsylvania Historical and Museum Commission(PHMC). 2001. National Register of Historic Places.

Pennsylvania Infrastructure Investment Authority (PennVest). 1997. Water, Sewer, and Stormwater – Utility's Guide to Financial and Technical Assistance Programs. Commonwealth of Pennsylvania. Harrisburg, PA.

Pennsylvania Municipal Planning Code Act of 1968 (P.L. 805, No. 247 as enacted and amended, 13th edition 1996).

Pennsylvanians Speak: Sound Land Use Forums Report. 2000. Prepared by Governor's Center for Local Government Services with assistance from Governor's Sound Land Use Committee. Produced by McCormick, Taylor & Associates, Inc.

Pennsylvania State Data Center. 1997. 1997 Pennsylvania County Data Book: Armstrong County. Penn State University. Harrisburg, PA.

Pennsylvania State Data Center. 2001. Muncipal Socio-economic Profiles for South Mahoning and West Mahoning Townships, Indiana County. Based on 1990 U.S. Census Data. http://www.pasdc.hbg.psu.edu/pasdc/mcd_profiles/c063.

Riparian Buffer Model Ordinance, Pennsylvania Department of Community and Economic Development. 1999.

Skelly and Loy, Inc. November 2001. *Cowanshannock Creek Watershed Fluvial Geomorphology Study, Draft Report*. Prepared for the Cowanshannock Creek Watershed Association with funding support from PADEP Growing Greener Grant Program.

Soil Survey of Armstrong County, Pennsylvania. 1977. United States Department of Agriculture, Soil Conservation Service, in cooperation with the Pennsylvania State University, College of Agriculture, the Pennsylvania Department of Environmental Resources, and the State Conservation Commission.

Soil Survey of Indiana County, Pennsylvania. 1991. United States Department of Agriculture, Soil Conservation Service, in cooperation with the Pennsylvania State University, College of Agriculture, the Pennsylvania Department of Environmental Resources, and the State Conservation Commission.

Southwestern Pennsylvania Commission. 2000. Southwestern Pennsylvania Commission's Long Range Forecast for Municipalities of Armstrong and Indiana Counties.

Southwestern Pennsylvania Commission. 2001. Geographic Information System (GIS) Data Library. Pittsburgh, PA.

U.S. Census Burea. 2000. Census 2000 Population Data for Armstrong and Indiana Counties, PA.

U.S. Census Bureau. 2001. Pennsylvania State Census Data. http://quickfacts.census.gov/qfd/states/42000.html

U.S. Department of Agriculture, Natural Resources Conservation Service. December 1998. Stream Visual Assessment Protocol. National Water and Climate Center Technical Note 99-1.

U.S. Department of Agriculture, Natural Resources Conservation Services, 2001. Correspondence with John Bohonak regarding acid mine discharges and general condition of the watershed.

U.S. Environmental Protection Agency, Office of Water. 2001. *Proposed Regulations to Address Water Pollution from Concentrated Animal Feeding Operations.*

U.S. Environmental Protection Agency, CERCLIS Hazardous Waste Sites. 2001. http://www.epa.gov/superfund/sites/cursites/

U.S. Environmental Protection Agency, Region III. 2001. Resource Conservation and Recovery Act (RCRA) Handler and Compliance Reports Database, Pittsburgh, PA

U.S. Environmental Protection Agency, Region III. 2001. Emergency Response Notification System (ERNS) Database, Pittsburgh, PA

U.S. Environmental Protection Agency. 2001. Hazardous Sites Clean-up Program. http://www.dep.state.pa.us/dep/deputate/airwaste/wm/hscp/hscahome.htm

U.S. Environmental Protection Agency. 2000. Draft Coal Remining Best Management Paractices Guidance Manual. Office of Water, Office of Science and Technology, and Engineering and Analysis Division. Washington, DC. pp. 21-27.

U. S. Geological Survey (Department of the Interior), 1968 - 1993. & .5 Minute Series (Topographic) Maps of the Cowanshannock Creek watershed (Kittanning, Mosgrove, Rural Valley, and Plumville).

Wallace, P. A. W. 1987. Indian Paths of Pennsylvania, 3rd Printing. Commonwealth of Pennsylvania, Pennsylvania Historical and Museum Commission, Harrisburg, PA. p. 32.

Westmoreland Conservation District. 2001. *Nutrient Management - Defining CAO's, AFO's, & CAFO's.* Mr. Dan Griffith. Greensburg, PA.

Woods, A. J., J. M. Omernik, and D. D. Brown. 1999. Level III and IV Ecoregions of EPA Region 3 (Map Poster). U. S. EPA, Philadelphia, PA.

Sources of Additional Reading:

A Guide for Land Preservation. Greater Grand Rapids Home Builders Association. 1996.

Arendt, R. 1994. *Rural By Design.* American Planning Association Press.

Community-Economy-Environment: A Citizen's Guide to Achieving a Healthy Community, Economy, and Environment. Center for Compatible Economic Development. 1996.

Environmental Resources Act of 1999. (P.L. 949, No. 68).

Michigan's Non-Point Source News, Issue #4, Fall 1997. Article 1. *Going B-A-N-A-N-A-S About Development.* Judy Barnes and Article 2. *Land Protection and Conservation – Minded Development: Tools for Growth in Northern Michigan.* Greg Reisig. Fen's Rim Publication.

Pennsylvania Planner. April/May 1997. Union County Hosts Sustainable Community Workshop: MPC Basics – Zoning Responsibilities, Fred Wilder.

New Legislative Rulings on Pennsylvania Smart Growth.

Governor's Sound Land Use Advisory Committee, "Land Use in PA: Practices and Tools, and Inventory". January 2000.

Governor's Center for Local Government Services, Pennsylvanian's Speak: Sound Land Use Forums Report. January 2000.

Hylton, Thomas. 1995. Save Our Land Save Our Town. Strine Printing Company, York, Pennsylvania.

Growing Greener: A Conservation Planning Workbook for Municipal Officials in Pennsylvania. 1999.

Palmer, Tim. Lifelines: The Case for River Conservation. Island Press, Washington, D.C.

REVIEW OF COMMENTS

Cowanshannock Creek Watershed
Draft River Conservation Plan

January 2002

PROJECT AREA CHARACTERISTICS

1. ***Size - More information on physical attributes of Cowanshannock Creek under Stream Characteristics and/or Project Characteristics such as slope, width, length, etc. (Tom Clark and DCNR).*** More information was added in these sections. Information added included total stream miles, area of each sub-watershed, and information on general slope of the creek.
2. ***Recent development influencing stormwater includes the new high shool, Rural Valley Borough Jail, Glass Factory, and Charlie Brown Trailor Courts.(J. Bohonak)***. Information has been added on page 7, under description of recent developments in the Land Use Planning section.
3. ***Education - Percentages add up to more than 100%*** College graduates are of the entire population. The number of high school graduates and college graduates overlap. This is clarified on page 12.
4. ***Include information on major sources of employment (DCNR)*** A section on employment was added on page 12.
5. ***Outstanding and unique features are not mentioned in the plan (DCNR).*** Including a section on outstanding and unique features is redundent given sections on important habitats in the Biological Resources Section, and the recreational and historic resources described in the cultural resources section.

LAND RESOURCES

6. ***Soil Characteristics - Soil association characteristics are given but do not contain specific limitations (DCNR).*** Additional soil association characteristic information was added for each soil type as described on pages 18-19.
7. ***Land Ownership - You might want to add percentages along with th total acres already given (DCNR).*** Percentages for CCWA property holdings are less than 1%. This is stated in the relevant section.
8. ***Sink holes - There is no mention of sink holes in the plan, even though some of the underlying beds are composed of limestone, which is indicative of sinkholes (DCNR).*** Sink holes described in the geology section on page 17.
9. ***Geology - More specific information in the geology section is needed. Include a geologic structure map with a brief description. (David Beale)***. More information added on geology. See page 17 and Appendix D.
10. ***Geology - More background information on the historical mining of clay, etc. is needed in the geology section.*** A section on clay mining was added on page 26-27.

WATER RESOURCES

11. ***Water supply and sewage supply - check to see if customer numbers are correct.*** Customer service numbers were incorrect as suspected. The correct numbers were added on pages 35 (sewage facilities) and 45 (water supply facilities).
12. ***Water Quality -Include more specific recommendations for septic systems management. Within Armstrong county soils do not meet perc. tests, so therefore systems are generally more costly. Photo of septic system included is misleading because this low-cost system is not useable in most parts of the County. Recommended contacting Carol Rotman at the Sewage Management Agency (David Beale).*** Carol Rotman was contacted. More specific information on application of septic systems is included on pages 34-37. Additional information on alternative septic systems and costs is also included. An additional recommendation on supporting research of cost efficient alternative septic systems.
13. ***Water Quality - Follow-up on potential impact of stormdrains along Cowanshannock Creek.*** Followed-up with Andrew Donaldson who completed the field work for the FGM project. Andrew indicated that there was no major impact from stormdrains along Cowanshannock Creek.
14. ***Water Quality, Integrate information from Cow FGM project - high priority areas map. BMPs listed- gravel roads is one that is not mentioned in the RCP.*** Information on dirt and gravel roads included in the transportion section on page 13. Information from the FGM study was integrated throughout the water quality section starting on page 30. Appendix F also includes updated information from the study.
15. ***Water Quality - Flow from Meredith 1 and 2 is on the Manjerovich Property (J. Bohonak).*** Changed on page 43 and 71.
16. ***Water Quality - Why is Crooked Creek Watershed samples including in Conservation District Non-point Study review information?*** The study was conducted for Crooked Creek and Cowanshannock Creek collectively. Information for applying each watershed was not given. Collective information was available. It was assumed that agricultural practices in the two areas would be similar.
17. ***Water Quality - Spreading animal manure on frozen or unsaturated ground is untimely. (J. Bohonak)*** Information added in water quality section on page 37-38.
18. ***Water Quality - Table 10 - RAMP projects for reclamation of 20 acres at Devil's washbasin and 30 acres at White Lake and Wetlands. Completed by NRCS in 1984. (J. Bohonak).*** Information added to Table 10 and corresponding text on page 41.
19. ***Water Supply - well head protection areas are not mentioned in the plan. Do the 11 public water systems in the watershed have wellhead protection programs in place.*** None of the 11 wells has a known wellhead protection program in place. See page 45 for general description of wellhead protection programs and purpose.

BIOLOGICAL RESOURCES

20. ***More information on AMD discharge being used to feed a Trout Nursery. Also add to figures with AMDs shown (Tom Clark and David Beale)*** Description of the facility and proposed AMD remediation projects is described in the biological resources section on page 48 and is also included in the water quality section. Figures 7 and 8.
21. ***In forest description, include information about forest fragmentation (Phil Brautigam).*** Forest fragmentation is discussed on page 53-54.
22. ***More specific information on the forests in the watershed are needed (David Beale).*** Additional information on forests is included in vegetation section on page 50-51 and section on forests under "Important habitats" on page 53-54.
23. ***Add foxes, raccoons, coyotes, oppossum to the species tables (J. Bononak).*** Information was added.

CULTURAL RESOURCES

24. ***Ownership and Condition - The ownership and condition of each individual site is not mentioned (public/private).*** Ownership and condition information identified for all recreational areas described in the section.
25. ***Great Shomokin path bridge completed under PennDOT ISTEA funding. (J. Bohonak).*** Information added under the description of the Great Shamokin path on page 60.
26. ***Cownanshannock Trail is also a rail-to-trail (J. Bohonak and D. Beale)*** Changed.
27. ***Accurately depict lake area and surrounding property for White Lake and Wetland as well as the Devils' Washbasin (Tom Clark, David Beale, John Bohonak).*** Changed throughout the document where mentioned.
28. ***Hunting is not mentioned for White Lake, Devil's Washbasin, Canfeild Holmes, and Buttermilk Falls (J. Bohonak)*** Hunting was added as a descriptor on these areas.
29. ***Parks - Boat Launch sedimentation - recommended building deflectors to reduce sedimentation at the boat launch (David Beale).*** Information added.

OTHER

30. ***Recommendations - Add recommendation for reestablishment of an Armstrong County Clean Ways Chapter. (Tom Clark).*** Information on PA Clean Ways is included on page 24 under the section on illegal dumping and is included in management recommendations on page 77.
31. ***Recommendations - CCWA is not interested in developing Devil's washbasin or White lake and wetlands for recreation with structural improvements. Maintain area as primitive, natural wildlife habitat areas (J. Bohonak).*** Recommendation altered.
32. ***Figures- why is white lake and wetland not shown as an AMD discharge on Figure 6 (J. Bohonak)*** White lake and wetland added as amd site on figures 7 and 8.
33. ***Funding assistance sources- Include information on Ducks Unlimited for stream bank fencing (J. Bohonak)*** Added to the matrix.

Cowanshannock Creek River Conservation Plan
Public Attitude Survey

The following is a summary of the results from the Public Attitude Survey. A total of 19 surveys were returned. The number of people who chose each response is listed in the columns for the particular categories.

Water quality is an issue in the Cowanshannock Creek Watershed due to:

	Very Prevalent	Somewhat Prevalent	Not Very Prevalent
High flows during storm events	8	10	1
Loss of stream-side vegetation	11	6	2
Physical alteration and erosion of streambanks	14	3	2
Soils and sediments in streams	12	6	1
Toxic chemicals and metals in streams (mine drainage)	10	7	2
Sewage and agriculture runoff (nutrients) in streams	12	7	0

Quality of life can be enhanced in the Cowanshannock Creek Watershed through:

	Very Important	Somewhat Important	Not Very Important
Maintaining the natural beauty of the watershed	14	4	0
Attractive streamsides	10	7	1
Hiking and biking trails	9	9	1
Fishable streams	17	2	0
Streams safe for swimming and wading	9	9	1
No flooding of communities	10	6	3
Low taxes	8	5	5
New residential development activity	1	9	8
Vibrant commercial activity	2	8	8

General Questions:

	Agree	Have No Comment	Strongly Disagree
"My township or municipality should enact zoning ordinances that are more protective of environmental quality."	14	2	2
"I believe that trails and hiking paths would be a good way to utilize our rivers and streams, link communitites, and raise interest in managing the quality of streams in my area."	15	3	0
"Older, more settled areas should be more fully utilized for residential and commercial development before opening up new development in pristine areas."	15	3	0
"I believe local municipalities should purchase land to preserve open space and water quality."	12	4	2
"I would like to see open space and natural areas, even if that means more intensive residential and commercial activities in some local areas."	12	4	2
"I believe we should use transportation, sewage and water utility planning to control residential and commercial development."	13	3	2
"I think improving stream quality in my area will improve economic conditions."	10	4	2
"I would rather we clean up a large number of moderately polluted stream miles than a small number of severely polluted stream miles within the next five years."	9	4	5

Comments from the
COWANSHANNOCK CREEK RIVER CONSERVATION PLAN
PUBLIC ATTITUDE SURVEY

1). "The stream is a lot cleaner than it was 15 years ago. Good job."

2). "With regard to issue A (Water quality is an issue in the Cowanshannock Creek Watershed due to:), there is a potential for polutional discharges from large deep mine complexes which are being abandoned. Also, surface mining of crop coal areas which could not be deep mined may precipitate mine pool breakouts or adversely impact water quality of existing discharges."

3). "Efforts should be made throughout the watershed to address all forms of non-point source pollution in the watershed. The installation of public sewage will improve water quality and open up economic development in conjunction with improved drinking water supplies in the Rural Valley/Yatesboro/Numine area."

4). "Very beneficial and informative meeting. I'm encouraged for continued progress in environmental quality."

5). "Need more community involvement and increased community awareness of issues affecting watershed. Would like to see more cooperation among groups and organizations in the watershed on issues of concern to the watershed as a whole."

6). "I think if the focus is put on improving water quality, the quality of life issues will follow."

APPENDIX C

CODE AND ORDINANCE WORKSHEET AND MODEL ORDINANCES

The following is a list of the Code and Ordinance Worksheet, Model Ordinances, Overlay Districts, and Guidelines/Standards that can be found in this appendix:

- Code and Ordinance Worksheet
- Buffer Model Ordinance
- Model Zoning Ordinance: Open Space Community (Hamburg Township, MI)
- Pennsylvania Model Timber Ordinance

Sources:

Center for Watershed Protection

8391 Main Street
Elliott City, MD 21043-4605
Telephone: (410) 461-8328
Facsimile: (410) 461-8324
e-mail: center@cwp.org
Website: www.cwp.org

Allegheny County Economic Development

Suite 800, 425 Sixth Avenue
Pittsburgh, PA 15219
Telephone: (412) 350-1000
Facsimile: (412) 642-2217
website: www.county.allegheny.pa.us
(Refer to: the former Allegheny County Planning Department's, *Improving Local Development Regulations: A Handbook for Municipal Officials*. May 1993.)

FOR MORE INFORMATION...

For more information and examples of model ordinances contact the sources listed above. Model ordinances available from the two listed sources include the following:

- Model Conservation Easement
- Model Buffer Protection and Management Ordinance
- Model Cluster Development Regulations
- Transfer and Development Rights (TDR) Ordinance
- Model Floodplain Overlay District Regulations
- Model Stormwater Management Development Standards and Regulations
- Ordinance on Onsite Water and Sewage Inspection at Time of Property Transfer
- Model Erosion and Sediment Control Regulations

OVERVIEW OF RESULTS FROM THE FLUVIAL GEOMORPHOLOGY STUDY OF COWANSHANNOCK CREEK WATERSHED

The Cowanshannock Creek is a scenic stream that flows through Indiana and Armstrong counties before emptying into the Allegheny River. The entire watershed includes almost 50 tributaries and contains a diverse mixture of farm land, strip mining areas, small towns, and forested regions. It also contains many impaired stream reaches that contribute to the degradation of the overall water quality in the creek.

Methodology

As part of the fluvial geomorphology study, stream reaches were identified using Rosgen stream type classification methods. In order to identify *impaired* stream reaches, Skelly and Loy, Inc. completed the USDA's Stream Visual Assessment Protocol (SVAP) each identified stream reach along the entire Cowanshannock Creek watershed. The SVAP protocol provides a basic level of stream health evaluation that is based primarily on the physical conditions observed within the assessment area. These physical conditions include: channel condition, hydrologic alteration, riparian zone, bank stability, water appearance, nutrient enrichment, barriers to fish movement, in-stream fish cover, pools, and insect/invertebrate habitat. Refer to the attached spreadsheet #1 for results of the evaluations of each stream reach.

Findings and Recommendations

Major Causes of Impairment

The majority of the Cowanshannock Creek watershed consists of private forested and agricultural lands. Streams have been impaired from poor land use practices on both agricultural and residential lands such as spreading animal manure on fields, historical channelization, utilizing poor stormwater and wastewater drainage systems, overusing fertilizers (herbicides, insecticides, etc.) and destroying riparian buffer zones in favor of farm fields and residential lawns. These land use practices have affected the flow regime of the watershed and have caused instabilities within the system.

Best Management Practices

As a result of the watershed assessment, eleven Best Management Practices (BMPs) were developed as strategies for streambank stabilization/restoration efforts, water quality improvements, and aesthetic value. Each impacted reach and the identified BMP should be evaluated for long-term effectiveness for the watershed. Almost all of the BMPs listed identify alternative methods to the traditional engineering methods that can be applied to unstable streams for streambank stabilization. The more traditional methods were considered only in situations where more natural techniques could not be implemented due to physical site constraints. The BMPs are listed below are explained in the FGM study.

BMP No.1	New Channel Reconstruction
BMP No.2	Floodplain Restoration and Bank Stabilization
BMP No.3	Riparian Planting
BMP No.4	Aquatic Habitat Improvements
BMP No.5	Sediment Transport Efficiency
BMP No.6	Streambank Fencing
BMP No.7	Debris Jam
BMP No.8	Nutrient Management Plan
BMP No.9	Dirt and Gravel Road Programs
BMP No.10	AMD Passive/Active Treatment
BMP No.11	Traditional Engineering Bank Stabilization

High Priority Reaches for Restoration/Enhancement

High priority stream reaches for restoration and enhancement were identified in order to provide the local community with a plan to restore, enhance and stabilize Cowanshannock Creek. Stream reaches with an overall SVAP rating of less than 6.0 are considered poor and were evaluated for inclusion on the list of high priority stream segments for restoration. In addition, stream segments with ratings between 6.0 and 7.0 with poor ratings in channel condition, hydrologic alteration, riparian zone, and/or bank stability were also considered for the high priority list. Overall 26 stream sections were identified as high priority areas for restoration as indicated in Table 1 and shown in Figure 9.

These high priority reaches were then ranked using 10 key factors in order to better understand where stream restoration enhancement improvements would be most beneficial and effective. These included the following:

Factor 1	Health and Safety Concerns
Factor 2	Landowner Willingness
Factor 3	Site Accessibility
Factor 4	Potential to Restore Flood-prone Area
Factor 5	Cost Benefits
Factor 6	Position in Watershed - Main Stem Headwater
Factor 7	Position in Watershed - Secondary Tributaries Headwaters
Factor 8	Position Relative to Other Good Reaches
Factor 9	Simplicity of Obtaining Permits
Factor 10	Affected by Upstream/downstream Reaches

No. 1 ranked priority projects are considered to be the most cost effective. For example, a project that might entail complex permitting and require extensive analysis and/or design time prior to reaching the construction phase would be excluded from the No. 1 ranked project list. Recommended best management practices for the No. 1 ranked stream reaches are shown in Table 2. *(Note: Despite the rankings, restoration efforts are commended on any of the high priority reaches where conditions would facilitate project implementation.)*

Spreadsheet #1

COWANSHANNOCK CREEK WATERSHED
USDA STREAM VISUAL ASSESSMENT PROTOCOL RESULTS

Index/Stream Type	Channel Condition	Hydrologic Alteration	Riparian Zone	Bank Stability	Water Appearance	Nutrient Enrichment	Barriers to Fish	Instream Fish Cover	Pools	Invertebrate Habitat	**OVERALL SCORE**
01 / E5	8	7	6	8	8	6	NA	NA	7	7	7.1
02 / B3	9	9	9	8	8	7	6	8	9	9	8.2
03 / E5	8	8	6	7	8	7	8	8	8	7	7.5
04 / E5	6	8	3	3	7	5	8	5	6	5	5.6
05 / E5	7	8	7	7	8	7	7	7	7	6	7.1
06 / C5	6	8	6	5	8	6	8	7	8	6	6.8
07 / E5	7	8	6	6	8	6	8	7	8	7	7.1
08 / E5	6	6	7	5	8	7	8	8	8	7	7.0
09 / E5	8	7	7	7	8	7	8	9	8	9	7.8
10 / E5	5	6	5	5	8	8	8	7	4	7	6.3
11 / E5	7	8	6	7	8	8	8	7	7	8	7.4
12 / F5	6	3	7	4	7	8	8	6	5	6	6.0
13 / E5	6	7	7	7	8	8	8	7	7	7	7.2
14 / F5	6	4	6	5	7	8	8	5	5	6	6.0
15 / E5	8	7	7	7	5	7	8	5	7	5	6.6
16 / DA	7	8	8	8	7	8	8	8	8	7	7.7
17 / E5	8	8	8	7	7	7	8	7	7	7	7.4
18 / C4	8	8	6	8	7	7	8	8	8	7	7.5
19 / E5	7	7	7	5	7	7	8	8	7	7	7.0
20 / C4	8	8	8	9	8	8	8	9	9	9	8.4
21 / DA	8	8	8	8	8	8	8	8	8	8	8.0
22 / C4	8	9	7	8	8	8	8	8	8	9	8.1
23 / DA	6	8	8	8	8	8	8	8	8	8	7.8
24 / C4	9	8	7	8	8	8	8	8	8	8	8.0
25 / C4	7	6	4	6	8	8	8	8	8	8	7.1
26 / DA	7	8	8	7	8	8	8	8	8	8	7.8
27 / C4	8	8	7	8	8	8	8	8	8	9	8.0
101 / E5	8	8	7	8	8	7	NA	NA	7	6	7.3
201 / B4	7	8	9	8	8	8	6	8	8	9	7.9
301 / E4	8	9	9	8	8	8	9	9	8	9	8.5

Index/Stream Type	Channel Condition	Hydrologic Alteration	Riparian Zone	Bank Stability	Water Appearance	Nutrient Enrichment	Barriers to Fish	Instream Fish Cover	Pools	Invertebrate Habitat	**OVERALL SCORE**
302 / E5	4	8	3	3	6	6	8	5	8	7	5.8
303 / E5	7	7	7	8	8	8	8	7	8	7	7.5
304 / E4	8	8	7	7	8	8	NA	NA	8	8	7.8
401 / E4	7	8	6	7	8	7	NA	NA	7	8	7.2
501 / B4	8	7	8	7	8	8	NA	NA	8	8	7.8
502 / E5	7	7	7	6	8	8	NA	NA	7	7	7.1
601 / E4	8	8	8	8	8	8	NA	NA	8	8	8.0
801 / E4	9	9	7	8	8	8	9	8	8	9	8.3
802 / E5	8	8	7	8	8	8	NA	NA	8	9	8.0
803 / E4	8	9	8	8	8	9	NA	NA	8	8	8.3
804 / E5	7	8	6	7	8	7	8	9	7	7	7.4
805 / E5	8	8	9	8	8	8	NA	NA	7	8	8.0
901 / E5	7	8	5	6	7	6	7	7	7	7	6.7
902 / E5	8	8	8	6	8	7	8	9	8	7	7.7
903 / E5	8	8	9	9	9	8	NA	NA	7	7	8.1
1001 / E5	8	8	9	8	8	7	NA	NA	7	7	7.7
1101 / E5	8	8	9	9	8	9	NA	NA	7	7	8.1
1102 / E5	8	7	8	7	8	7	7	8	7	7	7.4
1103 / E5	6	8	2	2	7	3	NA	NA	7	5	5.0
1201 / E4	7	8	9	8	8	9	8	8	9	9	8.3
1202 / E5	8	8	2	7	8	8	8	5	7	4	6.5
1203 / B4	8	8	9	8	8	9	9	8	8	9	8.4
1204 / C4	8	8	9	8	8	8	9	9	9	9	8.5
1205 / E4	5	6	2	7	8	8	8	4	7	7	6.2
1206 / E4	7	7	5	7	8	8	8	7	8	8	7.3
1207 / E5	6	7	2	8	8	8	8	7	7	7	6.8
1208a / C5	5	7	8	6	8	8	8	8	8	7	7.3
1208b / E5	8	7	7	9	8	8	8	8	8	8	7.9
1209 / C5	7	8	9	7	8	8	8	8	8	8	7.9
1210 / E5	8	6	7	5	8	8	8	8	8	8	7.4
1211 / B4	8	8	9	9	8	8	9	8	8	8	8.3
1212 / B4a	8	8	9	8	8	8	9	8	8	8	8.2
1213 / B4a	8	7	9	8	8	8	8	8	8	8	8.0
1214 / B4	8	8	9	8	8	8	8	8	8	8	8.1
1215 / E4	7	8	5	7	8	8	8	8	8	7	7.4

Index/Stream Type	Channel Condition	Hydrologic Alteration	Riparian Zone	Bank Stability	Water Appearance	Nutrient Enrichment	Barriers to Fish	Instream Fish Cover	Pools	Invertebrate Habitat	**OVERALL SCORE**
1216 / E5	8	8	6	8	8	8	8	8	8	8	7.8
1217 / B5	8	8	8	8	8	8	8	8	8	8	8.0
1218 / E5	8	8	6	7	8	8	8	8	8	8	7.7
1219 / B5	8	8	8	8	8	8	8	8	8	8	8.0
1220 / E5	7	8	6	8	8	8	8	8	8	8	7.7
1221 / E4	8	9	9	8	8	8	8	8	8	8	8.2
1222 / E5	8	7	4	4	7	7	8	7	8	8	6.8
1301 / E4	8	8	8	8	5	7	NA	NA	7	NA	7.3
1401 / E5	8	8	9	8	8	8	NA	NA	7	8	8.0
1402 / E5	8	8	7	8	8	6	NA	NA	7	6	7.2
1403 / E5	8	8	9	8	8	8	NA	NA	7	8	8.0
1501 / E5	3	8	1	1	7	7	NA	NA	5	1	4.1
1601 / E5	8	8	9	8	8	9	NA	NA	7	7	8.0
1602 / E5	7	8	7	7	8	7	NA	NA	7	7	7.2
1701 / G5	7	7	5	7	7	8	9	3	1	5	5.9
1702 / G5	1	3	5	3	7	7	5	3	3	3	4.4
1801 / E5	9	8	9	9	8	8	NA	NA	7	8	8.2
1802 / E5	7	7	6	7	1	8	NA	NA	8	1	5.5
1803 / E5	7	8	6	8	8	6	NA	NA	7	7	7.1
1804 / E5	7	7	3	5	7	4	NA	NA	6	7	5.7
1805 / E5	8	8	6	7	8	8	NA	NA	7	7	7.4
1901 / E5	8	8	9	8	8	8	NA	NA	7	7	7.8
1902 / E5	7	7	3	5	7	8	NA	NA	6	5	6.0
2001 / E4	8	8	8	8	8	8	NA	NA	8	8	8.0
2002 / E5	7	8	6	7	8	7	NA	NA	8	7	7.2
2003 / E5	8	8	7	7	8	8	NA	NA	7	7	7.5
2004 / E5	8	8	9	8	8	9	NA	NA	8	8	8.2
2005 / E5	7	8	6	7	7	7	NA	NA	7	7	6.7
2006 / E5	8	8	8	8	8	8	7	8	8	7	7.8
2007 / E5	8	8	7	8	8	8	NA	NA	7	8	7.7
2101 / E5	8	8	6	7	8	6	NA	NA	8	6	7.2
2102 / E5	8	8	7	8	8	8	NA	NA	7	7	7.6
2103 / E5	8	8	8	8	8	8	8	7	7	7	7.7
2104 / E5	7	7	5	7	2	2	NA	NA	7	2	4.8
2105 / E4	8	8	9	9	9	8	NA	NA	7	8	8.2

Index/Stream Type	Channel Condition	Hydrologic Alteration	Riparian Zone	Bank Stability	Water Appearance	Nutrient Enrichment	Barriers to Fish	Instream Fish Cover	Pools	Invertebrate Habitat	**OVERALL SCORE**
2201 / B4	8	8	9	8	8	9	NA	NA	8	8	8.2
2202 / E5	8	8	6	7	8	8	NA	NA	8	7	7.5
2301 / E5	8	8	9	8	8	9	NA	NA	8	8	8.2
2302 / B4	8	8	7	7	8	8	8	8	8	8	7.8
2303 / E5	8	8	9	8	8	9	NA	NA	8	8	8.2
2401 / E4	8	8	9	8	8	9	NA	NA	8	8	8.2
2402 / E4	8	8	5	7	8	8	8	7	7	8	7.4
2403 / E4	8	8	6	7	8	6	8	8	7	8	7.4
2501 / B3	8	8	10	8	8	9	8	8	7	8	8.2
2502 / E5	8	8	9	8	8	9	7	7	7	7	7.8
2503 / E4	8	8	8	8	8	8	7	7	8	7	7.7
2504 / B5	8	8	10	8	8	9	NA	NA	7	5	7.8
2601 / E5	8	8	7	8	8	7	NA	NA	8	7	7.7
2602 / B4	7	8	3	5	8	5	NA	NA	6	6	6.0
2603 / B3	8	8	8	8	8	8	8	7	7	7	7.7
2604 / B5	8	8	7	8	8	8	7	7	7	6	7.4
2605 / B5	8	8	6	7	7	8	8	7	7	6	7.2
2606 / B5	8	8	8	8	8	8	8	8	8	7	7.9
2607 / E5	7	7	3	5	7	5	NA	NA	6	4	5.8
2608 / E5	7	7	7	7	7	6	NA	NA	6	6	6.6
2609 / E5	7	7	2	6	7	3	6	6	6	5	5.5
2610 / E5	8	8	4	7	8	6	NA	NA	7	7	6.8
2611 / E5	8	7	5	7	8	4	NA	NA	7	6	6.5
2612 / B4	8	8	8	8	8	8	NA	NA	7	7	7.8
2613 / E5	7	8	4	8	7	7	NA	NA	7	7	6.8
2614 / B5	7	7	3	4	7	3	NA	NA	3	4	4.5
2615 / B5	8	8	7	8	8	7	NA	NA	6	7	7.4
2616 / E5	8	8	8	8	1	8	NA	NA	7	0	6.0
2617 / E4	8	8	8	8	8	8	8	8	8	7	7.9
2618 / E5	8	8	7	8	8	8	NA	NA	7	7	7.6
2619 / E3	8	8	9	8	8	9	NA	NA	8	9	8.3
2620 / Channelized	5	8	1	8	8	8	NA	NA	1	5	5.5
2621 / E5	8	8	8	8	8	8	NA	NA	8	7	7.8
2701 / E5	8	8	8	8	8	8	NA	NA	8	7	7.8
2801 / B5	8	9	9	8	9	9	NA	NA	7	7	8.2

Index/Stream Type	Channel Condition	Hydrologic Alteration	Riparian Zone	Bank Stability	Water Appearance	Nutrient Enrichment	Barriers to Fish	Instream Fish Cover	Pools	Invertebrate Habitat	**OVERALL SCORE**
2802 / F4	8	8	9	8	9	9	8	9	8	8	8.4
2803 / B3	9	8	9	9	9	8	8	8	8	8	8.4
2804 / A3	10	10	9	9	9	9	8	9	8	9	9.0
2805 / E5	9	8	9	8	8	9	NA	NA	8	7	8.2
2806 / E5	8	8	7	7	8	6	NA	NA	8	6	7.2
2901 / A4	8	8	9	8	8	8	6	8	8	8	7.9
3001 / A4	8	9	9	9	9	9	6	7	7	8	8.1
3101 / E5	7	8	2	4	8	4	8	6	7	5	5.9
3102 / B4	8	8	9	9	9	8	8	8	8	8	8.3
3103 /E4	7	8	5	7	8	8	8	8	8	8	7.5
3201 / E4	8	8	8	8	8	8	8	8	8	8	8.0
3202 / E4	8	7	2	7	8	8	8	6	7	7	6.8
3203 / E5	7	8	2	8	8	7	7	6	7	7	6.7
3301 / E5	7	8	4	7	8	5	NA	NA	7	6	6.5
3302 / E5	8	8	6	8	8	7	NA	NA	8	7	7.5
3303 / F4	8	8	9	9	8	8	8	8	8	8	8.2
3304 / B3	9	9	10	10	9	9	9	9	9	9	9.2
3305 / A3	8	8	8	8	8	8	8	8	8	8	8.0
3401 / E5	7	8	4	7	8	7	NA	NA	7	7	6.8
3402 / A3	8	8	9	7	8	8	8	8	8	9	8.1
3403 / G3	8	8	9	8	8	8	8	8	8	9	8.2
3404 / B4	8	8	9	8	8	9	8	8	8	9	8.3
3405 / B4	8	8	4	8	8	8	8	7	7	8	7.4
3501 / A3	9	9	9	8	9	9	7	9	8	8	8.5
3601 / E5	8	8	4	8	8	5	NA	NA	7	6	6.7
3602 / B4	8	8	10	8	8	8	8	8	8	8	8.2
3603 / F5	6	7	2	2	8	7	7	7	7	7	6.0
3604 / E5	8	8	4	8	8	5	NA	NA	7	6	6.7
3605 / A4	8	8	9	9	8	7	NA	NA	8	8	8.1
3701 / E5	7	7	2	5	8	6	NA	NA	8	6	6.1
3702 / E5	8	8	8	8	8	7	NA	NA	8	7	7.7
3703 / A4	8	8	10	8	9	9	8	8	8	8	8.4
3801 / A4	8	8	9	9	8	8	NA	NA	7	8	8.1
3802 / A4	7	8	3	8	8	8	NA	NA	7	7	7.2
3803 / A4	8	8	10	8	8	9	NA	NA	8	8	8.3

Index/Stream Type	Channel Condition	Hydrologic Alteration	Riparian Zone	Bank Stability	Water Appearance	Nutrient Enrichment	Barriers to Fish	Instream Fish Cover	Pools	Invertebrate Habitat	**OVERALL SCORE**
3804 / A4	8	8	3	7	8	8	NA	NA	8	7	7.1
3901 / A4	9	8	10	9	9	9	NA	NA	8	8	8.7
3902 / A4	8	8	3	7	8	8	NA	NA	8	7	7.1
4001 / A3	9	8	10	8	9	8	8	8	8	8	8.4
4101 / C5	7	8	9	8	8	8	8	8	8	8	8.0
4102 / F4	4	3	8	3	8	8	8	4	6	8	6.0
4103 / C4	8	8	9	8	8	8	8	8	8	8	8.1
4104 / E4	8	9	6	7	8	8	8	8	8	8	7.8
4105 / C4	8	9	9	8	8	8	8	8	8	8	8.2
4106 / B4	7	7	9	7	8	8	8	8	8	9	7.9
4107 / C4	8	9	6	7	8	8	8	8	8	8	7.8
4108 / E5	8	9	8	6	8	8	8	8	8	8	7.9
4109 / C4	8	8	8	8	8	8	8	8	8	8	8.0
4110 / C4	8	8	8	8	8	8	8	8	8	8	8.0
4111 / B5	8	8	9	8	1	8	8	8	8	8	7.4
4112 / B4a	9	8	9	8	8	8	8	8	8	8	8.2
4113 / B4	9	8	9	8	8	8	8	8	8	8	8.2
4114 / B4	7	7	9	7	1	8	8	8	8	8	7.1
4115a / C4	9	9	9	8	8	8	8	8	9	8	8.4
4116 / B4	8	8	8	8	8	8	8	8	8	8	8.0
4117 / B4	8	8	8	8	8	8	8	8	8	8	8.0
4118 / B4	6	8	8	8	8	8	8	8	8	8	7.8
4119 / B4a	9	8	9	8	8	8	8	8	8	8	8.2
4120 / A+	8	6	9	8	8	8	8	8	8	8	7.9
4121 / G5	6	4	4	5	8	8	7	7	7	7	6.3
4122 / B4	7	7	8	7	8	8	8	8	8	8	7.7
4123 / B4	8	8	3	8	8	8	8	8	8	8	7.5
4201 / A4	8	8	9	8	8	8	NA	NA	8	8	8.1
4202 / A4	7	8	3	6	8	8	NA	NA	7	7	7.3
4203 / A4	8	8	8	8	8	8	8	8	8	8	8.0
4204 / A4	8	8	7	8	8	8	NA	NA	7	7	7.6
4301 / C5	7	8	7	8	8	8	8	8	8	8	7.8
4302 / B5	7	6	9	7	8	8	5	8	7	8	7.3
4401 / E5	8	8	4	8	8	8	8	8	8	8	7.6
4402 / B4	8	8	8	8	8	8	8	8	8	8	8.0

Index/Stream Type	Channel Condition	Hydrologic Alteration	Riparian Zone	Bank Stability	Water Appearance	Nutrient Enrichment	Barriers to Fish	Instream Fish Cover	Pools	Invertebrate Habitat	**OVERALL SCORE**
4501 / B5	7	6	8	7	7	7	7	8	7	8	7.2
4601 / E5	7	8	3	7	8	6	NA	NA	7	7	6.5
4602 / E4	8	8	10	8	8	8	NA	NA	8	8	8.2
4603 / G4	8	8	6	7	8	8	NA	NA	7	7	7.3
4701 / E5	8	8	3	6	8	6	NA	NA	7	6	6.5
4702 / E4	8	8	8	8	8	8	NA	NA	8	7	7.8
4703 / E4	8	8	2	4	7	8	NA	NA	8	7	6.5
4801 / B4	8	8	10	8	8	9	NA	NA	8	8	8.3
4802 / G4	8	8	9	8	8	8	NA	NA	8	8	8.1
4901 / B4	8	8	8	8	8	9	NA	NA	8	8	8.1
4902 / A3	8	8	8	8	8	8	NA	NA	8	8	8.0

POTENTIAL TECHNICAL & FUNDING ASSISTANCE FOR WATERSHED PROJECTS IN PENNSYLVANIA

Source of Assistance	Phone	Contact Information	Assistance Information	Planning	Const.	Other
Farm Service Agency	(T) 724-222-3060 Ms. Linda Barnett	2800 North Main Street Extension PO Box 329 Meadowlands, PA 15347 www.fsa.usda.gov www.fs.fed.us	FSA offers financial assistance for streambank fencing and crossings for farmers.	NO	YES	YES
Allegheny Co. Conservation District	(412) 241-7645 Mr. Ed Feigel	Lexington Tech Park Building Room 1 102-400 North Lexington Street Pittsburgh, PA 15208-2521	Provides technical and financial assistance for conservation activities.	YES	YES	YES
Appalachian Clean Streams Initiative	(T) 412-937-2863 Mr. Milton Allen (T) 717-782-4036 Mr. David Hamilton	Office of Surface Mining 1951 Constitution Ave. NW Washington, DC 20240 mallen@osmre.gov	Assists with restoration activities involving abandoned mine drainage issues throughout Appalachia.	YES	YES	YES
DCNR: Rivers Conservation Program	(T) 717-788-8526 Mr. Jim Mays (T) 412-880-0486 Ms. Tracey Robinson	1405 State Office Building 300 Liberty Avenue Pittsburgh, PA 15222 www.dcnr.state.pa.us	Offer technical and financial assistance for planning, implementation, development, and acquisition grants. Applications: Late August Proposals: Early February	YES	YES	YES
DEP: Stormwater Management Program	(T) 717-772-4048 Mr. Durla Lathia	400 Market Street Harrisburg, PA 17105 www.dep.state.pa.us	Watershed planning for stormwater control and implementation of programs at local levels.	YES	YES	YES
Dirt and Gravel Road Maintenance State Conservation Commission	(T) 717-787-8821 Mr. Woody Colbert	2301 North Cameron Street Harrisburg, PA 17110-9408	Groups may be able to work with their local municipalities and state agencies, regarding erosion and sedimentation control problems, and fugitive dist in watersheds.	YES	YES	YES

Duck's Unlimited, Inc. (Western Pennsylvania) Habitat Stewardship Program	814-386-3458 Mr. Christopher Clouser		Provide incentives for landowners to create wood stream buffers, fence cattle out of streams and wetlands, and earn Best Management Practice credits. Program pays 100% of fencing and tree planting costs.		YES	

POTENTIAL TECHNICAL & FUNDING ASSISTANCE FOR WATERSHED PROJECTS IN PENNSYLVANIA

Source of Assistance	Phone	Contact Information	Assistance Information	Planning	Const.	Other
PA Association of Conservation Districts: Educational Mini-Projects Program	(T) 717-545-8878 Education Specialist	4999 Jonestown Road Suite 203 Harrisburg, PA 17109	Small grants for PA based grassroots educational projects that address non-point source watershed concepts.	NO	NO	YES
Environmental Protection Agency: Region III	(T) 215-814-5756 Mr. Bernie Samoski	Water Protection Division 3WP10, 1650 Arch Street Philadelphia, PA 19103-2029 www.epa.gov	Grants awarded to small non-profit groups for various projects in Region III	YES	YES	YES
EPA - Region III Environmental Education Grants	(T) 215-814-5546 Ms. Nan Ides	3G00, 16th Floor 1651 Arch Street Philadelphia, PA 19103 www.epa.gov	Grants awarded to small non-profit groups for various projects in Region III	YES	YES	YES
Natural Resources Conservation Service (NRCS)	(T) 724-222-3060 Mr. Tom Sierzega (T) 724-774-7090 Mr. Robin Moyer (T) 814-445-8979 Mr. Dan Seibert	2800 North Main Street Extension PO Box 329 Meadowlands, PA 15347 www.nrcs.usda.gov	Technical and funding assistance to farmers for planning, design, construction, and maintenance activities. These involve many programs (i.e., fencing and stream crossings, farmland protection).	YES	YES	YES

NRCS PL 83-566, Watershed Protection and Flood Prevention Act	(T) 717-782-4429 (T) 814-445-8979 Mr. Dan Seibert	North Ridge Building, Suite 105 1590 North Center Avenue Somerset, PA 15501	Plan development for natural resource concerns within a watershed area: cost-sharing available to carry out plan.	YES	YES	YES
Office of Surface Mining Reclamation and Enforcement	(T) 717-782-4473 Mr. David Hamilton	415 Market Street Transportation Building Suite 3C Harrisburg, PA 17101	Provides funds to Appalachian Clean Streams Initiative for Abandoned Mine related activities.	YES	YES	YES
PA - Growing Greener	(T) 717- 705-5400 1-877-PAGREEN Ms. Patricia Grim	Rachel Carson St. Office Bldg. 9th Floor, 400 Market Street PO Box 8776 Harrisburg, PA 17109-8776 www.dep.state.pa.us	Funds for PennVest, PA Department of Agriculture, Department of Environmental Protection and Department of Conservation and Natural Resource activities.	YES	YES	YES

POTENTIAL TECHNICAL & FUNDING ASSISTANCE FOR WATERSHED PROJECTS IN PENNSYLVANIA

Source of Assistance	Phone	Contact Information	Assistance Information	Planning	Const.	Other
PA DEP - Nonpoint Source Management Program (Section 319 & WRAP)	(T) 717- 787-5259 Ms. Jane Earle	400 Market Street PO Box 8555 Harrisburg, PA 17105-8555 www.dep.state.pa.us	Provide funding for improving Non-point source water pollution.	YES	YES	YES
PA Organization for Watershed and Rivers	(T) 717-234-7910 Mr. Walt Pomeroy wpomeroy@aol.com	PO Box 765 Harrisburg, PA 17120 www.powr.com	POWR assists as a voice for rivers and watershed organizations in Pennsylvania.	YES	NO	YES
PADEP Southwest Regional Office	(T) 412-442-4149 (F) 412-442-4194 Ms. Rita Coleman (T) 412-442-4049 Ms. Karen Crowley	400 Waterfront Drive Pittsburgh, PA 15222-4745 www.dep.state.pa.us	Grants for various environmental, conservation, and educational activities.	YES	YES	YES
PA Stream ReLeaf Program	(T) 717-236-8825 Ms. Susan Richards	Alliance for the Chesapeake Bay 600 North Second Street Harrisburg, PA 17101	Grants for riparian buffers along streams. For the purchase of trees, seed and planting mats. Grants between $500-$1000.00 Application: January Begin: Spring Complete: July	YES	YES	YES
Penn's Corner RC&D	(T) 724-834-9063 Mr. Nevin Ulery	Donhoe Center RD 12, Box 202B Greensburg, PA 15601	Provides technical assistance and small financial grants to non-profit organizations in 9 southwestern PA counties.	YES	YES	YES
Pennsylvania Fish and Boat Commission	(T) 814-359-5185 (T) 412-341-0370 Mr. Bob Wheeler	Adopt-A-Stream Program 450 Robinson Lane Bellefonte, PA 16823 www.fish.state.pa.us	Offers technical assistance on design and construction of stabilized stream crossings.	YES	YES	YES

Pennsylvania Game Commission	(T) 717-787-6400 Mr. Dennis Neideigh	2001 Elmerton Avenue Harrisburg, PA 17110-9797 www.pgc.state.pa.us	Streambank fencing financial and technical assistance to farmers who participate in one of the commission's cooperative public-access programs.	YES	YES	YES

POTENTIAL TECHNICAL & FUNDING ASSISTANCE FOR WATERSHED PROJECTS IN PENNSYLVANIA

Source of Assistance	Phone	Contact Information	Funding Information	Planning	Const.	Other
Pennsylvania Senior Environment Corps: Environmental Alliance for Senior Involvement	(T) 717-787-9580 Mr. Christopher Allen	400 Market Street Harrisburg, PA 17105 www.dep.state.pa.us	EASi provides technical assistance numerous environmental and education issues amongst many more.	YES	NO	YES
The Leo Model Foundation	(T) 215-546-8058 Extension 3021 Ms. Margaret Stridick	ICO - Model Entities 310 South Juniper Street Philadelphia, PA 19107-5818	Grants for habitat, conservation, watershed conservation, and species preservation.	YES	YES	YES
The Pittsburgh Foundation	(T) 412-391-5122 Mr. Alfred Wishart, Jr.	The Pittsburgh Foundation One PPG Place - 30 th Floor Pittsburgh, PA 15222-5401	Funding grants to organizations located in Allegheny County for special projects, seed money for new programs, or grants which would leverage additional funding. Submit proposals Jan. 1, March 15, June 1, and Sept. 15	YES	YES	YES
The William Penn Foundation	(T) 215-988-1830 Ms. Hollister Knowlton	Two Logan Square 11th Floor 100 North 18 Street Philadelphia, PA 19103-2757	Grants to preserve natural areas, including environmental education and planning, within the foundation's geographic area.	YES	YES	YES
US Army Corps of Engineers	(T) 412-395-7210 Dr. Ed Smith	1928 Federal Building 1000 Liberty Avenue Pittsburgh, PA 15222 www.usace.army.mil	Provides funding and technical assistance through a variety of planning and construction programs for environmental improvement, flood protection, and other projects.	YES	YES	YES
US Geological Survey	(T) 717-730-6916 Mr. John Nantz lmnantz@usgs.gov	840 Market Street Lemoyne, PA 17043 http://pa.water.usgs.gov	Provides technical assistance through planning programs for environmental improvement, flood protection, and other projects.	YES	YES	YES
Vira I. Heinz Endowment	(T) 412-281-5777 (F) 412-281-5788 Mr. Andrew McElwaine	30 CNG Tower 625 Liberty Avenue Pittsburgh, PA 15222-3115	Funds to implement ecosystem programs in selected western PA watersheds. Small matching grants are provided to the DCNR for the Coldwater Heritage program.	YES	YES	YES

POTENTIAL TECHNICAL & FUNDING ASSISTANCE FOR WATERSHED PROJECTS IN PENNSYLVANIA

Source of Assistance	Phone	Contact Information	Assistance Information	Planning	Const.	Other
Washington Co. Conservation District	(T) 724-228-6774 Mr. Gary Stokum	602 Courthouse Square 100 West Beau Street Washington, PA 15301-4402 WCCD@COBWEB.NET	Provides technical and financial assistance to farmers, developers, and conservation organizations.	YES	YES	YES
Waterways Conservation Grant Program (Conserve 2000 Fund) Commonwealth of PA PA Fish and Boat Commission	(T) 717-657-4515 717-657-4540 (F) 717-657-4033 (T) 814-445-3454 Mr. Rick Lorson	PA Fish and Boat Commission PO Box 67000 Harrisburg, PA 17160-7000 www.fish.state.pa.us	Grants support activities directed at restoring and protecting watersheds; including acquisition, and enhancing riparian habitat. Application Deadline: June.	YES	YES	YES
Western PA Watershed Protection Program	(T) 814-869-4847 Mr. John Dawes	RD #1, Box 152 Alexandria, PA 16611	Provides funding to grassroot organizations and watershed associations for site specific watershed remediation in western PA.	YES	YES	YES
WPCAMR: Western PA Coalition For Abandoned Mine Reclamation	(T) 724-837-5271 (F) 724-837-4127 Mr. Mark Killar	Donohoe Center RD # 12 - Box 202-B Greensburg, PA 15601 wpcamr@westol.com	Grants through the Regional Watershed Support Initiative Applications -December Received - January Complete - June	YES	YES	YES
Canaan Valley Institute	(T) 814-768-9584 Ms. Janie French (T) 304-866-4739 1-800-922-3601 Ms. Emily Grafton	650 Leonard Street Clearfield, PA 16830 www.canaanvi.org	Promotes the development and growth of local organizations committed to improving or maintaining the natural resources of their watersheds, in the Mid-Atlantic Highlands portions of PA. MD. VA and all of WV.	YES	YES	YES

League of Women Voters: Citizen Education Fund and Water Resources Education Network	(T) 724-465-2595 (T) 724-465-4687 1-800-692-7281 Ms. Sherene Hess	226 Forester Street Harrisburg, PA 17102 http://www.pa/lwv.org/wren	Grants up to $3000.00 Application: January Begin: Spring Grants are available for community education or outreach projects pertaining to water resource issues.	YES	YES	NO

POTENTIAL TECHNICAL & FUNDING ASSISTANCE FOR WATERSHED PROJECTS
NATIONAL ORGANIZATIONS

Source of Assistance	Phone	Address	Assistance Information	Planning	Const.	Other
American Canoe Association	(T) 703-451-0141 Mr. David Jenkins	7432 Alban Station Boulevard Suite B232 Springfield, VA 22150	May provide funding for various watershed related projects including starting groups and lobbying.	YES	NO	YES
National Park Service: Rivers, Trails, and Conservation Assistance Program	(T) 215-597-1581 Mr. Jody Bellows	200 Chestnut Street, 3rd Floor Philadelphia, PA 19106	Provide technical, administrative, public facilitation and other services for a variety of projects.	YES	NO	YES
Charles A. and Anne Morrow Lindburgh Foundation	(T) 612-338-1703	Minneapolis, MN	Grants awarded fro the conservation of natural resources and water resource management.	YES	NO	YES
American Sportfish Association and Foundation	(T) 703-548-6338	Alexandria, VA	Grants awarded for: stream bank stabilization materials, instream habitat improvements, contracted heavy equipment, and stream morphology work.	NO	YES	NO
Scenic America	(T) 202-543-6200 Ms. Debra Myerson	801 Pennsylvania Avenue, SE Suite 300 Washington, DC 20003 www.scenic.org	Technical assistance for improving community visual quality assessments, sign control, cellualr tower location, amonst other visual pollution issues.	YES	YES	YES
Wildlife Forever	(T) 612-936-0605 (F) 612-936-0915 Ms. Andrea Stoffregen	12301 Whitewater Drive Suite 210 PO Box 3404 Minnetonka, MN 55343	Provides technical and financial assistance for habitat enhancement projects.	YES	YES	YES
USEPA: Five Star Restoration Program	(T) 202-260-8076 Mr. John Pai	www. Office of Wetlands, Oceans, and Watersheds (4502F) Ariel Rios Building 1200 Pennsylvania Avenue Washington, DC 20460 www.epa.gov/owow/wetlands/restore/5star/	Clean Water Act Section 104 (b)(3) Program Applications - Jan./Feb.	YES	YES	YES

POTENTIAL TECHNICAL & FUNDING ASSISTANCE FOR WATERSHED PROJECTS
NATIONAL ORGANIZATIONS

Source of Assistance	Phone	Contact Information	Assistance Information	Planning	Const.	Other
North American Wetlands Conservation Council	(T) 413-253-8269 Attention: Small Grants Coordinator	Atlantic Coast Joint Venture US Fish and Wildlife Service 300 Westgate Center Drive Hadley, MA 01035-9589 www.fws.gov/r9nawwo	Program promotes long-term wetland activities through encouraging participation by new partners who may not be able to compete in the standard grant program. Grants no larger than $50,000. Application: December	YES	YES	YES
WalMart/Sam's Club: Environmental Clean Air and Water Grant	See Local WalMart/Sam's Club	Grants are administered through the local stores. Talk with Store Manager for applications. Washington and Robinson Town Center, PA Stores.	Funding distributed on a first come first serve basis. Funding Distribution: February	YES	YES	YES
National Tree Trust	(T) 202-628-8733 Ms. Joanne Miller	1120 G Street, NW Suite 770 Washington, DC 20005 www.nationaltreetrust.org/	Grants awarded: Tree plantings, education, administration, and national/regional programs.	YES	YES	YES
Rivers Unlimited	(T) 513-351-4417	3012 Section Road Cincinnatti, Ohio 15237				
National Audubon Society	(T) 412-963-6100	614 Dorseyville Road Pittsburgh, PA 15238 www.audubon.org	Inspire and educate people of southwestern PA to be respectful of the natural world.	NO	NO	YES
Wildlife Habitat Council	(T) 301-588-8994 (T) 412-433-5900 Ms. Marsh Mazlavic	1010 Wayne Avenue, Suite 920 Silver Springs, MD 2-910 http://www.wildlifehc.org	Provide technical assistance to corporate and community organizations to improve wildlife habitat.	YES	NO	YES

National Wildlife Federation: Community and Backyard Wildlife Habitat Programs	(T) 703-790-4434 1-800-822-9919	8925 Leesburg Pike Viena, VA 22184-0001 http://www.nwf.org/habitats	Provide technical assistance to corporate, communities, and organizations to improve wildlife habitat.	YES	NO	YES

POTENTIAL TECHNICAL & FUNDING ASSISTANCE FOR WATERSHED PROJECTS
NATIONAL ORGANIZATIONS

Source of Assistance	Phone	Contact Information	Assistance Information	Planning	Const.	Other