

WICONISCO CREEK WATERSHED CONSERVATION PLAN



**PREPARED BY:
THE DAUPHIN COUNTY CONSERVATION DISTRICT
FOR
THE EASTERN PENNSYLVANIA COALITION FOR ABANDONED MINE
RECLAMATION**

July 2004

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

**Wiconisco Creek
Watershed Conservation Plan
Table of Contents**

Section	Page
I. Description of the Wiconisco Creek Watershed	1
A. Location and Size	1
B. Political Boundaries	1
C. Topography/Geology	2
D. Climate	3
E. Population/Socio-economic Profile	4
1. Population	4
2. Housing	6
3. Economic Base	13
F. Land Use	17
1. Existing Land Use Trends	17
2. Future Land Use	20
3. Planning/Zoning	21
G. Infrastructure	22
1. Transportation Facilities	22
a. Highway Network	22
b. Railway Network	27
c. Airports	27
d. Ferries	27
2. Community Facilities/Utilities/Services	27
a. Schools	28
b. Hospitals/Nursing Homes	29
c. Libraries	30
d. Museums	30
e. Public Safety	30
f. Public Water Services	30
g. Public Sewerage Services	32
h. Solid Waste Disposal	34
i. Municipal Buildings	34
H. Previous Studies	38
II. Land Resources	39
A. Soils	39
1. Soil Erosion	42
2. Hydrologic Soil Groups	42
B. Woodlands	42
C. Landfills	43
D. Hazardous Areas	44
1. Abandoned Mines	44
2. Coal Refuse Piles	44
III. Water Resources	44
A. Major Tributaries	44
1. Stream Use Designations	47

Section	Page
B. Floodplain	47
C. Stormwater	47
1. Act 167	47
2. NPDES	48
D. Hydrology	48
E. Wetlands	48
F. Surface Water Quality	49
1. Recent Data	50
2. Permitted Discharges and Uptakes	52
G. Groundwater Quality/Quantity	53
IV. Biological Resources	55
A. Wildlife	55
B. Vegetation	55
C. Species of Special Concern/Important Natural Communities	56
1. Doc Smith Run Woods/Bear Puddles	56
2. Wiconisco Creek Outcrops	56
3. Rattling Creek Watershed	56
V. Cultural Resources	57
A. Recreational Facilities	57
1. State Game Lands and Forests	57
2. Local Recreation Areas	57
3. Trails and Public Access	57
4. Non-profit Private Facilities	57
VI. Historical and Archeological Resources	60
VII. Institutional Resources	61
A. Watershed Associations	61
VIII. Issues and Concerns	62
A. Public Meetings	62
B. Abandoned Mine Land/Mine Drainage	62
1. Mine Discharge Sites	62
2. Sheridan Banks	64
C. Hazardous Waste Sites/Landfills	65
D. Atmospheric Deposition	65
E. Sedimentation and Riparian Habitat Loss	65
F. Zoning	65
G. Cultural Resources/Tourism	66
IX. Management Options/Remediation	66
A. Abandoned Mine Drainage Remediation	66
1. Bear Creek Sub-watershed	67
2. Upper Wiconisco Creek Sub-watershed	67

Section	Page
B. Abandoned Mine Land	68
1. Sheridan Banks	68
C. Acid Rain Remediation	69
1. Rattling Creek Watershed	69
D. Sedimentation/Riparian Habitat Loss	69
1. Upper Wiconisco Creek Subwatershed	69
2. Lower Wiconisco and Little Wiconisco Creek Sub-watersheds	69
E. Land Use	69
F. Cultural Resources	70
X. State and Federal Financial and Technical Assistance Programs	70
A. State Programs	70
1. The Clean and Green Program	70
2. The Pennsylvania Agricultural Conservation Easement Purchase Program	71
3. Community Revitalization Program	72
4. New Communities/Main Street Program	72
5. PENNVEST	72
6. Land Use Planning and Technical Assistance Program	73
7. Community Conservation Partnership Programs	73
8. Growing Greener Program	73
B. Federal Programs	73
1. Conservation Reserve Program	73
2. Rural Housing and Economic Development	74
XI Recommended Actions	75
A. Goals/Objectives	75
1. Socio-Economics	75
2. Land Use	76
3. Infrastructure	76
B. Projects	77
C. Contact Information	79
1. Mining Issues	79
2. Agriculture	80
3. Aquatic Resources	80
4. Planning/Land Use	81
XII. Literature Cited	82

List of Tables

Table	Page
1. Comparison of the Wiconisco Creek Watershed and Southern Dauphin County Areas' Climate	4
2. Actual Municipality Population for Municipalities Partially or Wholly Within the Wiconisco Creek Watershed	5
3. Projected/Allocated Population for Municipalities Within the Wiconisco Creek Watershed	6
4. Total Housing Unit Characteristics	9
5. Occupied Households in Wiconisco Watershed Municipalities	10
6. Age of Watershed Housing	11
7. 1990 Housing conditions/Selected Utilities	12
8. 2000 Employment and Labor Force Class	15
9. 2000 Employment By Occupation	16
10. Existing Land Use Wiconisco Watershed Area	20
11. Functional Classifications of major routes within the Wiconisco Creek Watershed	25
12. Proposed Transportation Projects Wiconisco Creek Watershed	26
13. Wiconisco Creek Watershed Railways/Status	27
14. Fire Companies and Police Departments within the Wiconisco Creek Watershed	35
15. Public Water Services	36
16. Public Sewerage Services	37
17. Soil Associations within the Watershed	41
18. Wiconisco Creek Tributaries and Drainage Area in Square Miles	45
19. Permitted Discharge Points	54
20. Permitted Uptake Points	55
21. Municipal Recreation Facilities	58-59
22. State Owned Lands in the Wiconisco Creek Watershed	59
23. Recommended Actions: Socio-Economics	77
24. Recommended Actions: Land Use	77
25. Recommended Actions: Infrastructure	78
26. Recommended Actions: Natural Resources	78
27. Recommended Actions: Education	79

List of Figures

Figure	Page
1. Land Use and State Lands	19
2. Watershed municipalities with zoning ordinances and/or municipal comprehensive plans	23
3. Permitted point source discharges and major roads	24
4. Sub-watersheds	46

Foreward

The Wiconisco Creek Conservation Plan was initiated in 1998 through the efforts of the Wiconisco Creek Restoration Association (WCRA), The Eastern Pennsylvania Coalition for Abandoned Mine Reclamation (EPCAMR) and the Dauphin County Conservation District (DCCD) and is funded through the Pennsylvania Department of Conservation and Natural Resources. At the request of EPCAMR and WCRA, and after several years of work, DCCD has prepared what it believes to be an effective document that is practical.

The purposes of the Wiconisco Creek Watershed Conservation Plan are to:

- Restore, maintain or enhance the creek's resources
- Register the Wiconisco Creek on the Pennsylvania Rivers Conservation Registry
- Provide opportunities for municipalities and others to obtain implementation or development grants to accomplish the recommendations found in the Plan.
- Promote awareness and conservation of the Wiconisco Creek.
- Provide the Wiconisco Creek Restoration Association with a tool for education, setting goals, and establishing projects.

The Plan includes updated information and recommendations on such diverse topics as: Land Use, Socio-Economics, Hazardous Areas, Educational facilities, and Biological Resources. The Wiconisco Creek Conservation Plan will serve as a springboard for implementing watershed restoration and community development projects while fostering cooperation between municipalities. It will also serve to increase public awareness and connect municipal decision making to the health of The Wiconisco Creek.

With the watershed residents and municipalities taking the lead, water quality and the quality of life within the watershed will continue to improve for generations to come.

Wiconisco Creek Watershed Conservation Plan

I. Description of the Wiconisco Creek Watershed

A. Location and Size

The Wiconisco Creek is a 42-mile long stream located approximately 20 miles north of Harrisburg, Pennsylvania. The Wiconisco Creek Watershed consists of 116 square miles (74,450 acres) of the Appalachian Mountain section of the Valley and Ridge Physiographic Province in northern Dauphin and western Schuylkill Counties. The creek has its headwaters in extreme western Schuylkill County and flows westward to its terminus, emptying into the Susquehanna River at Millersburg, northern Dauphin County. The watershed is distributed over the following U.S. Geological Survey (USGS) 7.5 Minute Topographic Quadrangle Maps: Millersburg, Elizabethville, Lykens, Tower City, and Pine Grove. Three major tributaries emptying into the Wiconisco Creek are: Rattling Creek, Bear Creek, and Little Wiconisco Creek. Numerous, small named and unnamed tributaries also drain into the Wiconisco Creek.

B. Political Boundaries

The Wiconisco Creek Watershed is located within two counties, Dauphin and Schuylkill, and encompasses all or part of the 11 townships and 7 boroughs listed below.

Dauphin County (9 townships, 6 boroughs)*

Townships

Upper Paxton
Jefferson
Williams
Rush
Lykens
Wiconisco
Jackson
Washington
Mifflin

Boroughs

Millersburg
Berrysburg
Elizabethville
Gratz
Lykens
Williamstown

Schuylkill County (2 Townships, 1 Borough)*

Townships

Porter
Tremont

Borough

Tower City

* Source: Stoe, Travis W. 1999. Water Quality and Biological Assessment of the Wiconisco Creek Watershed. Publication No.206. Susquehanna River Basin Commission. Harrisburg, Pa.

C. Topography/ Geology

The headwaters (Upper Basin) of the Wiconisco Creek Watershed are located between Big Lick Mountain to the north and Broad Mountain to the south. The middle reach (Bear Creek Basin, Rattling Creek Basin, Middle Basin, Gratz Creek Basin) of the creek is bounded to the north by both Bear and Short Mountains, while Berry, Broad, and Peters Mountains serve as the southern border. Berry Mountain continues as the southern boundary for the lower reach (Lower Basin, Little Wiconisco Creek Basin), and Mahantango Mountain borders the northwestern edge of the basin.

Elevation within the watershed ranges from 380 feet at the mouth of Wiconisco Creek to 1,785 feet at the top of Big Lick Mountain. The upper section of the main stem Wiconisco Creek is generally straight and fairly flat, and is characterized by wetlands and slow pool/run habitats. Two main tributaries enter Wiconisco Creek near the western end of the Upper Basin at the Borough of Lykens. Bear Creek drains southward through Bear Valley from its beginnings in Bear Swamp, and Rattling Creek enters Wiconisco Creek from its beginnings in Broad and Peters Mountains. Wiconisco Creek passes between Short Mountain and Berry Mountain just east of the Borough of Lykens. At this point the characteristics of the stream change. The stream is still relatively flat, but without the confinements of the mountains, the stream becomes highly sinuous. There are many small, unnamed tributaries that add to the flow of Wiconisco Creek between Lykens and the mouth at Millersburg. The largest of these streams drains the areas to the west of Short Mountain near the Borough of Gratz. The last major tributary, Little Wiconisco Creek, drains a large area southeast of Mahantango Mountain, and enters the Wiconisco Creek near Millersburg (Stoe, 1999).

The Wiconisco Creek Watershed lies within the Appalachian Mountain Section of the Valley and Ridge Physiographic Province, which is characterized by folded, faulted, and often steeply dipping stratified sedimentary rock sequences. The stream valley begins to the east of Tower City Borough, where Big Lick and Stoney Mountains join. These two ridges are representative remnants of the north and south trough of the Minersville Synclinorium. Big Lick Mountain, along with Short and Bear Mountains, form the axial region of the north trough of the Minersville Synclinorium, with Bear Creek generally serving as the axis. West of the Village of Loyalton, the Lykens Valley widens and becomes the axial region of the north trough of the Minersville Synclinorium, with the surrounding ridges of Berry and Mahantango Mountains forming the limbs of the synclinal fold. Stony and Sharp Mountains form the axial region of the southern trough of the Minersville Synclinorium. The north and south troughs are divided by the northeastward plunging and narrowing New Bloomfield Anticlinorium, located within the Broad Mountain/Rattling Creek portion of the watershed.

Five Pennsylvanian- to Devonian-aged geologic formations comprise the surface geology of the Wiconisco Creek Watershed area. The youngest of the formations is the Pennsylvanian-aged Llewellyn Formation, located in Bear Valley and therefore in the axial region of the north limb of the Minersville Synclinorium. Consisting primarily of grey, fine to coarse-grained sandstone, siltstone, shale, and conglomerate, the Llewellyn Formation is also the major anthracite coal bearing formation in Pennsylvania. In Bear Valley, there are as many as twelve (12) to fifteen (15) major coal beds in the Llewellyn Formation including the Buck Mountain, Seven Foot, Skidmore, Mammoth, Holmes, and Orchard coal beds.

The other Pennsylvanian-aged formation in the Wiconisco Creek Watershed is the Pottsville Formation. This formation is one of the major ridge formers in the watershed, surfacing to the north and south of the Llewellyn Formation on Big Lick, Short, and Bear Mountains. The ridges of Stony and Sharp Mountains are also Pottsville Formation ridges. Lithologies of the region include grey conglomerate, conglomerate sandstone, siltstone, and anthracite coal. There are five (5) to ten (10) major Pottsville Formation Coal seams.

Although the Llewellyn and Pottsville Formations outcrop over a small percentage of the Watershed, their impact on surface water quality is the most significant. Both formations were extensively mined by surface and underground methods wherever they occur within the Watershed, and several of these mines remain active.

The major valley formation in the Wiconisco Creek Watershed is the Mississippian-aged Mauch-Chunk Formation, which consists of less resistant interbedded brownish-grey to greyish-red siltstone, claystone, and poorly cemented sandstone. The formation occupied the lower valleys of the watershed from Tower City Borough, the Village of Muir, and Gratz Borough, westward to Millersburg. Most of the Mauch-Chunk Formation in the narrow valley east of Loyaltown is overlain with less than ten (10) feet of Quaternary-aged boulder colluvium that has weathered and eroded from younger formations on the ridges. However, west of the Village of Loyaltown and from Gratz Borough to Millersburg Borough, the formation is generally exposed throughout the wide valley with talus limited to the ridges' sideslopes. The Mauch-Chunk Formation has the highest areal percentage of all five (5) formations in the watershed and is also the most important aquifer. Nearly all private water supplies and most municipal wells in the watershed are located in this formation.

The Mississippian-Pocono Formation is the other major ridge (along with the Pottsville formation) in the watershed, consisting of less erosive grey sandstone, conglomerate, siltstone, and thin coal beds. This formation makes up the ridges of Berry, Mahantango, and Broad Mountains. The Pocono Formation is also an important water supply source, as several communities in the watershed obtain supplies from springs and surface water emanating from the formation.

The oldest rock in the Wiconisco Creek Watershed is the Mississippian-Devonian-aged Specht-Kopf Formation, which outcrops adjacent to the Pocono Formation in the Broad Mountain area. The Specht-Kopf Formation has light to olive-grey crossbedded sandstone and siltstone, as well as conglomerate and shale.

D. Climate

The climate in the Wiconisco Creek Watershed varies considerably from that in the southern Dauphin County/Harrisburg area. (See Table 1) Due to the watershed's location within the ridge and valley physiographic province, the area experiences lower average annual temperatures, higher levels of precipitation and shorter growing seasons than that for the southern Dauphin County area (below Peters Mountain). The mountains between the Harrisburg area and the Wiconisco Creek Watershed moderate the influence of northwesterly weather patterns in the Harrisburg area. However, overall, they cause a harsher climate in the watershed. Cloud cover is also more frequent in the Wiconisco Creek Watershed.

Table 1.
Comparison of the Wiconisco Creek Watershed and
Southern Dauphin County Areas' Climate

Area	Average Annual Temperature (Degrees F.)	Rainfall (Inches)	Average Annual Snowfall (Inches)	Growing Season
Wiconisco Cr. Watershed	49-50	42-46	40	Late April - Mid October
Southern Dauphin County	53	38-40	30	Mid April-October

Approximately sixty (60%) percent of the total annual precipitation can be expected during the growing season. This precipitation is primarily by showers and thunderstorms during the summer. Rainfall in thunderstorms is occasionally heavy and is usually accompanied by rapid water runoff. On the average, snow cover can be expected for twenty-five (25) to thirty (30) days per year.

E. Population/Socio-economic Profile

1. Population

In order to establish guidelines for planning decisions involving the physical, economic, and social development of the watershed, it is important to study the population and its relation to its respective county. A quantitative analysis of population trends and a qualitative analysis of population composition enables us to make reasonable projections for future population levels and needs. Analyses and projections such as these are a basic prerequisite for the development of any planning project. Land area requirements, for example, for future residential, commercial, industrial, and other development needs are directly related to the amount and type of population that must be served. Future population demand will also determine the number and scope of future school, park, playground, and other public facility needs. All of these elements are important in creating the most suitable environment for future residents of the Watershed.

In most localities, the topography has an influence on the distribution of the population (Dauphin County Planning Commission, 1992). The distribution of the population naturally follows these geographic features.

Since 1950, the Wiconisco Creek Watershed has experienced very slight shifts in population. Prior to 1970, the watershed population decreased modestly (4.3%) which is reflective of the national population movement to suburban areas during this time period. From 1970 to 1984 however, the watershed increased by 3.3%. Upper Paxton Township has shown the greatest increases in population since 1970. This trend is likely to continue in the near future. The actual population for each municipality as recorded in Census 2000, either wholly or partially within the watershed, is given in Table 2. However, it must be noted that while the actual population for the watershed itself appears to be inflated, it is not practical to provide actual watershed population numbers since many municipalities are located partially in the watershed and census data are given for

municipal boundaries. The watershed area is expected to continue to mirror the national trend of movement from central cities into suburban and rural areas. The projected populations for municipalities within the watershed are given in Table 3. Population allocations for municipalities in the Schuylkill County portion of the watershed are not available. However, the current population loss is expected to level off in the future (Ross, Pers.Comm., 2002).

Table 2 **Actual Municipality Population for Municipalities partially or wholly within the Wiconisco Creek Watershed**

Municipality	2000 Total Population	1990 Total Population	Change in Population
Berrysburg Borough	354	376	-5.85%
Elizabethville Borough	1,344	1,467	-8.38%
Gratz Borough	676	696	-2.87%
Jackson Township	1,728	1,797	-3.84%
Jefferson Township	327	385	-15.06%
Lykens Borough	1,937	1,986	-2.47%
Lykens Township	1,095	1,238	-11.55%
Mifflin Township	662	676	-2.07%
Millersburg Borough	2,562	2,729	-6.12%
Porter Township	2,032	2,560	-20.6%
Rush Township	180	201	-10.45%
Tower City Borough	1,396	1,518	-8.0%
Tremont Township	250	297	-15.8%
Upper Paxton Township	3,930	3,680	6.79%
Washington Township	2,047	1,816	12.72%
Wiconisco Township	1,168	1,372	-14.87%
Williams Township	1,135	1,146	-0.96%
Williamstown Borough	1,433	1,509	-5.04%

Source: U.S. Census Bureau

Table 3
Projected/Allocated Population for Municipalities
Within the Wiconisco Watershed

Municipality	Allocation/Year		
	2005	2010	2015
Berrysburg Boro.	355	356	356
Elizabethville Boro.	1361	1371	1381
Gratz Boro.	691	699	707
Jackson Twp.	1823	1876	1929
Jefferson Twp.	347	358	369
Lykens Boro.	1931	1927	1924
Lykens Twp.	1133	1154	1176
Mifflin Twp.	691	707	723
Millersburg Boro.	2585	2597	2609
Porter Twp.	*	*	*
Rush Twp.	186	190	193
Tremont Twp.	*	*	*
Tower City	*	*	*
Upper Paxton Twp.	4124	4230	4338
Washington Twp.	2170	2237	2305
Wiconisco Twp.	1170	1171	1172
Williams Twp.	1173	1194	1216
Williamstown Boro	1426	1422	1418

Source: Draft Dauphin County Comprehensive Plan, 2002

* Projected Population data not available

2. Housing

Housing is a basic human need and as such provides shelter from adverse environmental conditions as well as a place to live. In addition, housing provides financial benefits both its owner and community in that its owner has a sound investment that generally appreciates in value. Consequently, the community gains a solid tax base.

This section of the Wiconisco Creek Watershed Study will identify selected housing characteristics for each municipality and county within the watershed. For those municipalities partially located in the study area, municipal level data was used due to limitations in census geography. It must be noted that although data are given for the Dauphin County municipalities of Jackson Township, Jefferson Township, and Rush Township, the areas of these municipalities within the Watershed boundaries are generally uninhabited.

Housing Unit Characteristics

Several general parameters were employed to assess the quality of the watershed's housing stock. They included total number of occupied households in 1990 and 2000, the age of housing units in 1990 and 2000, Total housing units and their characteristics from 1990, and housing conditions/selected utilities for 2000. This information was compiled by county and municipalities and is presented in Tables 4-7.

- Number of Total Households

The number of total housing units (households) and characteristics from 1990 is presented in Table 4. The housing unit characteristics identify types of housing units within a municipality.

- Number of Occupied Households

The number of occupied households within the watershed is presented in Table 5. Data from 1990 and 2000 are presented along with the percent change from 1990 to 2000.

- Age of Structure

The age of a residence can be useful in the evaluation of structural conditions. Although the age of a building does not necessarily imply its condition, it facilitates identification of the potential for major repair/renovations and higher maintenance costs, such as heating.

Presented in Table 6 is the age of the housing units within the watershed. A very high percentage of these units were constructed prior to 1939. This characteristic is particularly evident in the more established boroughs such as Williamstown Borough (79.2%), Berrysburg Borough (61.2%), and Tower City Borough (68.1%). Townships, in general, tend to show a lesser concentration of older homes, the majority having been built after 1940.

Housing Conditions/Selected Utilities

A selected group of housing conditions and utilities were studied in order to assist in the determination of substandard housing and the possible need for community facilities. The following three (3) parameters were reviewed: units lacking complete plumbing facilities, sewage disposal used, and water source. The 1990 information is presented in Table 7.

- Plumbing Facilities

One reliable indicator of substandard housing units is the lack of complete plumbing facilities for exclusive use. As defined by the U.S. Bureau of the Census, the lack of complete plumbing for exclusive use includes those conditions in which:

- all three (3) specified plumbing facilities (hot and cold piped water, flush toilet, bathtub/shower) are present but also shared by another household
- some but not all of the facilities are present
- or none of the three (3) specified plumbing facilities can be found in the house.

- Sewage Disposal Method

Also shown in Table 7 are the types of sewage disposal used by watershed residents. As can be expected, those areas serviced by public sewer systems have a higher percentage of housing units using the public sewer.

Other means of sewage disposal include septic tanks and cesspools. These types of disposal methods can eventually contribute to the contamination of potable water supplies, causing sickness and disease.

- Water Sources

The majority of households within the watershed are serviced by public/private water systems.

**Table 4.
Total Housing Unit Characteristics**

County/Municipality	Number of Total Housing Units			1 Detached	1 Attached	2	3 or 4	5-9	10-19	20 or more	Mobile Home	Other
	1980	1990	2000									
Dauphin County	95,728	102,684	111,133	54,748	22,613	4,582	6,577	6,612	5,270	6,772	3,917	42
Berrysburg Boro.	156	153	147	114	14	7	4	2	0	0	6	0
Elizabethville Boro.	616	616	617	320	106	31	74	32	17	29	10	0
Gratz Boro.	154	317	333	225	24	26	7	0	4	26	21	0
Jackson Twp.	*	666	679	580	3	9	2	0	0	2	83	0
Jefferson Twp.	*	228	148	130	0	0	0	0	0	0	18	0
Lykens Boro.	972	919	919	515	177	53	67	18	15	40	34	0
Lykens Twp.	118	435	365	322	4	4	2	2	0	0	31	0
Mifflin Twp.	138	235	239	206	2	8	0	0	0	0	23	0
Millersburg Boro.	770	1,294	1,315	595	293	153	122	30	19	93	10	0
Rush Twp.	*	104	76	67	2	0	0	0	0	0	7	0
Upper Paxton Twp.	809	1,355	1,528	1,177	82	16	8	27	7	23	181	7
Washington Twp.	597	672	787	678	15	9	8	14	0	0	63	0
Wiconisco Twp.	576	554	536	416	66	3	7	18	1	0	25	0
Williams Twp.	401	489	509	408	25	6	11	8	15	0	36	0
Williamstown Boro.	721	705	711	409	140	32	63	54	0	0	13	0
Schuylkill County	64,825	66,457	67,806	34,922	20,599	2,685	2,817	1,688	600	1,516	2,943	36
Porter Twp.	1022	1,086	926	659	108	40	27	0	0	2	90	0
Tower City Boro.	687	676	684	376	154	40	47	12	8	23	24	0
Tremont Twp.	*	120	95	61	16	0	0	0	0	0	16	2

Source: U.S. Census Bureau

Table 5.**Occupied Households in Wiconisco Watershed Municipalities**

Municipality	2000 Number of Occupied Households	1990 Number of Occupied Households	Change in # of Occupied Households
Dauphin County			
Berrysburg Borough	144	137	4.9%
Elizabethville Borough	579	585	-1.03%
Gratz Borough	301	294	2.38%
Jackson Township	652	615	6.02%
Jefferson Township	133	140	-5.2%
Lykens Borough	810	852	-4.93%
Lykens Township	356	396	-10.10%
Mifflin Township	222	214	3.74%
Millersburg Borough	1,213	1,235	-1.78%
Rush Township	70	80	-12.50%
Upper Paxton Township	1,458	1,293	12.76%
Washington Township	756	642	17.76%
Wiconisco Township	476	515	-7.57%
Williams Township	454	444	2.25%
Williamstown Borough	611	645	-5.27%
Schuylkill County			
Porter Township	851	1,009	-18.6%
Tower City Borough	608	629	-3.4%
Tremont Township	95	110	-15.8%

Source: U.S. Census Bureau

Table 6.
Age of Watershed Housing (%)

County/Municipality	Prior to 1939	1940 to 1959	1960 to 1969	1970 to 1979	1980 to 1989	1990 to 1994	1995 to 1998	1999 to March 2000
Dauphin County	22.1%	25.6%	12.2%	16.5%	11.4%	5.8%	4.8%	1.4%
Berrysburg Boro.	61.2%	17.7%	2.7%	2.7%	5.4%	4.8%	4.1%	1.4%
Elizabethville Boro.	54.9%	17.7%	4.5%	8.4%	2.4%	7.6%	4.4%	0%
Gratz Boro.	46.5%	15.3%	7.8%	8.4%	12.6%	4.2%	4.5%	0.6%
Lykens Boro.	70.1%	13.8%	4.1%	7.0%	2.6%	0.9%	1.5%	0%
Lykens Twp.	44.7%	7.7%	3.3%	14.8%	12.1%	8.5%	7.1%	1.9%
Mifflin Twp.	38.5%	10.9%	2.5%	24.7%	11.3%	9.6%	1.7%	0.8%
Millersburg Boro.	48.8%	18.3%	13.4%	9.1%	7.5%	1.4%	1.4%	0%
Upper Paxton Twp.	23.7%	19.3%	8.2%	18.6%	14.7%	9.9%	4.8%	0.8%
Washington Twp.	26.4%	8.5%	9.3%	17.9%	13.2%	13.5%	8.3%	2.9%
Wiconisco Twp.	66.2%	10.8%	5.0%	10.1%	4.7%	2.1%	1.1%	0%
Williams Twp.	43.6%	12.4%	3.5%	19.4%	13.4%	3.1%	2.9%	1.6%
Williamstown Boro.	79.2%	13.5%	1.8%	3.0%	1.4%	0.3%	0.8%	0%
Schuylkill County	52.9%	16.5%	6.4%	10.7%	6.6%	3.8%	2.4%	0.7%
Porter Twp.	54.6%	17.5%	6%	10.2%	6.0%	2.9%	1.8%	0.9%
Tower City Boro.	68.1%	15.9%	5.0%	3.8%	1.8%	2.2%	2.6%	0.6%
Tremont Twp.	45.3%	13.7%	7.4%	17.9%	8.4%	2.1%	5.3%	0%

Source: U.S. Census 2000

**Table 7.
1990* Housing Conditions/Selected Utilities**

County/Municipality	Lacking Complete Plumbing Facilities				System of Sewage Disposal				Water Source			
	Total Units	Occupied			Vacant	Public Sewer	Septic Tank/Cesspool	Other	Public/Private System	Individual Well		Other
		Total	Renter	Owner						Drilled	Dug	
Dauphin County	498	384	215	169	114	82,873	18,986	825	80,516	20,405	1,250	513
Berrysburg Borough	3	0	0	0	3	125	23	3	5	141	5	0
Elizabethville Borough	8	8	2	6	0	592	20	4	587	19	2	8
Gratz Borough	**	**	**	**	**	36	272	4	264	44	4	0
Jackson Township	24	**	**	**	**	5	639	22	0	596	45	25
Jefferson Township	49	**	**	**	**	2	182	51	2	196	7	30
Lykens Borough	1	1	0	1	0	883	32	4	901	5	0	13
Lykens Township	6	6	2	4	0	2	423	16	2	360	35	44
Mifflin Township	4	2	0	2	2	2	220	7	2	196	13	18
Millersburg Borough	10	0	0	0	10	1,294	0	0	1,280	14	0	0
Rush Township	0	0	0	0	0	0	151	0	3	137	4	7
Upper Paxton Township	9	9	0	9	0	714	626	15	643	649	57	6
Washington Township	5	2	0	2	3	123	536	13	201	429	29	13
Wiconisco Township	4	4	2	2	0	20	512	22	445	90	9	10
Williams Township	22	10	8	2	12	154	320	15	323	140	10	16
Williamstown Borough	6	4	0	4	2	700	5	0	703	0	0	2
Schuylkill County	724	**	**	**	**	42,613	22,426	1,418	50,882	13,290	1,395	890
Porter Township	26	**	**	**	**	759	330	26	818	241	41	15
Tower City Borough	0	0	0	0	0	664	12	0	646	24	6	0
Tremont Township	0	0	0	0	0	2	130	3	41	86	8	0
Watershed Total						131,554	44,743	2372	138,218	36,047	2,856	1,548

*Census 2000 data for these parameters not available at the time of report preparation

** Data not available

Source: U.S. 1990 Census

3. Economic Base

The purpose of this study element is to describe the general economic base characteristics of the watershed region. The economic future of the watershed is based on its ability to produce goods and services. In order to support an expanding population and provide employment for an increasing labor force, the economic base must also grow. There are several retail centers in the watershed: Millersburg, Elizabethville, Lykens, Williamstown, and Tower City Boroughs. All are linearly dispersed east-west along U.S. Route 209; the primary transportation corridor of the watershed. Minor sections of concentrated development also occur along Route 209 as well as PA Route 25 passing through Berrysburg and Gratz Borough to the north. The majority of development is occurring within the land corridor formed by these two (2) routes; extending from Millersburg Borough to the Village of Loyaltown. Expansion east of Loyaltown is severely restricted due to the steep, mountainous terrain.

Employment Characteristics

Those commercial uses occupying the largest amount of land do not necessarily provide the greatest number of concentrated employment opportunities for the watershed. Table 8 clearly identifies the private wage and salary worker as the leading labor force classification, followed by governmental workers, and self-employed workers.

Categorizing the labor force in terms of employment can provide a more detailed understanding of the watershed's work force characteristics. The following distinctive occupational groups were used:

- Managerial and Professional Specialty
- Technical, Sales, and Administrative Support Service
- Farming, Forestry, and Fishing
- Precision Production, Craft, and Repair
- Operators, Fabricators, Laborers

As illustrated in Table 9, Production/Transportation/Material Moving account for the largest number of workers within the watershed. Sales/Office jobs comprise slightly fewer employees, with Managerial/Professional workers following closely. With some exceptions, the fewest people are employed in the forestry and fishing profession. These statistics confirm previous findings that manufacturing is the major employment sector of the watershed's work force.

Watershed municipalities can best generate jobs and expand their economic bases by encouraging existing businesses to invest in new capital equipment. There are numerous high-tech productivity-improvement applications that can be used in traditional, low-tech businesses. Job opportunities can thereby be created for the watershed's expanding working-age population range.

It is critical that a balanced strategy of business retention, expansion, and attraction should be developed and implemented in the watershed. The Wiconisco Creek Restoration Association and Upper Dauphin Council of Governments are two (2) viable organizations that could act as catalysts in bringing the public and private sectors together and successfully realize this economic strategy.

Relationship Between the Environment and Economic Base

The watershed's natural resources have, and will continue to have, a critical support role in maintaining and expanding the region's economic base. Fertile soils and sufficient groundwater are needed to support the agricultural industry. Farmers are encouraged to become farm-cooperators in the U.S.D.A. Natural Resources Conservation Service and Dauphin County Conservation District Program. Unpolluted ground and surface water supplies are necessary to support both agriculture and a growing residential population.

The watershed also contains the anthracite coal beds of the southwestern extremity of the Pennsylvania Anthracite Region. Environmentally sound methods of extraction and processing should be applied.

Environmental laws have affected most industries, particularly quarrying, mining, and coal processing. These laws require land reclamation of disturbed areas, and prohibit acid mine drainage and coal processing waste from contaminating watercourses. This imposes higher operating costs on the producer, who must reorganize his production methods to comply with such standards. One benefit to this industry is that these regulations for the burning of fossil fuels favor anthracite coal because of its low sulfur content. An attempt must be made to allow the watershed to continue to benefit from the income and growth generated from this natural resource without sacrificing the future integrity of the land and water resources, and without jeopardizing alternative land uses once the minerals have been extracted. Projects proposing to utilize culm would link past waste with modern technology and help revitalize the anthracite area as well as provide a use for most of the coal refuse banks that still exist throughout the area.

Further, one of the primary influences in retaining existing businesses and attracting new ones is a community's amenities, both natural and man made. Once a business has evaluated the economic potential of an area based on available resources, it must next evaluate the area as a place to live. A clean environment plays an influential role in business investment. Other considerations include an adequate educational system, health care delivery, housing, and governmental service. These are described in more detail elsewhere in this study.

Table 8.
2000 Employment and Labor Force Class

County/ Municipality	Employed Civilian Population Age 16+	Private %	Govern ment %	Self-Employed %	Unpaid Family Workers %	% of Civilian Labor Force Unemployed Age 16 +
Dauphin County	122,805	75.4	19.6	4.8	0.2	2.9
Berrysburg Boro.	148	83.8	11.5	4.7	0	3.9
Elizabethville Boro.	652	76.9	18.7	4.3	0	3.2
Gratz Boro.	290	76.6	13.1	9.7	0.7	1.3
Jackson Twp.	974	81.6	12.9	5.2	0.2	2.1
Jefferson Twp.	197	75.6	16.2	7.6	0.5	0.7
Lykens Boro.	836	78.7	15.9	5.6	0	3.6
Lykens Twp.	492	77.6	10.2	11.4	0.8	1.8
Mifflin Twp.	341	73.3	11.1	14.1	1.5	1.2
Millersburg Boro.	1,306	79.4	14.1	6.5	0	2.0
Rush Twp.	94	74.5	23.4	2.1	0	4.8
Upper Paxton Twp.	1,826	81.5	13.0	5.1	0.3	2.9
Washington Twp.	1,004	81.2	12.3	6.5	0	0.7
Wiconisco Twp.	523	81.3	16.8	1.9	0	1.7
Williams Twp.	561	77.5	16.9	5.5	0	3.3
Williamstown Boro.	554	79.6	15.9	4.5	0	4.2
Schuylkill County	63,902	81.9	11.4	6.3	0.4	3.2
Porter Twp.	930	83.0	12.5	4.1	0.4	1.3
Tower City Boro.	595	84.0	10.9	4.7	0.3	3.2
Tremont Twp.	124	87.1	8.9	4.0	0	4.0

Source: U.S. Census 2000.

Table 9.
2000 Employment by Occupation

Municipality	Male	Female	Managerial/ Professional	Sales/Office	Service	Farming, Forestry & Fishing	Construction/ Extraction/ Maintenance	Production/ Transportation/ Material Moving
Dauphin County	60,986	61,819	42,833	35,345	17,254	447	9,435	17,491
Berrysburg Boro.	86	62	23	38	11	4	37	35
Elizabethville Boro.	329	323	165	186	76	5	58	162
Gratz Boro.	164	126	53	66	36	3	36	96
Jackson Twp.	529	445	221	273	95	5	138	242
Jefferson Twp.	119	78	54	26	34	1	28	54
Lykens Boro.	483	353	114	222	109	0	99	292
Lykens Twp.	306	186	115	104	32	11	60	170
Mifflin Twp.	197	144	106	53	39	13	40	90
Millersburg Boro.	672	634	320	370	154	0	142	320
Rush Twp.	50	44	21	29	2	0	14	28
Upper Paxton Twp.	1,038	788	563	380	263	29	228	363
Washington Twp.	581	423	274	193	136	0	117	284
Wiconisco Twp.	259	264	60	122	64	4	72	201
Williams Twp.	327	234	116	128	57	0	72	188
Williamstown Boro.	311	243	109	123	61	0	60	201
Schuylkill County	35,119	28,783	15,125	14,585	9,188	312	7,500	17,192
Porter Twp.	546	384	97	236	83	13	111	390
Tower City Boro.	333	262	111	126	61	5	81	211
Tremont Twp.	74	50	17	19	5	3	31	49

Source: U.S. Census, 2000

F. Land Use

The greatest number of land parcels and the largest amount of gross acreage are devoted to agricultural activities ranging from field crops and orchards to beef, dairy, and poultry farming. Thirty-five (35%) percent of the land parcels in the watershed are devoted to some form of agricultural production or support activity. Forestland comprises a large portion of the watershed, taking up about fifty-seven (57%) percent of the land. Commercial business and service uses account for less than three (3%) percent

1. Existing Land Use Trends

As part of the overall watershed study, a generalized study of the region's existing land use was completed. The land use profile provides a picture of the development pattern of an area and, together with other factors, provides a basis for recommendations regarding future land use, community facilities, and environmental needs. Table 10 presents the existing land use inventory for the watershed area in 1999.

The present land use pattern for the watershed is generally characterized by large and small farming operations in the western half and mountainous woodlands located to the east. Residential and commercial uses are primarily found in the more densely developed boroughs and villages throughout the watershed. In addition, newer strip development is occurring in townships along existing rights-of-way. Approximately fifty (50%) percent of the eastern half of the watershed is made up of mountainous woodland with roughly one-half (1/2) of that area comprised of state game lands and forests. The remaining section also contains abandoned strip mines and culm banks. The Wiconisco Creek Watershed encompasses approximately 74,450 acres.

The land use within each category is summarized in the following pages.

Woodland Uses

The predominant use of land in the Wiconisco Creek Watershed Area is that of woodland, which comprises almost fifty-seven (56.98%) percent or 42,430 acres of the watershed. Woodland is made up of tracts that are primarily wooded with either deciduous or evergreen trees, including state-owned lands. In general, woodland is located along the mountain ridges and slopes. In some instances, this type of land can be found along the south side of the Wiconisco Creek.

Although woodlands, in many cases, represent prime areas for residential development, an effort should be made to preserve these tracts. Woodlands form a vital part of the watershed's ecological system, and significant development of such lands could destroy its environmental basis. Woodlands also serve the necessary function of preventing erosion, blocking strong wind currents that can damage crops and housing, providing shelter for small animals and birds, supplying firewood, and reducing storm water runoff.

Agriculture Uses

The second most common use of land in the watershed area is agriculture. A total of 29,395 acres or over thirty-nine (39.48%) percent of the watershed land is presently farmed or being used as pastureland.

Agriculture uses all of the land west of the state game lands (Short Mountain), within the fertile Lykens Valley. Predominant crops include corn, soybeans, and hay, with some raising of spring and winter grains, livestock, and poultry.

As agriculture is the primary component of the region's economic base, future development of existing agricultural lands must be carefully planned to preserve this component. In addition, farm owners/operators should utilize proper tillage practices in order to reduce the loss of fertile soils.

Existing Rights-of-Way

State and Local rights-of-way are estimated to occupy less than two (2%) percent of the Watershed area. This percentage is based upon the Pennsylvania Department of Transportation standards for state and local roads and, therefore, can be interpreted as estimation and is not included in Figure 1 or Table 10.

Residential Uses

Only a slight percentage of the watershed, approximately two and a half (2.46%) percent or 1,830 acres has been developed for residential purposes.

The majority of the early residential development occurred along the mouth of the Wiconisco Creek at Millersburg and continued easterly to the coal-mining communities of Wiconisco, Lykens, Williamstown, and Tower City. Further progress created the Boroughs of Elizabethville, Berrysburg, Gratz, and several other villages throughout the watershed. Older frame houses are located in these community centers surrounded by newer, single-family homes.

Generally, more recent development is scattered throughout the watershed area and has occurred through the subdivision of agricultural land. Single-family, detached dwellings located on lots of one-half acre or more with very few major subdivisions or land developments primarily characterize the development pattern.

Commercial and Industrial Land Uses

As noted in Table 10, a relatively small percentage of the watershed approximately four tenths of one percent (0.43%) or about 316 acres is used for commercial or industrial purposes. Commercial establishments are generally located in the boroughs and towns and include retail stores, gasoline stations, food stores, restaurants and other service-oriented businesses. In addition, two shopping centers are located in Washington Township and Upper Paxton Township respectively, and contain larger food stores as well as department stores. One landfill, Dauphin Meadows, Inc., is located Wiconisco Creek Watershed near Elizabethville. Approximately two tenths of one percent (0.24%) or 175 acres is old strip mine land, quarries and gravel pits. Major industrial employers are scattered around the watershed and include coal companies, shoe and garment factories, tool and die manufacturers, and a quarry.

In addition to Table 10, land use within each of the aforementioned categories is graphically displayed in Figure 1.

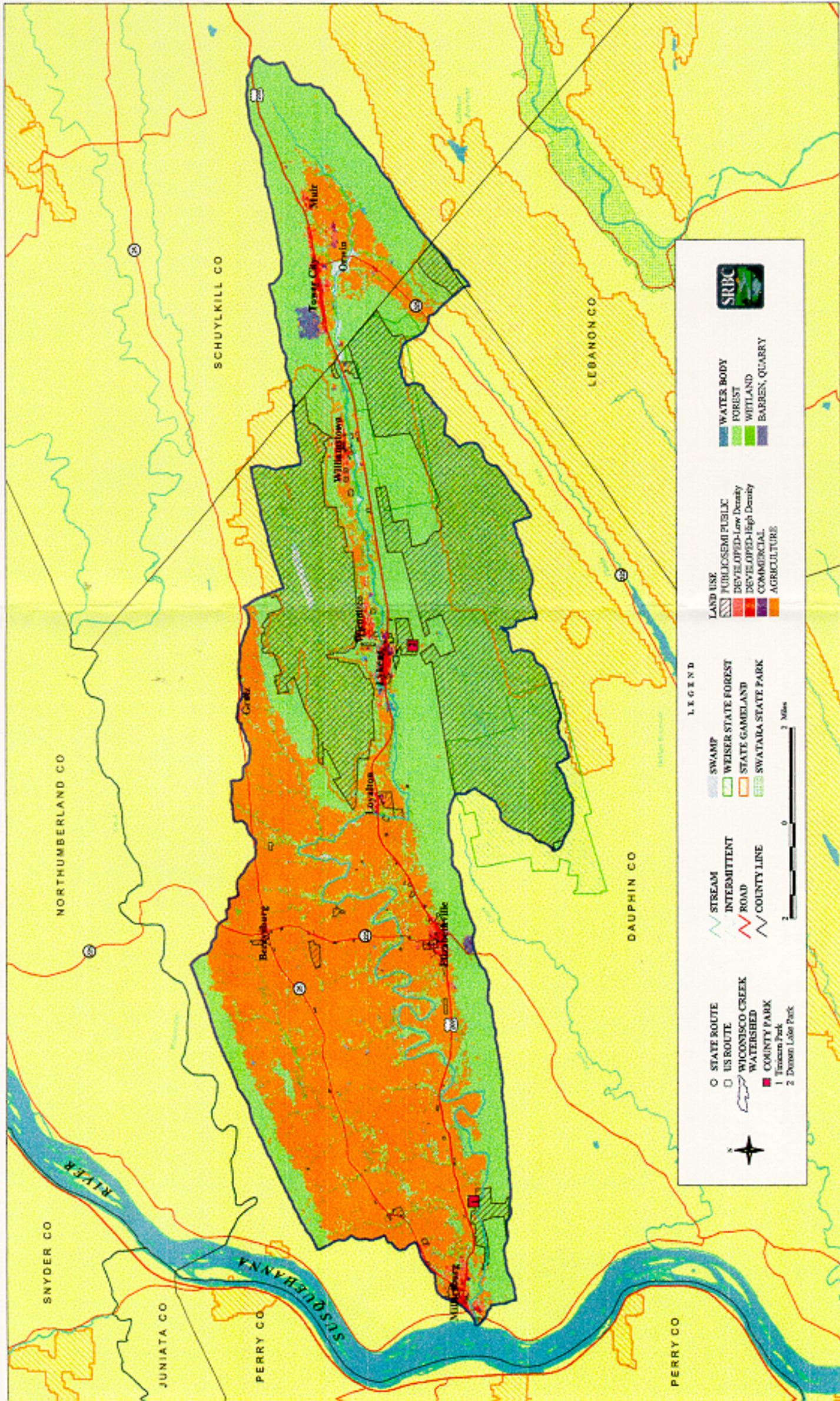


Figure 1. Land Use and State Lands in the Wiconisco Creek Watershed

Table 10.
Existing Land Use
Wiconisco Creek Watershed Area

Land Use	Square Miles	# Acres	% of Total
Cropland and Pasture	45.93	29,395.8	39.48%
Residential	2.86	1,830.4	2.46%
Commercial and Services	0.50	316.8	0.43%
Mixed Urban or Built Up Land	0.21	133.8	0.18%
Other Urban or Built Up Land	0.02	11.5	0.02%
Deciduous Forestland	66.11	42,307.8	56.82%
Evergreen Forestland	0.19	122.2	0.16%
Strip Mines, Quarries, and Gravel Pits	0.27	175.4	0.24%
Transitional Areas	0.17	106.9	0.14%
Nonforested Wetland	0.08	49.3	0.07%
Watershed Total	116.34	74,449.9	100.00%

Source: Stoe, Travis W. 1999. Water Quality and Biological Assessment of the Wiconisco Creek Watershed. Publication No. 206. Susquehanna River Basin Commission. Harrisburg, Pa.

2. Future Land Use

In the future, substantial land use changes will have to be made in order to protect the watershed. One important factor is the preservation of agricultural land, which should be maintained to protect the economic base and community needs of the watershed. A major goal is to prevent the destruction of this land. Development pressures are expected to increase in coming years, and accommodations for such growth must be made in a reasonable and prudent manner.

New residential and commercial development is largely dependent on the construction of public facilities that encourage growth, such as new highways that improve access and save commuting time, public water and sewer systems that invite developers and attract prospective homeowners, new community services, and facilities to improve the watershed's quality of life. This influx of people necessitates the financing and construction of new services and facilities to meet the needs of the expanded population.

New housing should be provided only in designated areas of the watershed, in a manner consistent with the rural character and agricultural base of the area, while limited to areas where a residential nature has already been established. Housing types should be of a range and price such that the needs of both present and future residents are met. Moderate cost housing should be encouraged to ensure that the young and the elderly are not driven by financial circumstances to seek housing elsewhere. Additionally, housing for higher-income families should be provided to ensure that the watershed's tax base remains stable. New residential and commercial development should not result in an increased tax burden for present residents.

The following assumptions have been set forth with consideration to future land use in the Wiconisco Creek Watershed area:

- An organized development approach should be applied throughout the entire watershed area. Such an approach would be beneficial to the area in that it would prevent further environmental degradation, preserve lands suitable for agricultural use, and provide for the compatibility with adjacent land uses.
- Agriculture should continue to be a major land use in the watershed area. In all probability, the slight reduction of agricultural land will be at the expense of residential expansion.
- Limited future residential development may continue outside the public sewer and/or water service areas, however, high-density residential development should be encouraged within service areas.
- Commercial establishments should continue to be service-oriented businesses, serving the watershed residents and those living in the immediate surrounding areas. Due to the lack of large population centers and easy access to the watershed, regional businesses appear unlikely.
- In all probability, major industrial employers should remain scattered throughout the region. There is the possibility of small light industries or high-tech industries locating in the watershed to utilize the available work force and lower land values.
- There appears to be little change expected in the watershed's public/semi-public land use. The only major changes that seem likely to occur are any additional purchases or sales of Commonwealth-owned state forests or state game lands.
- The minor increase in rights-of-way expected to occur would be to provide access to future residential developments.

3. Planning/Zoning

The Dauphin County Planning Commission and Tri-County Regional Planning Commission provide planning services for watershed municipalities within Dauphin County. The Schuylkill County Planning Commission provides planning services for the Wiconisco Creek Watershed municipalities within Schuylkill County. The primary duties of the Planning Commissions are to administer and enforce the county subdivision and land development ordinances in those areas of the counties that are not regulated by a municipal subdivision and land development ordinance. These primary duties are outlined in the Pennsylvania Municipalities Planning Code (M.P.C.), also known as Act 247. The M.P.C. states that all of the subdivision and land development plats located within municipalities that do have subdivision and land development ordinances must be reviewed and reported by the County Planning Commission.

The Pennsylvania Municipalities Planning Code gives municipalities the power and authority to establish and enforce land use controls. This legislation allows municipalities to prepare comprehensive development plans, and to establish zoning and subdivision and land development ordinances. The county's ordinance jurisdiction extends to municipalities that do not have these ordinances in effect.

Zoning is an important municipal tool to regulate the future use of land. A zoning ordinance divides all lands within a municipality into zones or districts, and establishes regulations for various types of land uses and development. Local subdivision and land development ordinances are the most commonly used land use control in the state. It is intended to protect against unwise and poorly planned growth.

Comprehensive Plans provide the necessary documentation and support information in order to effectively coordinate land use development within a municipality. It is known that land use patterns can affect the surface water flow patterns within a watershed. As additional development occurs and more impervious surfaces are created, natural drainage patterns are decreased; runoff increases, and groundwater recharge decreases. Appropriate planning measures enable communities to monitor, analyze, and react effectively to change while preserving the welfare of the citizens and the quality of their environs.

Currently, four (4) Boroughs and five (5) Townships within the Dauphin County portion of the Wiconisco Creek Watershed do not have municipal zoning ordinances. They are: Berrysburg Borough, Elizabethville Borough, Millersburg Borough, Williamstown Borough, Jackson Township, Jefferson Township, Mifflin Township, Rush Township, and Williams Township (Tri-County Planning Commission, 2001).

The following Boroughs and Townships within the Dauphin County portion of the watershed do not have Municipal Comprehensive Plans in place: Berrysburg Borough, Elizabethville Borough, Williamstown Borough, Jackson Township, Jefferson Township, Mifflin Township, Rush Township, Wiconisco Township, and Williams Township.

The Schuylkill County municipalities within the watershed (Porter Township, Tremont Township, Tower City Borough) do not have municipal zoning ordinances or Comprehensive Plans (Ross, Pers.Comm., 2002). Watershed municipalities in both counties with municipal zoning ordinances and/or municipal comprehensive plans are presented in Figure 2.

G. Infrastructure

1. Transportation Facilities

A description and analysis of the location and use of the existing highway system is an important component of the planning process. This section will offer a profile of the present transportation systems within the Wiconisco Creek Watershed study area, concentrating on the highway system and the traffic generated from the supporting land use.

The highway system of the area needs to operate in an efficient manner to maximize the accessibility and coordination of activities inside and outside of the study area. To analyze the highway network it is necessary to select the roadways that play a major role in the circulation of the area's vehicular traffic. Roadways chosen for this study were limited to minor arterials, major collectors, and minor collectors as classified by the U.S. Department of Transportation on the Federal Aid System. There are no major arterials present in the study area, as they are generally limited to interstate highways.

Data collection for this study was performed by interpretation of existing reports and studies. The reports will give a history of the present network as well as improvements noted for the future.

a. Highway Network

The efficiency with which an area's circulation system functions can greatly influence the extent of commercial, industrial, and residential development. The system must therefore permit expansion of the local economy within the area and also in the connecting urban regions. The watershed area has an effective internal transportation network. A principal highway interconnects all of the larger developed areas. As shown on Figure 3, the region has very good east/west movement provided by LR199 (PA

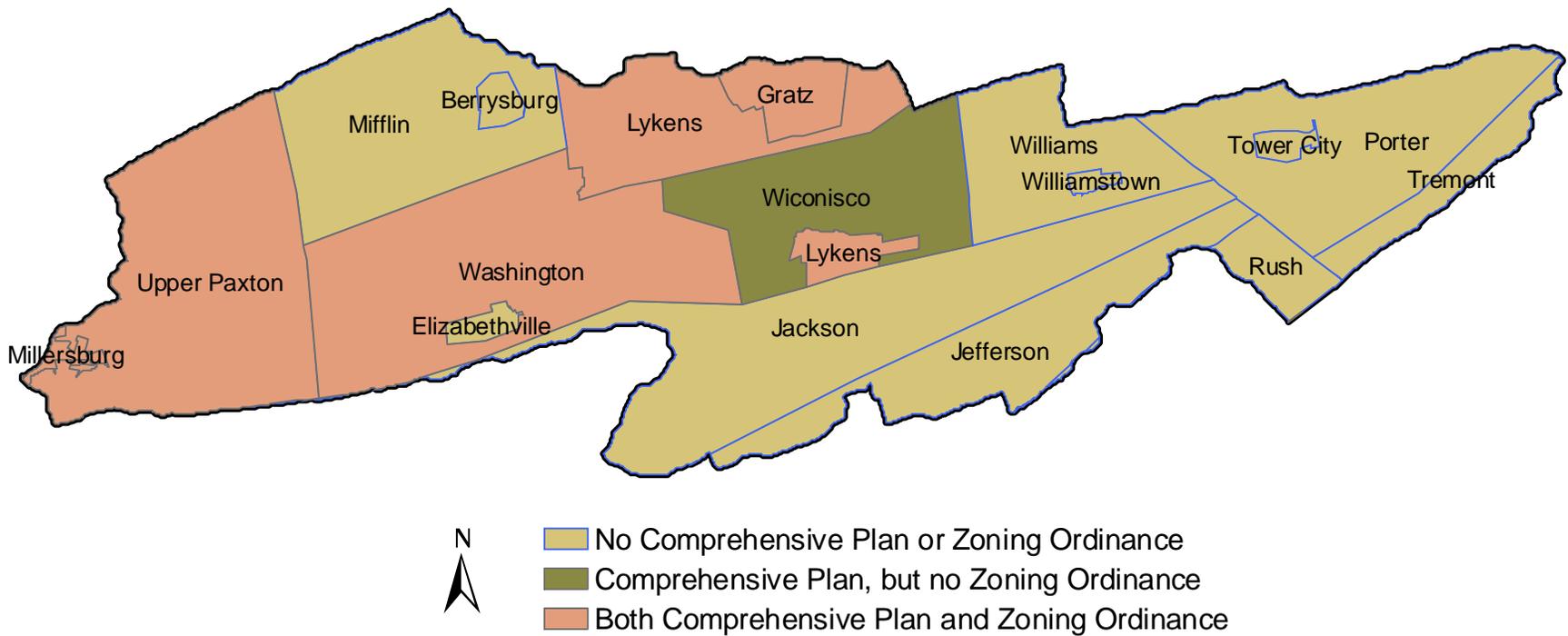


Figure 2. Map of Wiconisco Creek Watershed Municipalities with Comprehensive Plan and Zoning Ordinance Status

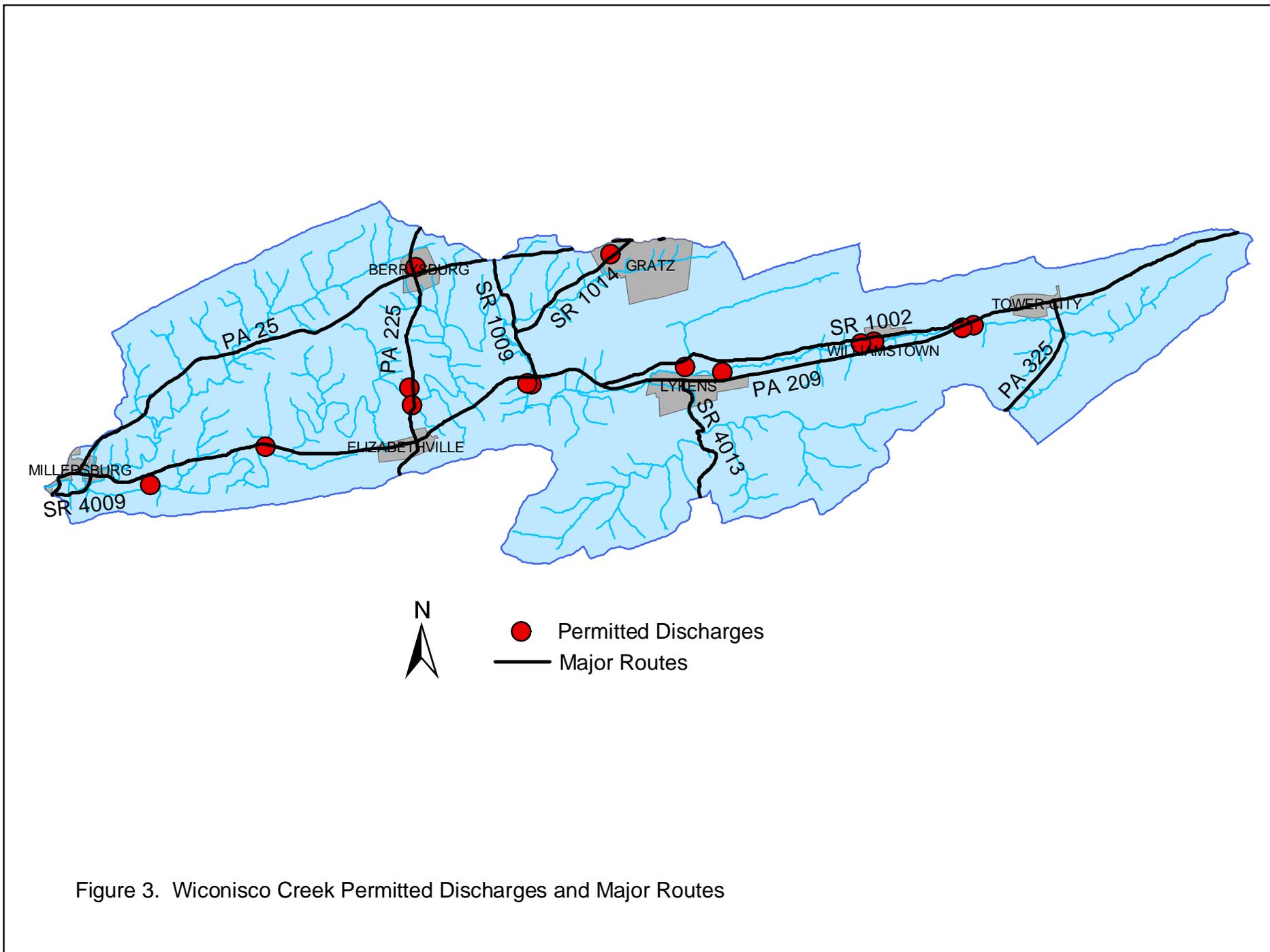


Figure 3. Wiconisco Creek Permitted Discharges and Major Routes

Rt. 209), LR336 and LR339 (PA Rt. 25), and LR22031 handling the majority of traffic. The north/south movement is handled primarily by LR22002 (PA Rt. 225) and by LR22035. There are also numerous local access roads to supply movement in the north/south direction that are not as extensively used.

Vehicular circulation to the surrounding urban areas is not quite as efficient as the internal network. The traveler is exposed to severe topographic features that limit highway use to a few roadways. The Susquehanna River imposes a restraint to westbound traffic, while mountainous terrain influences other directional travel. PA Route 225 offers an exit from the watershed area to the north and south. To the north it passes through a valley in the Mahantango Mountain, while to the south it climbs over Berry Mountain. LR001 (PA Rt. 147) follows the Susquehanna River and offers an option to north/south travelers. There are two other alternative travel routes available for north/south movement. LR22003 travels south from Lykens Borough and through the mountains of Haldeman State Forest before following the northern edge of Peters Mountain to the Susquehanna River. LR2204 (PA Rt. 325) starts in Tower City Borough, Schuylkill County, and travels south along the southern edge of Peters Mountain, finally ending at the Susquehanna River. The topographic features of the area may give an aesthetic offering but they severely limit the amount of highway circulation available to the outside of the watershed region.

The Pennsylvania Department of Transportation and the metropolitan planning organization, the Harrisburg Area Transportation Study, have classified the local and regional highways for planning and funding purposes. Functional classifications of the major routes that are located within the Wiconisco Creek Watershed are given in Table 11. Routes not listed in the table are considered local roads.

Table 11.
Functional Classifications of Major Routes
Within the Wiconisco Creek Watershed

Route	Municipality	Classification
PA 147	Millersburg Boro, Upper Paxton Twp.	Minor Arterial
PA 325	Rush Twp., Porter Twp., Tower City Boro.	Collector
PA 209	Millersburg Boro., Upper Paxton Twp., Washington Twp., Wiconisco Twp., Williams Twp., Porter Twp, Lykens Boro., Williamstown Boro., Elizabethville Boro., Tower City Boro.	Minor Arterial
SR 4009	Millersburg Boro.	Minor Collector
PA 25	Millersburg Boro., Upper Paxton Twp., Mifflin Twp., Berrysburg Boro., Lykens Twp., Gratz Boro.	Collector
SR 4013	Wiconisco Twp., Jackson Twp., Jefferson Twp., Lykens Boro.	Minor Collector
SR 1009	Washington Twp., Lykens Twp.	Minor Collector
SR 1014	Gratz Boro., Lykens Twp	Minor Collector
SR 1013	Gratz Boro.(small portion)	Minor Collector
SR 1002	Wiconisco Twp., Williams Twp., Williamstown Boro.	Minor Collector
PA 225	Washington Twp., Mifflin Twp., Elizabethville Boro., Berrysburg Boro.	Minor Arterial

Source: Tri-County Regional Planning Commission, 2002

Harrisburg Area Transportation Study

The Harrisburg Area Transportation Study (HATS) is an organization comprised of federal, state, and local agencies, and officials from Cumberland, Dauphin, and Perry Counties, the City of Harrisburg, and Capital Area Transit. HATS is commonly referred to by its official federal designation of "MPO" or Metropolitan Planning Organization.

Established in 1965, HATS is divided into two specialized committees, which oversee the transportation-planning program for the Region. The Coordinating Committee develops transportation plans and improvement programs. The Technical Committee oversees analyses and preparation of plans and studies, and makes recommendations to the Coordinating Committee.

The HATS planning process emphasizes short and long-term problem solving and involves the public in the development of a Transportation Plan, Transportation Improvement Program, Short Range Transit Plan, and Congestion Management System. The planning process culminates in the preparation and approval of a biennial Transportation Improvement Program, which constitutes the first four-year period of the Commonwealth's Twelve-Year Program. Projects slated for improvements within the first four-year period of the Pennsylvania Department of Transportation's 2003 Twelve Year Plan within the Wiconisco Creek Watershed are presented in Table 12.

Table 12
Proposed Transportation Projects
Wiconisco Creek Watershed

C= Construction, F= Final Design, U= Utilities, R= Right of Way Acquisition

Phase/year

Municipality	Project	Description	2003	2004	2005	2006	4-Year/TIP Project Total
Lykens	Lykens Railroad Station	Acquisition of Historic Railroad Station in Borough	R				\$ 85,000
Upper Paxton	Little Wiconisco Cr. Bridge	Replace bridge on SR 4008 over Little Wiconisco Cr.	F,R,U	C			\$530,000
Washington	Market St.-North	Resurface,realign, shoulders, bridge rehab & replacement	C				\$1,595,000
Washington	Church St. Bridge	Replace bridge on SR 1021 over Wiconisco Cr.	F	R,U	C		\$1,036,000

Source: Tri-County Regional Planning Commission, 2002

b. Railway Network

The only active railroad in the Wiconisco Creek Watershed is owned by the Norfolk and Southern Railroad and travels north from the Harrisburg area and crosses the Wiconisco Creek Watershed in the Millersburg area, Dauphin County along the Susquehanna River. Several abandoned railways are found in the mid to upper watershed. Railway information and status are given in Table 13.

c. Airports

The South Central Pennsylvania region is serviced by one major airport, Harrisburg International Airport. However, one small public airport is located in the Wiconisco Creek Watershed and is located 4 km south of Tower City in Rush Township, Dauphin County.

d. Ferries

The Millersburg Ferry provides access across the Susquehanna River from Millersburg Borough to Perry County. From Millersburg, the Ferry transports vehicles, passengers and pedestrians daily from early spring to late fall to a right-of-way through a campground in Buffalo Township to U.S. Route 11/15.

TABLE 13 Wiconisco Creek Watershed Railways/Status

Dauphin County	From	To	Status	Mileage
Seg. # 22_041	Rockville	Northumberland Co.	ACTIVE	Not Given
Seg. # 22_140	Schuylkill Co.	Lykens	ABAND.	6.0
Seg. # 22_430A	Millersburg	Elizabethville	ABAND.	8.4
Seg. # 22_430B	Elizabethville	Lykens	ABAND.	5.2
Schuylkill County				
Seg. # 53_140A	Dauphin Co.	Brookside	ABAND.	5.27
Seg. # 53_140B	Brookside	Keffers	ABAND.	5.22

* Source: PA DCNR, 2002

2. Community Facilities/Utilities/Services

Community facilities and services are provided by local government to protect the public health and safety and to insure the general welfare of its residents and businesses. The availability and adequacy of such facilities and services reflect the community's desirability as a place in which to live and work.

The purpose of this study element is to describe the scope of the following public facilities and services available throughout the Wiconisco Creek Watershed:

- Schools
- Hospitals/nursing homes
- Parks
- Public safety services
- Public sewerage services
- Public water services
- Solid waste disposal

a. Schools

The following three (3) public school districts serve residents of the watershed:

- 1) Millersburg Area School District, consisting of the Middle School/High School and Lenkerville Elementary School;
- 2) Upper Dauphin Area School District, consisting of the Upper Dauphin Area High School, Upper Dauphin Area Middle School, and Elementary School located in Loyaltown.
- 3) Williams Valley School District, consisting of the Williams Valley Junior/Senior High School, Tower City Elementary School #1, Williamstown Elementary #2, and Williamstown Elementary #3. This School District serves residents of both Dauphin and Schuylkill Counties.

The following three (3) non-public schools also serve residents of the watershed:

- 1) Berrysburg Christian Academy
- 2) Lykens Christian School
- 3) Muir Christian Academy.

There are seven institutions of higher learning located in Dauphin County, as follows:

- 1) Academy of Medical Arts and Business - Harrisburg
- 2) Electronics Institute - Middletown
- 3) Harrisburg Area Community College - Harrisburg
- 4) PA State University, Capitol Campus - Middletown
- 5) PA State University, Hershey Medical Center - Hershey
- 6) Thompson Institute - Harrisburg
- 7) University Center at Harrisburg - Harrisburg

b. Hospitals/Nursing Homes

Although not located in the watershed, area residents are served by the following hospitals:

- Community General Osteopathic Hospital-Pinnacle Health – located in Harrisburg, this is a 178-bed facility providing general services in medicine, surgery, pediatrics, obstetrics, and special care (burn, cardiac, intensive, and telemetry care).
- Edgewater Psychiatric – located on Front Street in Harrisburg, this facility provides psychiatric treatment.
- Harrisburg Hospital-Pinnacle Health – located in Harrisburg, this is a 450-bed facility offering general hospital services as well as special care units for surgical, neonatal, obstetrics, pediatric, and psychiatric services.
- Polyclinic Medical Center-Pinnacle Health – located in Harrisburg, this is a 570-bed facility including eighty (80) long-term care beds. In addition to medical, surgical, neonatal, obstetrics, gynecological, pediatric, cardiac, and intensive care, there are also medical rehabilitation and psychiatric care services provided.
- Hershey Medical Center – located in Hershey, this 332-bed facility provides general services in the medical, surgical, neonatal, obstetric, gynecological, pediatric, cardiac, psychiatric, burn, and self-care fields, as well as other special care services.
- Harrisburg State Hospital – located in Harrisburg, this 513-bed facility provides long-term psychiatric care services.
- Pottsville Hospital – located in Pottsville, this facility was founded as a community-owned hospital in 1895, The Pottsville Hospital and Warne Clinic is a 200-bed acute care, not-for-profit facility providing a full range of general hospital services.
- Holy Spirit Hospital and Health System – located in Camp Hill, this 296-bed facility provides obstetric, surgery, medical rehabilitation, and general hospital services.

The Tri-Town Medical Center, located in Williamstown Borough, and the Frederick Health Center in Millersburg, provide medical care services to watershed area residents.

The following nursing homes are located in the watershed:

- Kepler home – this 36-bed facility is located in Elizabethville Borough
- Susquehanna Lutheran Village – this 203-bed facility is located in Millersburg Borough.

c. Libraries

Branches of the Dauphin County Library System can be found in Elizabethville, Millersburg, and Lykens. Specific services provided at each Branch include reference information, reader's advisory services, children's services, mail order delivery, and audio-visual services and equipment. The State Library of Pennsylvania, located in Harrisburg, is the back-up major resource collection for the Central Pennsylvania Area.

d. Museums

The Millersburg/Upper Paxton Twp Heritage Museum is located at 330 Center Street in Millersburg. Also, Gratz Historical Society has or plans to have museum displays open to the public at its location. The Ned Smith Center for Nature and Art is located in Millersburg and is currently constructing a permanent 34,000 square foot facility that includes a modern gallery, interpretive center and theater.

e. Public Safety Services

Public safety services, consisting of local fire companies, police departments and emergency medical services (EMS), are provided by many local municipalities. While the majority of these services are based within the corporate limits of borough governments, their jurisdictions extend into the surrounding rural townships. Through mutual agreements, the Counties can also dispatch to fire companies outside of their County. A listing of local fire companies and ambulance service is presented in Table 14.

f. Public Water Services

The primary source of drinking water for several public water supplies (Boroughs of Williamstown, Lykens, and Gratz) is from surface water intakes, reservoirs, and springs. Other public systems (Boroughs of Tower City, Millersburg, and Elizabethville) rely on a combination of surface and ground water sources. Table 15 lists public water suppliers, service areas, population served, consumption, and sources within the watershed.

- Elizabethville Borough

The Elizabethville Water Company provides public water service to the Borough and adjacent developed areas in Washington Township. Water supplies are drawn from two (2) streams, three (3) springs, and two (2) drilled wells. Water flows to a small, opened concrete collection basin located on Berry Mountain south of the Village of Loyaltown and two (2) miles east of the Borough Reservoir. Also in the general area is Company Well, housed in a cinderblock structure. This is an emergency source and can be pumped only by a diesel engine located at the site; no electricity is available. Water moves through and eight (8") inch cast iron pipe and empties into a 375,000 gallon open concrete reservoir and a connecting 125,000 gallon reservoir on Berry Mountain. Water from Lentz Well, located 100 yards east of the reservoirs, also feeds into the reservoir. A phosphate feeder taps into the main distribution line, and the

water receives gas chlorination. The distribution system consists of about seventeen (17) miles of cast iron pipe.

- Gratz Borough

The Gratz Water Authority provides public water service to the Borough only. The system is fed by one (1) well and two (2) springs. Water flows from these sources to a 28,800 gallon concrete reservoir housed under the same roof as the pumps and the chlorinator. Chlorinated water is distributed by pumps to a 100,000 gallon elevated steel standpipe, and then to the distribution system, which consists of about 3.5 miles of four (4") inch and six (6") inch diameter cast iron pipes.

- Lykens Borough

The Lykens Borough Authority provides public water service to all but a small portion of the Borough and extends into the adjacent village area of Wiconisco Township. Water flows from the East and West Branches of Rattling Creek into their respective dams. Water flow from these dams can be fed to the main line independently or supply the main reservoir directly. The reservoirs and dams are located one (1) mile southeast of the Borough. Gas chlorine is injected into a twenty (20") inch main line. The unit is housed in a cinderblock structure at the dam site. Water to the Borough and to the southern part of Wiconisco is gravity fed. A booster pump station directs water to a 100,000 gallon standpipe located on the mountainside north of Wiconisco. The distribution system consists of fourteen (14) miles of iron, steel, and concrete pipes of eight (8") inch to ten (10") inch diameter.

- Millersburg Borough

The Millersburg Area Authority provides public water service to the entire Borough and developed portions of Upper Paxton Township adjacent to the Borough. Water supply sources consist of nine (9) wells and six (6) springs. The supply receives both chlorine and fluoride treatment. The distribution system incorporates about twenty-two (22) miles of one (1") inch to twenty-four (24") inch diameter iron, steel, PVC, A/C, and CU pipe.

- Williamstown Borough

The Williamstown Authority provides public water service to the entire Borough and developed portions of Williams Township adjacent to the Borough. South of the Borough, on Berry Mountain, water collects in a small impounding dam which is collectively fed from the East Branch of Rattling Creek, Greenfield Creek, Updegrave's Run, and Nine O' Clock Creek. The water then enters a ten (10") inch screened intake and is conveyed to an open, upper reservoir, and subsequently a lower reservoir. Each reservoir has an intake which allows separate or combined flow to the transmission main. Flows enter the distribution system in an opened, concrete balancing reservoir on Bear Mountain, north of the Borough. The distribution system consists of fourteen (14) miles of three (3") inch to ten (10") inch cast ductile iron pipe.

- Tower City Borough

The Tower City Borough Authority provides public water service to the Borough and adjacent sections of Porter Township. The Authority utilizes three (3) wells and three (3) springs as water sources. A reservoir is located at the base of Stony Mountain is used as a backup supply, with water being pumped into the Peter's Mountain Reservoir. Treatment involves chlorination and chemical treatment to protect the pipes from corrosive water. The distribution system is made up of twelve (12) miles of galvanized, cast iron, ductile, and cement pipes.

g. Public Sewerage Services

Local authorities in Berrysburg, Elizabethville, Lykens, Millersburg, Williamstown, Wiconisco, and Tower City Boroughs provide public sewerage services. Table 16 lists sewerage service providers, service areas, population connected, type of treatment, plant capacities and flows, and receiving streams within the Watershed.

* Following text/data taken from 1995 Dauphin County Sewerage Plan

* Additional data provided by Tri-County Regional Planning Commission, 2002.

- Berrysburg Borough

Berrysburg Wastewater treatment Plant, built in 1985, is located in the Borough of Berrysburg and currently services the Borough area only. The facility serves approximately 300 people, mainly residential and sparse commercial land uses. The 2002 hydraulic loading capacity of the plant is 0.035 mgd. The 1992 average daily flow was 0.021 mgd.

The treatment process involves carbon nitrogen wastewater secondary treatment. The effluent is discharged into the Wiconisco Creek. The excess sludge is found to have a high copper content and is hauled to a landfill in Elizabethville. The facility may be expected to serve an ultimate population of 495. The 2002 average daily flow is expected to be 0.018 mgd.

The Borough of Berrysburg owns the sewage treatment plant, however, the municipal authority operates and maintains the facility on a daily basis. The system is reported to be in good condition.

The Municipal Authority does anticipate some sewer line extensions on streets within the Borough boundaries. However, these extensions are not included in a five (5) to ten (10) year planning period. The Borough's population has been decreasing since 1980 and is not expected to increase soon.

- Elizabethville Borough

The Authority owns, operates, and maintains the sewage treatment system located in Washington Township. The primary treatment system was built in 1969 and upgraded to secondary treatment facilities in 1975. The plant services approximately 1900 persons in Elizabethville Borough and adjacent portions of Washington Township with a capacity of 0.274 mgd.

This primary and secondary treatment facility had experienced problems caused by aging equipment. The plant has undergone system upgrading, which resulted in improved sludge, grit, and grease removal. The Borough of Elizabethville has initiated Act 537 Planning. Future sewered areas include residential development extending from the Borough on Route 209. Expansion plans are to increase capacity before 2004.

- Lykens Borough

Lykens Borough residents receive public sewage services from the Lykens Borough Authority Sewage Treatment Plant. The plant services a population of approximately 2,140 and is located on South Second Street in Lykens Borough. This facility has recently undergone an upgrade. The upgrade has resulted in an increase in the flow capacity from 0.27 mgd to 0.41 mgd. The Borough Authority owns and operates the STP and its collection lines.

- Millersburg Borough

The sewage treatment facility located in Millersburg Borough serves the entire Borough and an adjoining portion of Upper Paxton Township. The facility is owned and operated by Millersburg Area Authority and has a design capacity of 1.325 mgd and an organic loading capacity of 1700 lbs BOD₅ /day. The facility utilizes primary settling and the activated sludge process. Sludge is stabilized by aerobic digestion.

The main pumping station operated at approximately thirty-one (31%) percent of total capacity in 2002.

There are no immediate plans for sewer extensions, treatment upgrades, line construction, or pump station replacement or additions. The Authority does foresee a population increase north of Millersburg Borough in upper Paxton Township and feels public sewer service will be needed in those growing areas. Residential growth is expected to occur extending north on Route 147, SR 4002, north on Route 25, and T369, or Charles Road.

- Washington Township

Over 90% of all residents utilize on-lot disposal systems. Residents in the Loyaltan area are serviced by the Upper Dauphin Middle School Treatment Plant.

- Williamstown Borough

The Williamstown Wastewater Treatment Plant was built in 1965 and is located in Williams Township. The facility serves Williamstown Borough and a small portion of Williams Township. The plant serves approximately 1,500 people.

The facility utilizes high rate trickling filters followed by secondary sedimentation. The hydraulic daily loading capacity of the facility is 0.375 mgd. The five-year (1988-1992) annual average hydraulic and organic loading was 0.192 mgd and 249 lbs BOD₅/day respectively. Hydraulic or organic overloads are not expected within the next five years. This facility is running at 67% capacity in 2002.

- Wiconisco Township

Wiconisco Township has constructed, in the last eleven (11) years, a sewage treatment plant, collection lines, and the associated pumping stations. The 2002 maximum capacity is permitted at 0.125 mgd.

The treatment process involves a gravity sewer system, which conveys wastewater to receive primary treatment using aerated facultative lagoons for mixing, aeration, and secondary treatment. The receiving stream is Bear Creek, a tributary of the Wiconisco. The excess sludge will be kept in detention until disposal is necessary.

The new STP has replaced all existing disposal facilities within the Wiconisco Village Area as well as a small treatment plant serving a twenty (20) unit public housing development called Minnich Terrace.

The sewage treatment plant and collection lines are newly constructed. There are no additional extensions planned or problems requiring corrections at the present time.

h. Solid Waste Disposal

The only municipal solid waste hauler in the watershed is Lykens Borough. Private haulers provide remaining pickup and disposal services. Dauphin Meadows, Inc., located in Washington and Upper Paxton Townships, is the only permitted landfill in the watershed.

i. Municipal Buildings

Depending upon staff needs and services provided, municipal buildings are maintained by local governments as borough halls, township buildings, municipal garages, or municipal maintenance and equipment storage facilities. Such buildings, in one or more forms, are maintained separately or on a shared basis by each local government unit or authority.

TABLE 14.

Fire Companies and Police Departments
within the Wiconisco Creek Watershed.

Fire Company	Location
Volunteer Fire Co. #1	Tower City, Schuylkill Co.
Sheridan Fire Co.	Sheridan, Schuylkill Co.
Berrysburg and Community Fire Co.	Berrysburg, Dauphin Co.
Gratz Fire Co.	Gratz, Dauphin Co.
West End Fire Co.#3	Tower City, Schuylkill Co.
Reinerton Fire Co.	Tower City, Schuylkill Co.
Reliance Hose Co. #1	Elizabethville, Dauphin Co.
Millersburg Fire Co.	Millersburg, Dauphin Co.
Liberty Hose Co. #2	Lykens, Dauphin Co.
Wiconisco Fire Engine Co. #1	Wiconisco, Dauphin Co.
Orwin Fire Co.	Muir, Schuylkill Co.
Muir Volunteer Fire co.	Muir, Schuylkill Co.

Police Depts.	Location
Lykens Boro. Police	Lykens, Dauphin Co.
Elizabethville Boro. Police	Elizabethville, Dauphin Co.
Millersburg Boro. Police	Millersburg, Dauphin Co.
Tower City Boro. Police	Tower City, Schuylkill Co.
Williamstown Boro. Police	Williamstown, Dauphin Co.
Wiconisco Twp. Police	Wiconisco, Dauphin Co.
Pennsylvania State Police Troop H	Elizabethville, Dauphin County

**Table 15
Public Water Services**

Location	Service Area	Population Served	Consumption (GPD) Max./Avg.	Water Sources
Elizabethville Boro.	Elizabethville Boro. Washington Twp.	1,830 +/-	115,000/93,000	2 Wells/3 Springs 2 Streams
Gratz Boro.	Gratz Boro.	750 +/-	50,000/30,000	1 Well/2 Springs
Lykens Boro.	Lykens Boro. Wiconisco Twp.	3,200 +/-	861,000/573,258	1 Stream
Millersburg Boro.	Millersburg Boro. Upper Paxton Twp.	4,500 +/-	571,000/373,216	9 Wells/7 Springs
Williamstown Boro.	Williamstown Boro. Williams Twp.	2,400 +/-	500,000/343,000	2 Streams/1 Well
Tower City Boro.	Tower City Boro. Porter Twp.	4000 +/-	240,000/234,000	3 Wells/3 Streams
Washington Twp. (Loyalton Water Association)	Village of Loyalton	130 +/-	--/8,000	2 Wells/1 Spring

Sources: PA Department of Environmental Protection; Dauphin County Comprehensive Plan, 1992.

**Table 16
Public Sewerage Services**

STP (Site)	Service Area	1992 Pop. Served	1992 Avg. Daily Flow (mgd)	1992 Design Capacity (mgd)	2002 % Capacity	Treatment Type	Receiving Stream
Berrysburg Boro.	Berrysburg Boro.	300	0.021	0.035	51.43%	Secondary	Wiconisco Creek
Elizabethville Boro.	Elizabethville Boro. Washington Twp.	1,900	0.208	0.273	84.31%	Secondary	Wiconisco Creek
Lykens Boro.	Lykens Boro.	2,140	0.22	0.27	46.83%	Secondary	Wiconisco Creek
Millersburg Boro.	Millersburg Boro. Upper Paxton Twp.	4,650	0.374	1.0	31.55%	Secondary	Susquehanna River
Wiconisco Twp.	Wiconisco Village	1,250	0.125	0.734	48%	Secondary	Bear Creek
Williamstown Boro.	Williamstown Boro. Williams Twp.	1,500	0.177	0.375	67.47%	Secondary	Wiconisco Creek
Tower City Boro. Porter Twp.	Tower City Boro. Porter Twp.	*	*	*	*	Secondary	Wiconisco Creek

* Data unknown

Source: Tri-County Regional Planning Commission, 2002

H. Previous Studies

There have been several studies on the Wiconisco Creek Watershed over the years. In fact, the Wiconisco Watershed is one of the most studied watersheds in Dauphin County. Most of these studies have been commissioned by, or performed by, the Pennsylvania Department of Environmental Resources (now PA Department of Environmental Protection).

The first of these studies was commissioned by DER and published in 1973 by Sanders and Thomas, Inc.. This project was called Operation Scarlift. Its purpose was to determine the specific nature and extent of mine drainage pollution in the Wiconisco Creek and to recommend steps to be taken for the immediate reduction and eventual abatement of the pollution.

The most comprehensive studies of the chemical and biological water quality conditions of the Wiconisco Creek Watershed were those conducted by the PA Department of Environmental Resources (PA DER) in 1977 and 1983.

In 1981, an Aquatic Biological Investigation was performed on an unnamed tributary to Wiconisco Creek on December 23. The purpose of this study was to determine whether the treated leachate discharge at Fulkroad's landfill was resulting in the degradation of the stream's benthic community.

The Wiconisco Creek Watershed Study (1985) was performed by personnel from DER's Bureau of Water Quality Management as an update to the Operation Scarlift report done in the early 1970's. This report was conducted at the request of the watershed association at the time (Wiconisco Creek Watershed Association). The report stated that the Mine Drainage severely affects the ability of the Wiconisco Creek to support a desirable aquatic community over almost its entire length and gives recommendations for remediation.

The Wiconisco Creek Watershed Study, Phase I (1985) was the first report to bring to light all of the existing environmental, population, socio-economic, land use, housing, transportation, and community facility conditions throughout the watershed. This report was prepared by the staff of the Dauphin County Planning Commission and the Dauphin County Conservation District.

In 1986, the Wiconisco Creek Watershed Study, Phase II presented potential solutions to the principal problems identified in Phase I.

In 1998, Travis Stoe of the Susquehanna River Basin Commission (SRBC) conducted the "Water Quality and Biological Assessment of the Wiconisco Creek Watershed" to examine water quality and degradation problems in the watershed.

In 1999, Travis Stoe of the SRBC authored the "Wiconisco Creek Watershed Assessment and Plan". This report used the problems defined in the previous study as the basis for targeting areas of the Wiconisco Creek Watershed for remediation activities. Recommended actions were given for remediation of mine drainage and agricultural problems.

In 1999, the Dauphin County Conservation District, with funding from PA DEP's Bureau of Mining and Reclamation Watershed Restoration and Partnership (WRAP) Act Grant Project, conducted water quality sampling of several mine discharges. Also, this project is the first of its kind in Dauphin County to attempt to remediate the effects of Atmospheric Deposition (Acid Rain) on a stream.

The Natural Areas Inventory for Dauphin County was completed in 2000 by the Nature Conservancy for the Tri-County Regional Planning Commission and includes several important natural areas within the Wiconisco Creek Watershed.

The Dauphin County Conservation District received Growing Greener Funds in 2000 to continue water quality monitoring of mine discharges and stream water in addition to developing a conceptual plan for the treatment of the mine discharges.

In 2001, the Dauphin County Conservation District received Growing Greener funds to document the present surface water hydrologic conditions in the Bear Creek Watershed and to update and begin implementing some of the mine drainage mitigation activities suggested in the Operation Scarlift report.

During the summer of 2003, the Dauphin County Conservation District performed a study of the Little Wiconisco Creek. Nitrate levels were found to be exceedingly high (20 mg/l) at the upstream sites. Stream bank fencing and riparian zone condition were also examined. Results were presented to the general public at several informative workshops held in the Little Wiconisco Creek Watershed.

In Spring, 2003, the Dauphin County Conservation District applied for, and was subsequently awarded Clean Water Act Section 319 funding to begin two projects within the Watershed. The first grant involved construction of agricultural Best Management Practices (BMP's) in the Little Wiconisco Creek Watershed. The second grant was for construction of mine drainage remediation ponds to treat one discharge within the Bear Creek Watershed.

II. Land Resources

A. Soils

In the Dauphin County portion of the Wiconisco Creek Watershed, two major soil associations are present. They are the Dekalb-Lehew Association and the Calvin-Leck Kill- Klinesville Association. These soil associations are based on a particular type of landscape that has a distinctive pattern of soils. The soils named in the association comprise the majority of soils found within that association. Other soils not named may still be found within the associations. Table 17 shows the soils associations and their acreage.

▪ Dekalb – Lehew Association

These soils are found almost entirely on the upper slopes, ridges, and flats of Mahantango, Berry, Coal or Thick, and Peters Mountains. The entire Rattling Creek Sub-watershed consists of the association. These soils are nearly all forested and often have stones larger than ten (10”) inches in diameter on the surface. Such soils are also found on slopes that range from gentle to very steep.

Since the Dekalb and Lehew soils have very similar characteristics, they are mapped in Dauphin County as a single soil-mapping unit. The Dekalb soils are formed in soil material from red sandstone and red shale.

Due to rather shallow bedrock (2 to 3.5 feet) these soils have severe limitations for on-lot sewage disposal systems. Severe slopes may also be a restriction for this type of disposal system.

The primary distinguishing characteristic of the soils in this association is the depth to bedrock, which is a limiting factor for these soils. All of the soils are well drained and were formed in materials of red sandstone and shale.

The large amount of shale fragments found throughout the soil profile in the Calvin – Leck Kill – Klinesville soils is an easily recognizable feature. It is common for Klinesville soils to have fifty (50%) to sixty (60%) percent shale fragments by volume throughout the soil profile. Calvin soils often have as much as fifty (50%) percent shale fragments by volume. As a result these soils have a low moisture holding capacity and are often droughty. In order to protect the inherent productivity and characteristics of these soils, soil conservation practices should be applied to cropland.

Soils of minor importance that may be found within the Calvin – Leck Kill – Klinesville Association include Barbour, Basher, Atkins, and Albrights.

- Calvin- Leck Kill

Due to the similarity of the Calvin and the Leck Kill soils and because they are extensively intermingled on the landscape, these soils are identified as a soil complex (single mapping unit) in the “Dauphin County Soil Survey”. From a practical standpoint the boundaries between Calvin and Leck Kill soils cannot be clearly identified on a soil survey map.

The Calvin – Leck Kill soils’ primary limitation for on-lot sewage systems is the depth to bedrock of the Calvin phase (2 to 3.5 feet). The Leck Kill phase is deeper (3.5 to 6 feet) and for the most part is not a limiting factor for on-lot systems. These factors must be checked in the field on a site-to-site basis since the Calvin and Leck Kill soils are mapped as a soil complex. Slow permeability of water may also be a limitation.

The primary land use of these soils is for agricultural purposes. More urban encroachment of this association is likely to occur in the near future.

- Klinesville

The Klinesville soils are mapped two ways in the Dauphin County Soil Survey (Kunkle, et.al., 1972). They are mapped as a separate soil series (Klinesville) or in a soil complex (Calvin-Klinesville). The primary distinguishing characteristic of this soil from the Calvin and the Leck Kill soils is the depth to bedrock (1 to 1.5 feet). Where a mapping unit is easily distinguished, the Klinesville soil is identified individually. However, the Calvin – Klinesville complex was derived for the same reason as the Calvin – Leck Kill complex; the Calvin and Klinesville soils are often so intermingled that each soil cannot be easily identified as a mapping unit. The steeper areas within this complex tend to be Klinesville soils.

The major limiting factors for on-lot sewage systems in the Klinesville soils and the Calvin – Klinesville Complex is the depth to bedrock (1 to 1.5 feet).

In the Schuylkill County region of the Wiconisco Creek Watershed, there are two (2) soil associations present. They are the Leck Kill – Meckesville – Calvin Association and the Dekalb – Buchanan – Hazelton Association.

- Leck Kill – Meckesville – Calvin Association

The characteristics of the Calvin – Leck Kill soils in this association are similar to those in the Calvin – Leck Kill – Klinesville Association found in Dauphin County. However, the Meckesville soils are very different from the Klinesville soils. The Meckesville soils are formed in colluvial material on the uplands and are deep and well drained. The lower part of the subsoil has a very firm and brittle fragipan. The seasonal high water table is within a depth of thirty (30”) to forty-two (42”) inches during wet periods.

- Dekalb – Buchanan – Hazelton Association

The characteristics of the Dekalb soils are similar to those in the Dekalb – Lehew Association in Dauphin County. The Buchanan and Hazelton soils, however, differ from the Dekalb or Lehew soils.

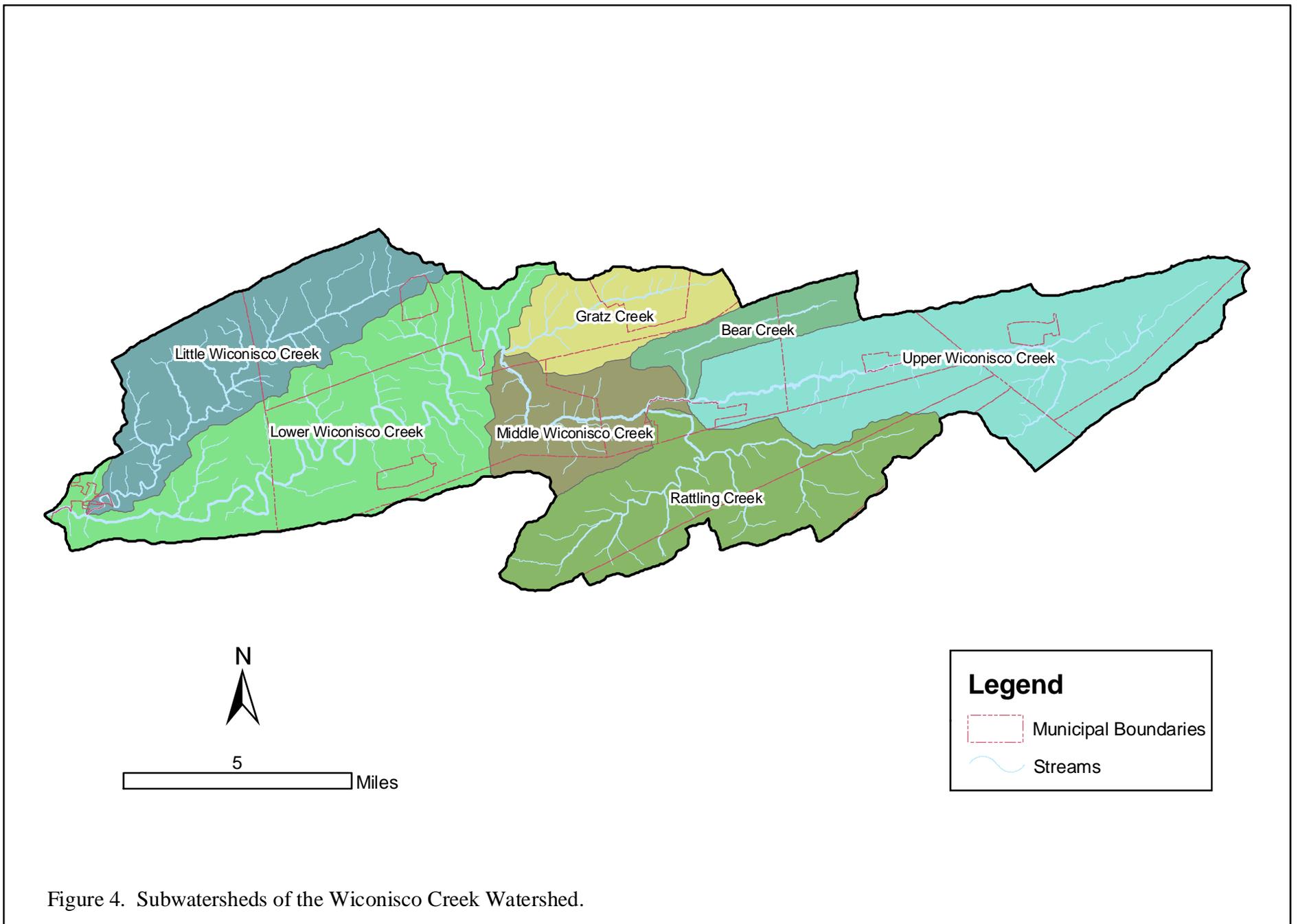
The Buchanan soils are deep, moderately well to somewhat poorly drained, and are formed in colluviums found in the foot slopes of the mountains. Slow permeability and a seasonal water table are serious limitations for on-site waste disposal.

Hazelton soils are deep and well drained, and are formed on the top and sides of mountains. Hazelton soils are not extensive in the Wiconisco Creek Watershed region of Schuylkill County.

Table 17. Soil Associations within the Watershed

Soil Association	Acres in Watershed
Duncannon-Urban Land-Chavies	49
Hazelton-Dekalb-Buchannon	34,128
Leck-Kill-Meckesville-Calvin	35
Uderthents-Dekalb-Hazelton	40,205

Source: Stoe, Travis W. 1999. Water Quality and Biological Assessment of the Wiconisco Creek Watershed. Publication No. 206. Susquehanna River Basin Commission. Harrisburg, Pa.



1. Soil Erosion

Soil erosion, the detachment and removal of soil particles from the soil surface by rainfall, and the consequent sedimentation are serious problems throughout the non-forested areas of the watershed, and threatens the long-term productivity of the agricultural land. The sedimentation of the waterways changes the aquatic system by covering the gravel streambed and destroying the freshwater environment. Erosion from logging operations and stream bank and earthmoving construction sites also contributes to the sediment loads of the waterways.

The most severely eroding agricultural region in Dauphin County is the Wiconisco Creek Watershed. This is true because of the nature of the soil associations that comprise the region. In addition, extensive areas of corn and soybean planting and fairly steep slopes contribute to this problem, as well as the area's several logging operations. Such erosion lessens the water holding capacity of the soils and exposes large shale formations.

2. Hydrologic Soil Groups

Hydrologic soil groups, developed by the U.S Department of Agriculture's Soil Conservation Service (now known as the Natural Resources Conservation Service), are classified into four (4) groups indicating the runoff potential for the majority of the soils found in the United States. In the Wiconisco Creek Watershed, three (3) groups are present; Groups B, C, and D. Group C extends over a major portion of the watershed, and has slow infiltration rates when thoroughly wetted. Small areas of Hydrologic Soil Groups B and D are also found in the watershed. Group B is located in the Millersburg area (the northern part of the Borough) and represents soils with moderate infiltration when thoroughly wetted. Group D is found in the previously surface-mined areas of the eastern end where a high runoff potential exists.

B. Woodlands

Woodland covers much of the land surrounding the Wiconisco Creek. The valleys, however, have mostly been cleared for agricultural purposes and therefore contain a significantly smaller number of trees. Overall, forests comprise approximately fifty-seven (57%) percent of the land area in the watershed. In general, forests dominate the mountains of the watershed region. The Mahantango, Broad, Big Lick, Short, Coal, and Berry Mountains are covered with stands of oak, black gum, maple, hemlock, and pine. In the minor forested areas (the valleys), maple, sycamore, river birch, ash, tulip polar and mixed hardwoods are more common. Cherry, black locust, maple, and pine are the most prevalent types of trees found in the valleys and farmland areas.

The Rattling Creek Sub-watershed, south of Lykens Borough, is the most undisturbed area in the entire Wiconisco Creek Watershed. Over ninety-five (95%) percent of this area is owned and operated by the Pennsylvania Game Commission, the Pennsylvania Department of Conservation and Natural Resources, and/or the Lykens Borough. Forests comprise approximately ninety-eight (98%) percent of the Rattling Creek Sub-watershed.

The damage of recent and current gypsy moth infestations is the most visible forest resource problem throughout the Watershed. Being selective of oaks, the gypsy moth has damaged or killed thousands of acres of forests in the region. The volume or cost estimates of this damage are unknown. Ecologically, the gypsy moth is changing the monocultural forests (oaks) to a more

diversified tree population. As the oaks die out, they will eventually be replaced by red maple, black gum, and white pine. The present gypsy moth suppression program is primarily directed at solving the public nuisance problem associated with the larvae.

Another forest resource concern is the long-term impact of acid rain. The loss of nutrients such as calcium and magnesium from soil and foliage due to acid rain stresses and weakens trees, making them more susceptible to climatic and insect stress.

The Pennsylvania State Game Commission and the Pennsylvania Department of Conservation and Natural Resources' Bureau of Forestry own, operate, and maintain a significant amount of forested land area north and south of Lykens Borough. These areas include:

DCNR, Bureau of Forestry	
Haldeman State Forest Tract	5333 acres
Greenland State Forest Tract	2977 acres
Pennsylvania State Game Commission	
State Game Lands 210	11061 acres
State Game Lands 264	8782 acres

The Haldeman State Forest Tract is located almost entirely within the Wiconisco Creek Watershed, and the Greenland Tract is completely contained in the Watershed. State Game Lands 210 also traverses large areas in the Powells and Clarks Creek Watersheds located to the south of the Wiconisco Creek Watershed. Only a small portion of State Game Lands 264 does not drain into the Wiconisco Creek.

C. Landfills

Dauphin Meadows, Inc., located in Washington and Upper Paxton Townships, is the only permitted landfill in the Wiconisco Creek Watershed. In December of 1987, the landfill was closed down due to overfilling and associated environmental problems. In September of 1990, the DEP granted the facility a permit for expansion and allowed the re-opening of the site. Currently, this facility is undergoing intergovernmental review for a proposed western expansion. Dauphin Meadows has responded to DEP's public process identifying the harms and benefits of the landfill's proposed expansion. In response to this, Dauphin Meadows appears to be using technology to mitigate the impacts of the landfill on nearby properties. Dauphin Meadows is currently operates as a multi-state landfill however, the Dauphin County Planning Commission has historically envisioned this facility handling Dauphin County waste and not as a multi-state facility (Dauphin County Planning Commission, 2002). During 2002, this facility had accepted a limited amount of waste (less than 100 tons/day) to fill in areas and was scheduled to be capped and closed by the end of 2002 (Rathfon, 2002). The landfill is currently closed but the parent company is expected to file a new application to expand the facility.

There is one non-permitted closed landfill within the Wiconisco Creek Watershed. The old Fulkroad landfill started in the late 1960's and was closed in the mid 1970's (Rathfon, 2002)

D. Hazardous Areas

1. Abandoned Mines

The Upper Wiconisco Creek Sub-watershed is dotted with many abandoned strip mines, mine tunnels, and associated crop falls. These areas pose a definite hazard to hikers, hunters, and others due to the instability of the surrounding earth and/or the dilapidated condition of the tunnel structures. While some work has begun to address the discharges from these abandoned mines, the watershed continues to be impacted by Abandoned Mine Drainage. A complete list of mine tunnels and their discharge characteristics is given in section VIII.

2. Coal Refuse Piles

Sheridan Coal Banks is a 250-acre coal refuse pile perched above the village of Sheridan. The potential exists for instability of the refuse piles during storm events resulting in possible landslides with loss of life or property. Additionally, open stand pipes, unstable coal refuse piles, and lack of appropriate fencing are a hazard to trespassers who use the site for recreational ATV operation. Although some maintenance activities have taken place yearly since construction, the site is currently in a state of extreme disrepair. Sheridan Banks has returned to being one of the major pollution sources in the watershed as well as a known hazard for local residents. A description of the remediation history of the Sheridan Coal Banks is given in section VIII.

III. Water Resources

A. Major Tributaries

With a total watershed area of 74,450 acres, the Wiconisco Creek is fed by numerous tributaries. They are of a wide spectrum of sizes, ranging from a few tenths of a mile to 8 or ten miles in length. Two main tributaries enter the creek near the western end of the Upper Basin at the Borough of Lykens. Bear Creek drains southward through Bear Valley from its beginnings in Bear Swamp, and Rattling Creek enters Wiconisco Creek from its beginnings in Broad and Peters Mountains. The Wiconisco Creek Sub-watersheds are presented in Figure 4.

There are many small, unnamed tributaries that add to the flow of the Wiconisco Creek between Lykens and the mouth at Millersburg. The largest of these streams drains the area to the west of Short Mountain near the Borough of Gratz. Stoe (1998) referred to this creek as "Gratz Creek" however, most sources consider it unnamed. The last major tributary, Little Wiconisco Creek drains a large area southeast of Mahantango Mountain and enters Wiconisco Creek near Millersburg. A list of tributaries and drainage area is given in Table 18.

Table 18. Wiconisco Creek Tributaries and Drainage Area in Square Miles

Tributary	Drainage Area (sq. mi.)	Percent of Wiconisco Creek Watershed
Wiconisco Creek	116.0	100.0
Bear Creek	4.69	4.0
Rattling Creek	19.5	16.8
East Branch Rattling Creek	9.31	8.0
Nine O'clock Run	2.31	2.0
Stone Cabin Run	2.06	1.8
West Branch Rattling Creek	9.14	7.9
Wolf Run	0.73	0.6
Mud Run	1.1	0.9
Hawks Nest Run	0.62	0.5
Shale Run	1.4	1.2
Dry Run	0.31	0.3
Doc Smith Run	0.82	0.7
Big Run	0.56	0.5
Canoe Gap Run	0.82	0.7
Little Wiconisco Creek	17.5	15.1

Source: Stoe, Travis W. 1999. Wiconisco Creek Watershed Assessment Plan. Publication 206. .
Susquehanna River Basin Commission. Harrisburg, Pa.

1. Stream Use Designations

The PA Department of Environmental Protection (PA DEP) develops water quality standards for all surface waters of the state. Use designations are a part of these standards. The main stem of the Wiconisco Creek, Little Wiconisco Creek, and all unnamed tributaries to Wiconisco Creek west of the Route 209 bridge at Loyaltown, PA. are classified as warm water fisheries (WWF). Cold water fisheries (CWF) within the Watershed include all unnamed tributaries east of Loyaltown and Bear Creek. Rattling Creek is included in the Commonwealth's Special Protection Program, and the stream from the confluence of the east and west branches to the mouth is designated as a high quality cold water fishery (HQ-CWF). The headwaters of Rattling Creek, from the source to the confluence of the east and west branches, are designated as an exceptional value (EV) watershed. An exceptional value stream or watershed is defined as, "...a stream or watershed which constitutes an outstanding national, state, regional, or local resource, such as waters of national, state or county parks or forests, or waters which are used as a source of unfiltered potable water supply, or waters of wildlife refuges or state game lands, or waters which have been characterized by the Pennsylvania Fish and Boat Commission (PFBC) as "wilderness trout streams," and other waters of substantial recreational or ecological significance" (PA DEP, 1998). The PFBC stocks trout in the lower 16 miles of Wiconisco Creek.

B. Floodplain

Flooding has historically occurred in the Wiconisco Creek Watershed, especially during the major floods of 1889, 1936, and 1972. Most likely due to the low, flat topography, the watershed area has been subject to varying amounts of destruction from flood activity. In June of 1972, Tropical Storm Agnes deposited an unprecedented quantity of rainfall over the Middle Atlantic States, causing severe damage along the Susquehanna River and its tributaries such as the Wiconisco and Rattling Creeks. This affected all of the creek's communities and demonstrated the need for proper land use management within the floodplain.

Flood Hazard Areas, as identified by the U.S Department of Housing and Urban Development, Federal Insurance Administration, are areas particularly susceptible to flooding. These areas are then mapped for the purposes of delineating the Regulatory Floodplain (100-year floodplain and floodway) for all waterways. Residents whose properties lie within the Regulatory Floodplain may insure themselves against future flood damage at federally subsidized rates. New construction is governed by building regulations adopted by each municipality in accordance with the National Flood Insurance Program and the Pennsylvania Floodplain Management Act, Act 166, as amended.

At present all of the Wiconisco Creek Watershed communities are in compliance with the National Flood Insurance program (NFIP) and Act166 regulations.

C. Stormwater

1. Act 167

Stormwater management involves the control of water that runs off the surface of the land from rain or melting ice or snow. The volume, or amount of runoff and its rate of runoff, increases as land development occurs. Pennsylvania's Stormwater Management Act of 1978 (Act 167) provides grant monies to Counties to develop stormwater management plans for designated watersheds such as the Wiconisco Creek Watershed. Work for the proposed Wiconisco Creek Watershed Stormwater

Management Plan is currently in progress. The Draft Wiconisco Creek Watershed Stormwater Management Plan is likely to be completed by the end of 2004 and the final plan is expected to be approved sometime in 2005. Upon completion of the plan by the county and approval by DEP, municipalities in the watershed adopt ordinances consistent with the plan. Developers are then required to follow the local drainage regulations that incorporate the standards of the watershed plan when preparing their land development plan. Low interest loans to correct storm drainage problems are then available through PENNVEST, the Pennsylvania Infrastructure Investment Authority. These loans are available for the construction, improvement or rehabilitation of stormwater systems and installation of best management practices to address point or nonpoint source pollution associated with stormwater.

2. NPDES

In 1990, the U.S. Environmental Protection Agency (EPA) developed permitting regulations for stormwater discharges as required by the federal Clean Water Act. Effective October 1992, all construction activities proposing to disturb five or more acres of land must be authorized by a National Pollutant Discharge Elimination System (NPDES) permit. Additionally, all construction activities proposing to disturb one to five acres and have a point source discharge to surface water require an NPDES General Small Construction Stormwater Permit. Stormwater from certain municipalities requires an NPDES permit. The municipalities that require NPDES stormwater discharge permits are referred to as MS-4 municipalities based on population density. Currently, there are no municipalities within the Wiconisco Creek Watershed that are classified as MS-4 municipalities.

D. Hydrology

Management of water resources requires knowledge of the quantity of water that is available for use and which must be managed in order to provide for the safety and welfare of the public. For studies of water use and quality, low flow conditions are of general concern; whereas, for floodplain/stormwater management it is necessary to know the high flow characteristics of streams and the locations of drainage problem areas.

E. Wetlands

Wetlands, a vital element in the hydrologic cycle, have gained much attention in the last few years as people are recognizing their qualities as a valuable resource that requires protection. Wetlands are defined by the United States Fish and Wildlife Service as transitional lands between terrestrial and aquatic systems where the water table is at or near the surface or where land is covered with shallow water (Dauphin County Comprehensive Plan, 1992).

Wetlands and slow pool/run habitats are the main characteristics of the Wiconisco Creek's upper regions (Stoe, 1999). Tower City Swamp is a large wetland located just South of Tower City, Schuylkill County in the vicinity of PA Route 325. Bear Swamp, located at the headwaters of Bear Creek, is contained entirely within State Game lands #264 between Bear Mountain and Big Lick Mountain in Wiconisco Township, Dauphin County. Bear Puddles is a series of shallow woodland pools at the headwaters of Doc Smith Run and is located within State Game Lands #210 and Weiser State Forest in Jefferson Township, Dauphin County. Such ecosystems provide a wide variety of important functions in the environment for man. Their existence helps to ensure food and natural habitat for an assortment of wildlife. They create safe areas for migrating and nesting birds, as well as wintering areas for migrating and stationary fowl. Wetlands naturally form

breeding, spawning, and feeding grounds, and provide natural cover for nursery areas for fish (Dauphin County Comprehensive Plan, 1992).

Wetlands are also instrumental in cleaning the water that flows through them. As the water sits in the shallows of a wetland, it is no longer able to carry the same volume of materials that it could while moving at higher speeds. Consequently, the dissolved nutrients, metals, and sediments are able to precipitate out. This is a particularly effective method for removing pollution from streams and creeks.

F. Surface Water Quality

One of the most important components of this watershed study is the water quality of the Wiconisco Creek. Unfortunately, this body of water is notorious for problems stemming from acid mine drainage, poor nutrient management, and general mistreatment by the public. From the earliest mining days to the present, man has used “The Black Creek” for his dumping grounds, unloading tons of mining waste and garbage. Today the Wiconisco Creek is in better condition, due to the closing of the majority of the mines and the continued interest of the Wiconisco Creek Restoration Association and other conservation groups. Despite the recent efforts to clean the creek however, the water still struggles to restore a complete biological community. A complete listing of aquatic macroinvertebrates and fish found to occur in each sub-watershed of the Wiconisco Creek is given in Appendix C.

The surface water quality of the Wiconisco Creek Watershed varied dramatically due to the influence of past and present human activities. Mine drainage, coal silt, municipal and on-lot sewage disposal, and farmland runoff have all contributed to surface water degradation. Because of this, the watershed has been the subject of many water quality studies of both a chemical and biological nature. Unfortunately, only the effect of abandoned mine drainage and, to some extent, municipal sewage has been well documented. The consequences and extent of on-lot sewage disposal and farmland runoff (both are nonpoint pollution sources in the watershed) are not well understood to date. The most severely degraded portion of the Wiconisco Creek is in the Upper Basin, east of the Borough of Lykens. A study conducted in the mid-1960’s by the Federal Water Pollution Control Administration indicated that considerable water quality degradation had occurred in the upper Basin due to mine drainage from active and abandoned mines, as well as from coal silt, coal refuse piles, and untreated municipal wastewater discharges. Some recovery had occurred at the mouth of the Wiconisco Creek. The Pennsylvania Department of Environmental Protection has conducted a number of more extensive studies primarily to identify and quantify sources of mine drainage in the eastern headwaters of the watershed. The first of these was done in 1971 under the Operation Scarlift Mine Drainage Pollution Abatement Project. Water quality was sampled monthly for a year from forty-one (41) locations throughout the headwaters of the watershed. About ten of these points were actual mine discharges. The DEP’s most complete study was conducted from May of 1981 to September of 1982. Weekly samples were taken from about twenty (20) stations along the main stem and major tributaries. As with the 1971 study, about ten (10) of the stations were mine discharges.

These studies, along with several others, give a good indication of the surface water quality of the Wiconisco Creek and its major tributaries. The studies demonstrate that water quality is severely degraded in the upper reaches of the creek from abandoned mine drainage and coal silt. Wiconisco Creek enters a transition zone from Bear Creek to the Village of Loyaltown due to raised levels in pH and alkalinity. Downstream from Loyaltown, water quality becomes progressively better as the creek meanders toward Millersburg Borough.

1. Recent Data

Several years ago, the Susquehanna River Basin Commission completed an extensive study and assessment of the watershed area (Stoe, 1998 and 1999). This work provided a comprehensive view of the water quality and instream habitat conditions of the creek. Summarized here is the water quality analysis and bioassessment data contained within that report.

Upper Wiconisco Basin

The data collected in this area (the headwaters) show that the habitat conditions of the Wiconisco Creek immediately upstream of the Porter Tunnel discharge are excellent. The only evidence of past mining activities is slightly elevated metal concentrations and a minor impairment of taxonomic diversity. Below the Porter Tunnel, however, the waters are severely impaired. Repeated attempts to collect macroinvertebrate samples failed, producing no organisms. Although the surrounding habitat is mainly undisturbed, the deposition of ferric hydroxide precipitate (yellow-boy) leads to increased embeddedness and thus a loss of suitable insect habitat. Additionally, the highest metal and ion loads in the watershed were found entering the creek from this tunnel. This clearly demonstrates the impact of the Porter Tunnel discharge.

Approximately 2.3 miles downstream from the Porter Tunnel discharge the creek shows the initial stages of biological recovery, although the physical habitat in this area is substantially degraded. The benthic community was found to be in between severely and moderately impaired, and the collected samples consisted of only those organisms that are tolerant of pollution. Further downstream, south of Orwin, PA, the effects of the Porter Tunnel discharge are generally diluted. Slightly higher nitrogen concentrations indicate the present of multiple farming operations.

The water quality of the creek continues to improve as it flows westward toward Williamstown, in spite of run-off from the Tower City/Sheridan Banks area, sewage treatment discharges, and degraded physical habitat. The macroinvertebrate population remains moderately impaired yet shows signs of recovery. The Wiconisco Creek shows lower metal concentrations than the site near Orwin, but urban influences and excess nutrients from poor farming practices continue to degrade the water.

Continuing towards the mouth of the Wiconisco Creek, the biological community and water quality remains in an impaired state. Stream channel substrate, morphology, and taxonomic variety also deteriorate as the creek flows southwest of the town of Wiconisco. Moreover, an increase in nitrogenous and ionic loads and a decrease in metal concentrations were observed in 1996.

Bear Creek Basin

Bear Creek is a severely impaired tributary to the Wiconisco Creek. Although the surrounding habitat is supporting of a balanced biological community, the water of the creek is wholly unsuitable. Stagnant, metal loaded water lead to the complete absence of macroinvertebrates in both 1996 and 1997. This is expected due to the fact that the creek is influenced by past mining operations; Operation Scarlift identified four drift openings in the east side of Short Mountain that contribute mine drainage to Bear Creek. Such influences lead to the increase of the pH of the

water, causing the metals to precipitate out and coat the streambed. This is necessary for the improvement of downstream water quality.

Rattling Creek Basin

The Rattling Creek Basin is one of the few relatively unimpaired areas in the Wiconisco Creek Watershed. The physical habitat is in excellent condition and is mainly deciduous forest. There is little anthropogenic disturbance within this sub-watershed. The streambed itself is in optimal condition, with cobble substrate and very low embeddedness. The biological community is slightly impaired, the reason for which is the homogeneity of the resident taxa. Water quality data indicate moderately elevated nutrient concentrations from upstream conditions, but the water is still sterile. One problem observed in Rattling Creek is low pH, caused by the lack of soil buffering capacity coupled with atmospheric deposition. Overall, Rattling Creek improves the water quality of the Wiconisco Creek.

Middle Basin

In this area of the watershed, mine drainage effects from Bear Creek are reduced by Rattling Creek and high alkalinity, which facilitates the precipitation of dissolved metals. The macroinvertebrate community is moderately impaired due to taxonomic similarity, although habitat was found to be excellent. This section of the creek is a transition area, where the deciduous forests change into cropland and agricultural uses. Influences of the creek change at this point, from mine drainage to farming impacts. The water quality data collected provide evidence for this; some metal levels drop while nitrogen and nitrates increase.

“Gratz Creek” Basin

This site is another of the few unimpaired sections in the watershed. The habitat is supporting of a balanced biological community, although moderately degraded stream bank stability causes embeddedness. Macroinvertebrate samples show pollution-intolerant species, and chemical parameters are among the lowest in the watershed. The Gratz Basin thus contributes to the ongoing recovery of the Lower Basin.

Lower Basin

The Lower Basin site north of Elizabethville supports a biological community that is slightly impaired due to low taxonomic diversity. Habitat is considered in excellent condition, and changes from the upstream sites are noticeable. Insect samples shown increased populations of pollution-intolerant genera. Immediately downstream of this site increased nitrogen levels are present from agricultural activities.

Further downstream, midway between Elizabethville and Millersburg, the stream community borders between non-impaired and slightly impaired and includes some pollution intolerant species. Habitat is excellent and scores well for all primary criteria. Water quality data show lowered metal concentrations, but increased ions and nitrogenous species.

Continuing westward, the stream community remains only slightly impaired with an excellent habitat. From 1996 to 1997 this site gained a new species of pollution intolerant macroinvertebrate that demonstrates the creeks persistent recovery.

Approximately two miles east of Millersburg, the water quality parameters are among the lowest in the watershed. None of the chemistry parameters are conspicuous, indicating a marked improvement from upstream sites.

At the mouth of the Wiconisco Creek in Millersburg, both physical and biological scores are lowered due to a bedrock substrate, lack of vegetative cover and stream bank erosion. Residential and commercial land uses in this area also contribute to the absence of a forested buffer zone. The biological population is slightly impaired due to taxonomic similarity. Water quality data indicate comparable levels of nitrogenous chemicals and metal concentrations to those of upstream sites.

Little Wiconisco Creek Basin

Land use in this area is mainly agricultural in nature, with scattered woodland areas. At this point the creek is influenced by the farming practices and by the Borough of Millersburg at the mouth.

At the headwaters of the Little Wiconisco Creek, west of Berrysburg, PA, the stream habitat borders between partially supporting and non-supporting. Habitat degradation is due to lack of suitable substrate, high embeddedness, stream bank erosion, and lack of a forested buffer zone. The biological community reflects the deterioration of the surrounding habitat and is moderately impaired. This site also shows elevated concentrations of nitrogen, nitrate, and ions.

Approximately 4.5 miles downstream, both the physical habitat and biological community improve and show signs of recovery. Near the confluence of the Little Wiconisco Creek with the Wiconisco the biological community is only slightly impaired, and the habitat is supporting. Water quality data indicates low concentrations of most chemical parameters, with the exception of aluminum.

Conclusions

It was concluded in this report that there were no unimpaired sites along the main stem of the Wiconisco Creek. At forty-four (44%) percent of the sites a slightly impaired biological community was observed, while the remaining sites possessed a moderately or severely impaired community. In the Upper Basin the creek's greatest influence is mine drainage, and similarly Bear Creek is the largest contributor of metals to the Wiconisco. The Rattling Creek and Gratz Creek Basins are the most pristine and healthy communities in the watershed, while the Little Wiconisco Creek Basin is among those that are impaired by agricultural practices. The Middle Basin reflects the transition from mining lands to agricultural, and the Lower Basin is undergoing biological recovery. It is fairly obvious that the Wiconisco Creek Watershed is an area in need of significant help.

2. Permitted Discharges and Uptakes

In addition to acid mine drainage and agricultural influences, permitted discharges and uptakes are factors involved with the water quality and stream habitat. Tables 19 and 20 describe the permitted discharge and uptake points, and Figure 2 locates the permitted discharge points within the watershed. In the interest of Homeland Security, Latitude and Longitude coordinates are not given in Table 20 for the uptake points.

G. Groundwater Quality/Quantity

Groundwater quality within the Wiconisco Creek Watershed is much more constant than surface water quality. The vast majority of private and public wells in the watershed are located in the Mississippian-Mauch Chunk Formation, which underlies the valleys of the watershed. The other formations in the watershed are less important for groundwater supplies due to their locations on ridge sides and tops and/or contamination by acid mine drainage.

In the “Groundwater Resources Report #57” completed for the Pennsylvania Department of Environmental Resources, Bureau of Topographic and Geologic Survey in 1984, eleven (11) well samples were taken within the Mauch Chunk Formation of the Wiconisco Creek Watershed. Mauch Chunk Formation groundwater is adequate for drinking water supplies, although it is moderately hard. All eleven (11) samples were below the Environmental Protection Agency’s (EPA) recommended drinking water limits for iron and manganese at the time (recommended limits were 0.3 mg/l and 0.05 mg/l respectively). However, there may be areas where iron and manganese concentrations are high. Median nitrate (NO₃) concentrations for these eleven samples were 4.4mg. Although all nitrate levels were below the median limit of 10 mg/l, it was an indication that nitrates from agricultural manure and fertilizer are leaching into the groundwater flow system due to the intensity of farming practices within the valleys of the watershed.

In 1996, the U.S. EPA developed drinking water standards that only apply to finished (filtered and treated) water. Maximum Contaminant Levels for Nitrate were set at 10 mg/l. Recent ground water data from the National Water Quality Assessment Project (NAWQA) , conducted by the U.S. Geological Survey in the Lower Susquehanna River Basin (Lindsey, et al., 1998), determined that land use and bedrock type accounted for most of the variation in nitrate concentrations in ground water in the Lower Susquehanna Basin. Water from 30 percent of the wells sampled would exceed the U.S. Environmental Protection Agency (USEPA) Maximum Contaminant Level (MCL) for nitrate-nitrogen of 10 mg/L if not properly treated before use as drinking water. Although this study did not include sample sites in the Wiconisco Watershed, the results found could indicate the extent of groundwater quality in the Wiconisco Watershed.

Groundwater quantity can be affected by land use within the watershed. The increase in low-density residential housing outside of infrastructure service areas result in more wells drawing from an aquifer thereby possibly reducing the amount of available water resources. The lack of groundwater re-charge Best Management Practices for stormwater prevents water from percolating down to the aquifer.

Table 19
Permitted Discharge Points

Facility	NPDES	Type	Latitude	Longitude
AMP Inc./Williamstown	PA0010294	IW	40°34'42"	76°37'16"
Bendar, Connie	PA0087203	SN	40°33'58"	76°48'53"
Berrysburg Municipal Authority	PA0080900	SP	40°36'15"	76°48'42"
Dauphin Meadows, Inc.	PA0080187	IW	40°32'52"	76°52'30"
Elizabethville Borough Authority	PA0037737	SP	40°33'38"	76°48'50"
Metal Industries Inc. of California	PA0086495	IW	40°36'27"	76°43'49"
Millersburg Area Authority	PA0085570	IW	40°32'10"	76°55'23"
Porter-Tower Joint Authority	PA0046272	SP	40°34'59"	76°34'46"
Thompson, Fred	NO PM REC*	IW	40°34'10"	76°41'04"
Upper Dauphin School Authority	PA0035301	SN	40°34'00"	76°45'50"
Washington Township Sewer Authority	PA0086185	SP	40°34'01"	76°45'57"ˆ
Wiconisco Township	PA0084697	SP	40°34'17"	76°41'59"
Williams Valley School Authority	PA0083062	SN	40°34'56"	76°35'03"
Williamstown Borough Authority	PA0021491	SP	40°34'40"	76°37'35"

Source: Stoe, Travis W. 1999. Water Quality and Biological Assessment of the Wiconisco Creek Watershed. Publication No. 206. Susquehanna River Basin Commission. Harrisburg, Pa

* No permit number recorded
ˆ Approximate Longitude

Type: IW Industrial Waste
SN Sewage Non-municipal
SP Spray Field

Table 20
Permitted Uptake Points

Source Name	Pump Capacity	Safe Yield	Latitude	Longitude	System Name
Rattling Creek	0	700000	*	*	Lykens Borough Authority
Springs 123456	115000	0	*	*	Millersburg Water Authority
Rattling Creek/Greenland	0	343000	*	*	Williamstown Borough Authority

* Data not presented.

IV. Biological Resources

A. Wildlife

Wildlife habitat in the Wiconisco Creek Watershed is diverse, ranging from forested upland slopes to rolling agricultural land in the valleys. Small and large woodlots are interspersed throughout the wide valley west of the Village of Loyaltown, while much of the Wiconisco Creek floodplain and steep slopes along tributary streams also remain forested. Common game species that inhabit the ridges and larger forested areas in the watershed include white-tailed deer, wild turkey, ruffed grouse, and grey squirrels. At the southern edge of its range in Pennsylvania, an occasional black bear is seen in the more remote areas of the watershed. Common valley game species include ring-necked pheasant, cottontail rabbit, and grey squirrel. Floodplains continue to harbor waterfowl and provide excellent habitat for other wildlife.

The most recognized problem associated with wildlife populations, not only in the Watershed region but also in agricultural areas throughout the country, is the loss of suitable habitat due to changing farmland practices and development. In the Wiconisco Creek Watershed, the major decline has been observed in the ring-necked pheasant population. This decline is thought to be primarily caused by loss of habitat due to changing farm practice over the past several decades. Early hay mowing (prior to June 15) is the major reason for pheasant mortality, as hay fields are prime nesting habitat. Premature mowing destroys not only the nest but often the hen bird as well, as flushing bars have been removed from modern hay mowing equipment.

The Pennsylvania Game Commission has several programs to enhance wildlife habitat and provide land for public hunting. The first of these, the Farm Game Cooperative Program, has been very successful in the Wiconisco Creek Watershed, with over 200 participants in the program. The Game Commission also conducts border cuts on their property to provide herbaceous growth between crop fields and bordering woodlands. The Safety Zone Program is similar to the Farm Game Cooperative Program. However, acreage requirements for the Safety Zone Program are smaller and a landowner need not be contiguous with another participant in the program.

B. Vegetation

The Wiconisco Watershed, like all of Dauphin County, is located in the original Oak-Chestnut Forest Region. The American chestnut was once a dominant feature of the Oak Chestnut Forest, but was virtually eliminated with the introduction to North America of the chestnut blight fungus in 1904.

Today, the forests of this region are dominated by several species of oak, often mixed with tulip poplar, red maple, and/or beech. The drier ridge tops with shallow nutrient poor soils are characterized by chestnut oak and black gum with an understory of shrubs including blueberries, huckleberries, and mountain laurel.

Some of the small stream corridors, such as that found at the lower end of Rattling Creek are dominated by hemlock, with a minor component of yellow birch and an understory of huckleberries, witch hazel, and swamp azalea. The higher gradient headwaters of tributaries such as Rattling Creek and Bear Creek are characterized by hemlock mixed with several species of oak and mountain laurel with sphagnum mosses, sedges, ferns, and sundews along the streambank. The headwaters of the main stem of the Wiconisco Creek above Tower City are dominated by hemlock and yellow birch, with an understory of rosebay laurel, and ferns.

Because of the dense shade and acidic litter, these hemlock-dominated forests typically have a depauperate herbaceous layer, often limited to several species of fern and/or sedges.

C. Species of Special Concern/Important Natural Communities

The Wiconisco Creek Watershed is home to a variety of Natural Communities, which support several species of plants and animals that are threatened, endangered, or rare. Several noteworthy Natural Communities are presented herein. However, in an effort to provide some measure of protection, the rare plants and animals are not identified in text.

1. Doc Smith Run Woods/ Bear Puddles

This site includes one plant and one animal species of concern from two different habitats. The animal is a globally imperiled invertebrate species occurring in even-aged stands of white oak with mountain laurel in the understory and a sparse groundcover with low-sweet blueberry. The plant species is a poor to fair quality population of federally and PA-Endangered species that occurs in a series of shallow woodland pools (Bear Puddles) and wet depressions at the headwaters of Doc Smith Run.

2. Wiconisco Creek Outcrops

These outcrops of calcareous shale and limestone below Elizabethville contain a PA-Threatened plant species that can be quite rare in parts of its range. While the outcrops themselves are fairly inaccessible, logging upslope or across the creek from these outcrops is a potential threat.

3. Rattling Creek Watershed

The current Special Protection Waters selection criteria characterize Rattling Creek and its tributaries as waters of substantial ecological significance. Rattling Creek is the only Exceptional Value stream in Dauphin County.

The understory of the dry-mesic forest within this watershed supports a large, good quality population of a PA-Rare shrub species. A good quality population of a PA-Threatened herbaceous plant species is found in the upper reaches of the creek and its tributaries. In 1992, active signs of a PA-threatened animal species were observed in a boulder field however, additional surveys are needed to determine the extent and current quality of this population. Heavy deer browse has been observed on both plant species of concern.

V. Cultural Resources

A. Recreational Facilities

Residents of the watershed are afforded a variety of public and non-public recreation opportunities. Adequate recreational opportunities serve to maintain a high standard of living for the citizens and supplement their outdoor activities. The provision of publicly supported park and recreational facilities is the key component emphasized in this study element.

1. State Game Lands and Forests

The large areas of State Game Lands and State Forest within the watershed provide ample opportunities for nature-oriented recreation such as fishing, boating, hunting, and hiking. Over 8,000 acres of State Forest are within the watershed as well as a significant portion of State Game Lands 210 and 264.

Table 21 lists the public parks and recreational facilities supported by the municipal governments within the Watershed as well as the State Forests or Game Lands. Table 22 lists the acreage of State Owned Lands (State Forest and Game Lands) within the watershed.

2. Local Recreation Areas

Recreational facilities provided by local governments include the following and vary from municipality to municipality:

- Field games
- Swimming pools
- Playgrounds
- Picnic areas
- Court games

3. Trails and Public Access

The Lykens Valley Rail Trail feasibility study has been initiated for the proposed segment from the Borough of Lykens to Elizabethville. The Lykens to Elizabethville segment is the immediate project while the Elizabethville to Millersburg segment is seen as the long-range project.

4. Non-profit Private Facilities

The Ned Smith Center for nature and Art was founded in 1993 as a non-profit organization to foster an appreciation for the central Appalachian region's natural heritage and to further the legacy of its namesake, nationally recognized wildlife artist Ned Smith. Plans are currently underway to construct the permanent facility encompassing approximately 34,000 square feet including a gallery, interpretive center, and theater. The Center will be located on over 500 acres adjacent to Wiconisco Creek and Berry Mountain. The Center will also be the home of the Twin Valley Players, a regional theatrical group.

**Table 21.
Municipal Recreation Facilities**

Municipality	Name	Facilities	State Game Lands/State Forest	School District Facilities
Berrysburg Borough	Borough Park	Playground, picnic area, baseball, basketball, tennis (1.0 acre)	–	Upper Dauphin Area Schools –three (3) playgrounds, one (1) football field, one (1) soccer field, two (2) basketball backstops, two (2) softball fields, two (2) tennis courts
Elizabethville Borough	Borough Memorial Park	Playground, baseball and Little League fields, hiking, picnic area, swimming pool, tennis (7.0) acres	–	Upper Dauphin Area Schools –three (3) playgrounds, one (1) football field, one (1) soccer field, two (2) basketball backstops, two (2) softball fields, two (2) tennis courts
Gratz Borough	Borough Park	Playground, field games, baseball and Little League fields, tennis, (1.5) acres	SGL Area 264	Upper Dauphin Area Schools –three (3) playgrounds, one (1) football field, one (1) soccer field, two (2) basketball backstops, two (2) softball fields, two (2) tennis courts
Jackson Township	–	–	SGL Area 210 State Forest Land (with two (2) picnic areas)	Halifax Area Schools – one (1) football field, baseball fields, basketball courts, two (2) tennis courts, two (2) playgrounds
Jefferson Township	–	–	SGL Area 210 State Forest	Upper Dauphin Area Schools –three (3) playgrounds, one (1) football field, one (1) soccer field, two (2) basketball backstops, two (2) softball fields, two (2) tennis courts
Lykens Borough	Borough Park	Basketball, tennis, swimming pool	–	Upper Dauphin Area Schools –three (3) playgrounds, one (1) football field, one (1) soccer field, two (2) basketball backstops, two (2) softball fields, two (2) tennis courts
	Glen Park	Baseball, picnic area, volleyball court (Borough total: 90-100 acres)		
	Machamer Ave Girls Softball Field	Softball field		
Lykens Township	–	–	SGL Area 264	Upper Dauphin Area Schools –three (3) playgrounds, one (1) football field, one (1) soccer field, two (2) basketball backstops, two (2) softball fields, two (2) tennis courts
Mifflin Township	–	–	–	Upper Dauphin Area Schools –three (3) playgrounds, one (1) football field, one (1) soccer field, two (2) basketball backstops, two (2) softball fields, two (2) tennis courts
Millersburg Borough	Myo Park	Playground, baseball field, soccer, pavilions (4.2 acres)		Millersburg Area Schools – One (1) practice football field, one (1) athletic field, two (2) softball fields, two (2) basketball courts, two (2) tennis courts, one (1) playground
	Riverfront Park	Playground, picnic area, scenic area, boat docks (3.8 acres)		
	Market Square Park	Scenic area, park benches, gazebo (1.0 acres)		
	Brown Bradenbaugh Park	Softball (1.25 acres)		
	Seal Park	Playground, baseball field, pavilions, picnic area, volleyball, tennis (9.7 acres)		
	River Access	Launch ramp, Overnight mooring		

Table 21 continued
Municipal Recreation Facilities

Rush Township	-	-	-	Williams Valley School District
Upper Paxton Township	Wiconisco Creek County Park	Soccer, softball, picnic areas, creek fishing, shelters, restrooms, hiking trails (383 acres)	-	Millersburg Area School District
Washington Township	Loyalton Ball field; Henninger Covered Bridge	Playground, ball field (11.0 acres)	-	Upper Dauphin Area Schools –three (3) playgrounds, one (1) football field, one (1) soccer field, two (2) basketball backstops, two (20 softball fields, two (2) tennis courts
Wiconisco Township	Mountain St. Park	Playground, picnic area	SGL Area 264	Williams Valley School District
	Walnut St. Park	Playground, basketball		
	L. and W. Athletic Park	Baseball, football		
Williams Township	Williams Township Recreational Field	Little League fields	SGL Area 264 State Forest	Williams Valley School District
Williamstown Borough	Borough Park	Playground, picnic area, swimming pool, basketball, shelter (10.0 acres)	-	Williams Valley School District

Sources: Wiconisco Creek Watershed Study, Phase I: Problem Identification/Recommendations. Dauphin County Conservation District, 1985. Dauphin County Parks and Rec., 2002

Table 22
State Owned Lands in the Wiconisco Watershed.

Bureau/Department	Name	Acres
Forestry	Haldeman State Forest	5,333
Forestry	Greenland State Forest	2,977
Total Forestry		8,310
Game Commission	Game Lands # 210	11,061
Game Commission	Game Lands # 264	8,782
Total Game Commission		19,843

Source: Tri-County Regional Planning Commission, 2002

VI. Historical and Archeological Resources

In pre-colonial days, the area between the Susquehanna and Delaware Rivers was the domain of the Lenni-Lenape tribe of Native Americans. Hunting and scouting parties often set up camps in this “valley of many springs” along the “Whiconescong” as the creek was called by the Delaware tribe. By 1681, when William Penn purchased this land, the Turtle Clan of the Shawnees resided on the Susquehanna River Watershed.

In 1774, Daniel Williams purchased a total of 1526 acres in “The Likens Valley along Wiconisco Creek”. In 1787, he sold his tract to his son, Ennier. James Wilson, a signer of the Declaration of Independence, owned several thousand acres in the valley as early as 1780. The land passed through several hands until a group of merchants from Philadelphia sold their holdings to families who settled in the area. James Wilson’s holdings passed through several owners until purchased by the Philadelphia and Reading Coal and Iron Company in 1872. During a 30-year period from 1840 to 1870, thousands of acres of coal land were bought and sold and many different mines were opened and subsequently abandoned.

As stated in the Susquehanna River Conservation Plan (Tri-County Regional Planning Commission, 1998), there are several historic structures and buildings dispersed throughout the area. However, none of these structures are noted in the National Register of Historic Places as of August 1996. This is due to the fact that the multiple sites do not meet the mandatory 50-year cut-off and thus were not included.

Nonetheless, there are other historic sites and structures that are worthy of such distinction. The majority of sites in this category are related to the colonial modes of transportation. An excellent example would be the Millersburg Ferry, which has been in use since 1817. Shortly after the town was established, it became a thriving commercial center for the exchange and movement of agricultural products and coal. The ferry, which is the last wooden stern paddlewheel ferry in the country, was used to provide the residents of Millersburg with the supplies they needed and also to distribute the area’s goods to other communities.

The extensive canal system of the watershed also contributes to the historical significance of the region. The “Wiconisco Feeder” canal was constructed in 1844 to facilitate the movement of coal from Lykens Valley, where the booming mining industry dominated the local economy during the 1800’s and into the 1900’s. The canal connected into the main line of the Pennsylvania Canal, allowing the coal to be transported north to Millersburg and south to Clark’s Ferry and Halifax. In 1889, a great flood destroyed the majority of the canal and it was deemed more feasible to abandon than to repair. Portions of the crumbled walls still remain in Millersburg, as well as pieces of one of the old barges.

At the same time as the collapse of the canal system, or perhaps inspiring it, came the advent of the railroad system. Destined to become part of the largest rail network in the world, the Lykens Valley Railroad began hauling coal to the Susquehanna River in 1834. Other smaller rail lines were leased to the expanding North Central Railroad, and eventually it served the majority of the towns along the northern riverbanks. The web of rail lines was later consolidated into the Pennsylvania Railroad, which ran the service until 1937. The Reading Railroad bought the additional lines, which served the Williams Valley.

As the railroads had replaced the canals, so the new roadways and automobiles would supplant the train lines. Along with the Great Depression, which shut down most of the region’s mining

operations, the newer, faster roads added to the disuse of the railroads. As time passed they were abandoned and became part of the watershed's historical significance.

Historic Preservation

A Pennsylvania municipality may become a "Certified Local Government" (CLG), a designation established under the National Historic Preservation Act, by fulfilling certain requirements of the Act. The primary requirement is the municipality's enactment of a historic preservation ordinance affording protection of historic buildings, structures, and areas certified by the Pennsylvania Historical and Museum Commission (PHMC) as historic, and by establishing regulations and appointing a Board of Historical Architectural Review or a Historical Commission to advise the governing body or zoning hearing board as to the issuance of certificates of appropriateness or permits.

Mining History

The upper part of the Wiconisco Creek Watershed lies in the extreme southwest section of the anthracite coalfields of Pennsylvania. Until the 1930's, the region at the northeastern end of the Wiconisco Creek Watershed was heavily mined using both strip and deep mining methods. At present, all but one of the deep mines in the area have been abandoned and pools of polluted mine water underlie the region. All of the strip mining has ceased and many mine pits remain open and fill with water with each storm event. At the time the strip mining ceased, no effort was made by the mine operators to restore these areas because state requirements concerning reclamation were only recently legislated. Approximately 660 acres were disturbed by strip mining in the Wiconisco Creek Watershed.

The only recently renewed permit for coal mining activities in the watershed is for the Meadowbrook Coal Co., Inc. in Lykens, PA. for an existing anthracite coal refuse reprocessing and disposal operation in Wiconisco Township, affecting 10.81 acres with the Wiconisco Creek named as the receiving stream.

VII. Institutional Resources

A. Watershed Associations

In January 1983, the first official meeting of the Wiconisco Creek Watershed Association (WCWA) was held in the Upper Dauphin High School cafeteria in Elizabethville, Dauphin County. Over fifty (50) people attended the meeting, which was directed at discussion coal mining related problems in the area of the watershed, east of the Village of Loyalton. This meeting in itself was a milestone in that it brought people together from Schuylkill and Dauphin Counties to discuss and work together in solving common problems in the 116 square mile drainage area of the watershed. The WCWA was primarily concerned with the cleanup of Sheridan Banks. Through the efforts of the WCWA, the coal sediment from Sheridan Banks was reduced to the point where there was noticeable difference in the Wiconisco Creek. The WCWA disbanded in 1986 and the watershed was without an association.

The Wiconisco Creek Restoration Association (WCRA) formed in 1997, and through the assistance of the Dauphin County and Schuylkill County Conservation Districts and the Eastern Pennsylvania Coalition for Abandoned Mine Reclamation (EPCAMR), has been the leader in environmental restoration efforts in the watershed since.

The WCRA continues to enjoy the support and cooperation of many legislators and municipalities within the watershed. The WCRA will continue to seek support from local government as well as state government and other private organizations to assist them in their restoration efforts.

VIII. Issues and Concerns

A. Public Meetings

Three public meetings were held in 1999 at several sites in the Wiconisco Creek Watershed. The purpose of these meetings is to inform the public about the study, who is administering the grant, gather information on problems, local issues and concerns, and get suggestions on areas of the watershed that need improvement. The first of these public informational meetings was held at the Tower City Lions Club on February 22, 1999. The second was at the Millersburg Borough Building on February 25, 1999 and the third was on March 1, 1999 at the Upper Dauphin High School. Valuable input was gathered at the three initial public meetings. Some of the most common topics/concerns for the Wiconisco Creek Watershed are given below. Attempts to describe these concerns in more detail follow. Section VIII addresses management options for these concerns. Prioritization for recommended actions in Section XI B. was a result of the final public meeting held on November 19, 2003, at the Northern Dauphin Library in Lykens.

Topics/Concerns

Wetlands as wildlife habitat
Preserving Important Natural Sites
Sheridan Coal Banks
Land Use After Mine Land Reclamation
Land Use in Flood Plain
Riparian Buffers
Education
Abandoned Mine Reclamation at the Headwaters
Public Water Supplies
Maintain and Develop Recreational Trails/Ecotourism
Bank Erosion
Dam Removal
Developing Abandoned Rail Lines
Zoning and Land Use Regulations
Impacts of Land Use on Water Quality

B. Abandoned Mine Land/Mine Drainage

1. Mine Discharge Sites

- Keim Tunnel (Rush Township)

Keim Tunnel is located in State Game Lands No. 211 on the north side of Stony Mountain approximately one mile west of Gold mine Road, South of Tower City. The elevation of the

portal is approximately 1240 ft and the tunnel extends in a southerly direction into Stony Mountain. Abandoned strip mines provide a direct flow of water to the mine in addition to water seepage. The discharge flows down the north side of Stony Mountain and into the Wiconisco Creek. Information from The Operation Scarlift Report (Sanders and Thomas, 1973) indicates an average flow of 131 gallons/minute (GPM) and pH of 3.7. An unnamed tributary of the Wiconisco Creek was sampled in 1998 by The Susquehanna River Basin Commission (Stoe, 1999) in the locality of Keim tunnel. In all likelihood, this tributary received the Keim tunnel discharge, however this cannot be determined since the SRBC report makes no mention of the Keim tunnel discharge. Data is not currently being collected at this site.

- Bear Creek Discharges (Wiconisco Township)

The Bear Creek Discharges are located a mile north of Lykens. The most direct source for the water draining from the tunnel is the series of strip mines along the north side of Short Mountain together with an underground connection to the Williamstown Mine Water Pool. Water is discharged from the Lykens Water Level Tunnel and from several abandoned drift mine entrances and seeps directly into Bear Creek. The Operation Scarlift report (1973) and SRBC report (1999) indicate that the majority of flow is from the northern-most drift mine entrance. The Lykens Tunnel was an acidic discharge (pH 3.4 in 1971, pH 4.6 in 1998), while the drift mine discharges were alkaline. The Dauphin County Conservation District along with the USGS continues to monitor these discharges for water chemistry and flow data.

- Big Lick tunnel (Williams Township)

Big Lick Tunnel is located between Williamstown and Lykens on the south side of Big Lick Mountain. Drainage from the tunnel flows down the south side of Big Lick Mountain and discharges into the Wiconisco Creek west of Williamstown. Discharge rates and water chemistry have been historically variable. Under low flow conditions, the discharge was marginally acidic and under high flow conditions, the discharge was alkaline. The Dauphin County Conservation District continues to monitor this discharge for water chemistry and flow data.

- Tower City Tunnel #1 (Porter Township, Schuylkill County)

Tower City Tunnel #1 is located on the south side of Big Lick Mountain at a point north of the village of Muir. Strip mines on the northern side of Big Lick Mountain contribute heavily to the drainage from this tunnel. Discharge from the tunnel flows down the south side of Big Lick Mountain and discharges into the Wiconisco Creek. Average flow was reported in the Operation Scarlift report (1973) as 342 GPM with an average pH of 3.0. Subsequent reports give no mention of this discharge. No monitoring is currently taking place at this discharge.

- Tower City Tunnel #2 (Porter Township, Schuylkill County)

This tunnel is located on the south side of Big Lick Mountain at a point northeast of the village of Muir. As in the case of Tower City Tunnel #1, the most direct source of water draining from the tunnel is strip mines on the north side of Big Lick Mountain. Unlike Tower City Tunnel #2, this discharge was reported to flow down the side of Big Lick Mountain a

short distance and disappeared into the ground where it eventually seeps into Porter Tunnel (Sanders and Thomas, 1973). No monitoring activities are currently underway at this discharge.

- Porter Tunnel (Porter Township, Schuylkill County)

This source is the only one in the Wiconisco Watershed with an active permit. It is located directly below Tower City Tunnel #2, on the south side of Big Lick Mountain and discharges down the south side of Big Lick Mountain to the Wiconisco Creek. Average reported flow rates are similar from 1973 to 1998 with an average discharge of approximately 500 GPM. Due to the active status of the permit at this time, Abandoned Mine Land funds and Clean Water Act Section 319 funds cannot be spent on mitigation projects at this site. However, the Wiconisco Creek Restoration Association operates and maintains a limestone diversion well on private property downstream from the discharge source. The Dauphin County Conservation District currently monitors the discharge as part of a Growing Greener grant.

- Keffers Tunnel (Porter Township, Schuylkill County)

Keffers Tunnel is located on the south side of Big Lick Mountain, about a mile west of the village of Keffers. The elevation of the portal is 1250 ft. and the tunnel extends into Big Lick Mountain in a northerly direction. Though situated outside the Wiconisco drainage basin north of Keffers, seepage from the Joliett Mine Water Pool finds its way to Keffers Tunnel and flows down the side of Big Lick Mountain to discharge into the Wiconisco Creek. Average flows, reported by Operation Scarlift (1973), were 520 GPM with a pH of 3.2. No monitoring is currently taking place at this discharge.

- Kalmia Tunnel (Tremont Township, Schuylkill County)

Kalmia Tunnel is located on the north side of Broad Mountain approximately 1 mile east of Gold Mine Road, south of Tower City. The portal elevation is 1220 ft. and the tunnel extends in a southerly direction into Broad Mountain. The sources of water at this site are the same abandoned strip mines that feed Keim Tunnel. The discharge flows down the north side of Broad Mountain and into the Wiconisco Creek. Average flow and pH reported by Operation Scarlift (1973) were 373 GPM and 4.1 respectively. No monitoring is currently taking place at this discharge.

2. Sheridan Banks

Sheridan Coal Banks is a 250-acre coal refuse site located on the south side of Big Lick Mountain just north of the village of Sheridan in Schuylkill County. The site was reported to contain 6-9 million tons of coal and rock, which are the sortings/tailings from the deep mines in Big Lick Mountain. Unusable coal, coal refuse, and rock material were sorted from the “good” coal and merely piled to form the Sheridan Banks. Most of this occurred during the 1920’s and 1930’s. Historically, this site has been an obvious hazard to the village of Sheridan, which is down-slope of the site. Additionally, the coal silt, which had run off of the site for many years washed into the Wiconisco Creek and helped to give the creek its local name, “Black Creek”. Pennsylvania Department of Environmental Resources (PA DER), now PA DEP, took over the site in 1974. Erosion and Sedimentation inspections by the Dauphin and Schuylkill County Conservation Districts in 1982 found DER in noncompliance with Erosion and Sedimentation standards at the time. In 1983, DER announced plans to construct sedimentation basins and, when the initial phase of the project had been completed, begin re-

vegetation (Pottsville Republican, 1983). A year later, in 1984, DER contracted a firm to construct three sediment basins and channels to minimize erosion problems. Since construction, personnel from PA DEP Bureau of Abandoned Mine Reclamation (BAMR) have conducted yearly maintenance activities on the smaller basins and channels. However, the largest basin has filled in with sediment and is currently in need of maintenance and repair. No Operation, Maintenance, and Replacement (O, M&R) plan exists for this site.

C. Hazardous Waste Sites/Landfills

The Wiconisco Creek Watershed contains no known EPA listed CERCLA or “Superfund” sites and no known locations listed in the Toxics Release Inventory (TRI). Dauphin Meadows, Inc. is a permitted landfill located in the lower Wiconisco Creek sub-watershed near Elizabethville, Dauphin County. The old Fulkroad landfill, located off of Route 209 on Landfill Rd. near the Borough of Millersburg, has been closed since the mid 1970’s and has had periodic discharges of leachate since then. It is not known whether there have been any investigations of the leachate or groundwater surrounding the landfill.

D. Atmospheric Deposition

Over the last 30 years, a large amount of information has been collected in the United States that demonstrates that air pollutants can be deposited on land and water, often at great distances from the original sources. Two of the most common categories of air pollutants are nitrogen compounds and sulfur compounds. These compounds, when in the atmosphere, become nitric acid and sulfuric acid and fall into the watershed with rain. While nitrogen compounds are a natural part of the earth’s atmosphere, human activities far outside of the Wiconisco Creek Watershed are increasing concentrations to the point that sub-watersheds such as Rattling Creek are being degraded. As an Exceptional Value/High Quality stream, the waters of both branches of Rattling Creek contribute to the recovery of the Wiconisco Creek. However, most of the East and West Branch Rattling Creek Watersheds are not attaining their designated use as Exceptional Value Waters according to PA DEP’s 1998 303(d) list of impaired waters. This non-attainment is due to low pH and alkalinity, which is the result of atmospheric deposition coupled with the low buffering capacity of the natural geologic composition of these watersheds. In the PA 1998 303(d) list, the cause of the low pH is erroneously referred to as being due to acid mine drainage although there are no mines in the Rattling Creek sub-watershed.

E. Sedimentation and Riparian Habitat Loss

The sources of sediment are varied, and occur in many locations within the watershed. In the upper part of the watershed, sedimentation is due primarily to metals deposits from mine drainage and coal silt. In the lower part of the Wiconisco Creek Watershed, sedimentation is due to a loss of forested riparian buffer zones, erosion from crop and pasture lands, trampling of stream banks by livestock, and bank erosion from abandoned structures such as dams diverting the flow. The Little Wiconisco Creek sub-watershed is particularly plagued by excessive sedimentation and most of the Little Wiconisco Creek and its tributaries are listed on the state’s 1998, 303(d) list of impaired streams due to sedimentation.

F. Zoning

With the development pressures on the Wiconisco Creek Watershed continuing, some loss of agricultural land is inevitable. However, without locally generated municipal zoning and land

development ordinances, the probability exists for unwise and poorly planned growth. Future land use patterns will have an effect on the watershed in areas such as: stormwater runoff, groundwater recharge, and aesthetic appeal. Seven (7) Townships out of the eleven (11) within the watershed and five (5) out of seven (7) Boroughs currently do not have municipal zoning ordinances.

G. Cultural Resources and Tourism

There are many possibilities for expansion of cultural resources and tourism within the watershed and the development of cultural resources and tourism within the area will continue to showcase the attributes of the Wiconisco Creek Watershed. The impacts of tourism and cultural resource development, such as expansion of the Ned Smith Center and the Rails to Trails program, should be considered with respect to the other resources within the watershed.

IX. Management Options/Remediation

A Abandoned Mine Drainage Remediation

As stated in Pennsylvania's Comprehensive Plan for Abandoned Mine Reclamation (PA DEP, 1998), "...the magnitude of the abandoned mine land problem in Pennsylvania is greater than any one institution can address in the foreseeable future." Acid mine drainage from abandoned mine sites represents one of the two largest sources of surface water use impairment in Pennsylvania (PA DEP, 2002). It then becomes critical that partnerships develop among public and private institutions to reclaim abandoned mine lands and foster partnerships while involving local citizens, governments and other groups. In the past, active treatment facilities were built to treat mine drainage. However, the installation of physical and chemical treatment mechanisms at each discharge site in Wiconisco Creek is impractical due to high installation, operation, and maintenance costs. The passive treatment of coal mine drainage has advanced considerably in the past decade and increased confidence in the effectiveness of passive treatment systems has resulted in regulations that encourage passive treatment at permitted mine sites (PA Code, Title 25, Chapter 87, Section 102.).

An important advance in the evolution of passive technology was the recognition of the variability of mine water chemistry and its importance in designing efficient, effective treatment systems. Alkaline discharges are effectively treated with sedimentation ponds and constructed wetlands that provide the aeration and retention necessary to naturally precipitate the metal contaminants. An acidic mine discharge requires the generation of alkalinity and the precipitation of metals.

The most reliable technique for satisfying these requirements is pretreatment of the acidic water with limestone to generate the alkalinity followed by ponds and wetlands in order to precipitate the metals. However, in many passive treatment systems, manganese is not significantly removed due to the fact that its precipitation requires raising the pH above 9.0 (PA DEP, 1999). With remediation plans in action, wetlands would be created, stream quality would be restored, and demonstration projects would increase educational opportunities in the community.

Other methods suggested by the Operation Scarlift report (1973) include: Deep Mine Sealing, Strip Mine Reclamation (backfilling), Surface Water Diversion, and Treatment by actively introducing neutralizing agents under pressure. Mine areas are shown in the land use map (Figure 1) on page 19.

1. Bear Creek Sub-watershed

Bear Creek Discharges

The mixture of discharges at this site results in alkaline water. The Operation Scarlift report (1972) recommended the filling, grading, and planting of the strip mines in the Bear Mountain area. In addition to this, the Wiconisco Creek Watershed Study, Phase II (Dauphin County Planning Commission, 1986) suggests a treatment option, which includes aeration and settling ponds. Stoe (1999) recommends treating the water with a properly sized constructed wetland while keeping the flow of Bear Creek separate. The estimated treatment system was estimated by Stoe in 1999 at \$1,121,250. Hedin (2001) also states that the Bear Creek mine discharges are well suited for passive treatment with constructed wetlands and, in a report for Dauphin County Conservation District as part of a Growing Greener Grant, gives the specifications for a treatment system with a then total estimated cost of \$865,000. Under a second Growing Greener Grant completed in December 2002, the Dauphin County Conservation District, in combination with U.S. Geological Survey and the firm of Skelly and Loy, determined the interconnectedness of underground mine workings and surface disturbances, collected data to characterize the current chemical and hydrologic conditions within Bear Creek Watershed, and examined the biological and chemical effects of the drainage upon the Wiconisco Creek with the hope of mitigating the effects of Bear Creek mine drainage on the Wiconisco Creek Watershed. The results of this study indicate that filling in cropfalls would only result in a 13% reduction of the mine outflow. Additionally, mine discharge data collected during this project showed that the Lykens Tunnel discharge is now net neutral. In February 2003, the DCCD applied for a Growing Greener Grant to construct sedimentation ponds to treat the Lykens Tunnel discharge. The Lykens Tunnel discharge remediation application was subsequently awarded to DCCD in fall, 2003 with construction slated to begin during 2004. Bear Creek Discharges should continue to be a remediation priority within the watershed and restoration/protection plans such as a TMDL Implementation Plan should be created to provide the groundwork for prioritization of remediation measures.

2. Upper Wiconisco Creek Sub-watershed

Big Lick Tunnel

The Stoe report in 1999 recommends a system consisting of sedimentation ponds in conjunction with constructed wetlands at this site to lessen the impact of storm-related flushing events on the Wiconisco Creek. Stoe (1999) states that because the discharge flows through state gamelands, there may be no land acquisition costs (assuming the wetland could be benched into the hill below the discharge). DCCD monitors water quality and flow at this site on a quarterly basis but there is no current remediation activity at this site. A restoration/protection plan should be formulated for this discharge and remediation activities encouraged.

Porter Tunnel

Operation Scarlift (1973) suggests a scheme where the wastes generated by the discharges from Tower City #1, Tower City # 2, Keffers Tunnel, and Porter Tunnel would be mixed and the combined waste diverted to a suitable location wherein treatment would include the addition of neutralization reagents, aeration, settling and discharge. The Wiconisco Creek Watershed Study Phase II (1986) also identifies this as a treatment option. Vertical Flow Ponds (VFP's) were recommended by Stoe in 1999 as a method of treating the Porter Tunnel discharge. The VFP's had an estimated cost in 1999 of \$5 per square foot (installed) and does not include land acquisition costs. An active permit still exists for this site although mining is currently not occurring here. An active permit may complicate the treatment of

this site because Section 319 funds and Abandoned Mine Land funds cannot be spent on sites where there is an active mining permit. The Wiconisco Creek Restoration Association had operated one limestone diversion well for on the discharge for several years just above the confluence with the Wiconisco Creek.

More limestone diversion wells and a regular maintenance plan would have been needed to make this an effective option for addressing the acidity. However, at present (2003) there is a possibility for active mining to resume at this site. If this occurs, the permittee will be responsible for remediation efforts to treat the discharge. A remediation plan for this discharge should be created since this discharge contributes a substantial amount of metals to the Wiconisco Creek.

Keffers Tunnel

Operation Scarlift (1973) recommends the installation of surface water diversion ditches around the crop falls to reduce the flow from Keffers Tunnel in addition to the backfilling of strip mines. The Wiconisco Watershed Study, Phase II (1986) identifies this site as one which could be co-mingled with the Porter Tunnel discharge. The discharge could then be treated with the Porter Tunnel discharge as given previously. Currently, no monitoring or remediation activity is occurring at this site. A remediation plan should be created for this site and remediation activities encouraged.

Keim Tunnel/Kalmia Tunnel

The Operation Scarlift report (1973) and the Wiconisco Creek Watershed Study (1986) recommend the filling, grading and planting of the strip mines in the area around these discharges. Stoe (1999) makes no mention of remediation possibilities on these sites. While these sites are not the largest contributors of pollution to the Wiconisco Creek, the remediation projects here should be considered with regard to public safety as well as water quality. A remediation plan for these discharges should be created and remediation activities encouraged. Currently, no monitoring or remediation exists at these sites.

B. Abandoned Mine Land

1. Sheridan Banks

In 1984 and 1985, PA DER accepted bids for removal of the coal waste at Sheridan Banks however there had been problems encountered with the contractor(s). It remains unclear as to how much, if any coal waste has been removed from this site. Recently, most of the settling ponds had filled in to such a degree that their operating efficiency was questionable and erosion had taken place in the spillway areas. Additionally, the standpipes, which accept the drainage from the ponds, are essentially "open manholes" and represent a grave danger to the area children. It is also unclear as to whether PA DEP is regularly maintaining this site. Regular maintenance is vital to the effectiveness of the structures here and to the health and welfare of the residents of the Wiconisco Creek Watershed. It is unknown as to whether possibilities may exist for utilizing the coal silt in the sediment ponds, however this potential use should be examined further. A restoration/maintenance plan should be created to provide for adequate and timely maintenance. Ultimately, the removal of the coal waste should be encouraged so restoration activities can take place.

C. Acid Rain Remediation

1. Rattling Creek Sub-watershed

The direct application of limestone sand to increase and maintain pH and alkalinity values is the method that was chosen in 1999 by DCCD for the West Branch Rattling Creek. Stoe (1999) recommended this course of action in order to support a healthy macroinvertebrate and native brook trout community. Preliminary data suggests that the ongoing limestone sand dosing is raising the pH and alkalinity to more acceptable levels. Continued implementation and support for this remediation effort will offset the effects of atmospheric deposition on the Rattling Creek Watershed and will allow healthy aquatic communities to thrive. Additionally, remediation of the atmospheric deposition will result in less treatment of the water by the Borough of Lykens, which uses Rattling Creek as its water supply. A completed restoration/protection/maintenance plan for this watershed will greatly assist with remediation efforts.

D. Sedimentation/Riparian Habitat Loss

1. Upper Wiconisco Creek Sub-watershed

While there is some degree of agriculture-related sedimentation in the upper Wiconisco Creek Sub-watershed, the majority of sedimentation stems from the abandoned mine land and mine drainage issues. The upper part of the Wiconisco Creek has suffered for many years from the deposition of metals, primarily iron deposits (yellow-boy). The remediation of this type of sedimentation is tied inextricably with the remediation of the mine issues. When the mine drainage issues are addressed, the aquatic biological communities will be able to recover. Riparian re-vegetation has been addressed to some extent by the WCRA, however riparian zones here as elsewhere in the watershed will greatly benefit from continued restoration.

2. Lower Wiconisco Creek and Little Wiconisco Creek Sub-watersheds

Often, small tributaries contribute heavily to the degradation of larger systems such as the Wiconisco Creek. Agricultural Best Management Practices (BMP's) have been suggested in past reports and continue to be utilized as the most effective way to reduce agriculture-related sedimentation in streams. The BMP's can take many forms: Cropland nutrient management, Conservation tillage, Cover crops, Stream bank fencing, Streambank stabilization, proper forestry practices, and riparian re-vegetation, to name a few. DCCD, with the assistance of the Chesapeake Bay Program, continues to implement these practices with the cooperation of local farmers and municipalities. Although much has been done to date, there are numerous sites that still need to be addressed. These sub-watersheds should be targeted for agricultural BMP's. Nutrient and sediment Total Maximum Daily Loads (TMDL's) should be established and a restoration plan developed for these sub-watersheds.

E. Land Use

The land use options presented in this section are based upon studies completed in The Wiconisco Creek Watershed Study Phase I (1985) and are still relevant today. These options should not be considered as inflexible or unalterable decisions, but as a guide based on present and past conditions that can be revised as variables change.

- An organized development approach should be applied throughout the entire watershed area
- The development of Zoning and Inter-Municipal Land Use Ordinances
- Development of Municipal Comprehensive Plans
- Agriculture should continue to be a major land use in the watershed area and planning efforts should be directed at protection and preservation of prime agricultural land.
- Conservation of the steep slope areas and large wooded tracts that are not currently publicly owned.
- Continue residential development as low-density single-family detached dwellings, excepting those areas adjacent to public sewer and/or water service areas. Additionally, urban growth boundaries should be considered.

Additionally, the impacts of land use on surface water quality should be examined and a long-term water quality monitoring program should be considered. Also, a comprehensive groundwater quality/quantity study should be conducted for the entire watershed to provide up-to-date data.

F. Cultural Resources

Development of cultural resources and tourism opportunities such as the Lykens Valley Rails to Trails program will continue to draw attention to the watershed's natural resources. Municipalities, local business, and other groups are encouraged to work together with county and state agencies to promote and plan for recreation and tourism within the watershed. Recreation projects may spur new business and provide an economic boost to existing area businesses.

X. State and Federal Financial and Technical Assistance Programs

In an effort to assist municipalities and other public/private agencies in locating project funding, a listing of relevant federal and state financial and technical assistance programs was compiled. This small listing is by no means comprehensive, but will allow the reader a sampling of programs that are available. A description of each program is provided along with eligibility criteria and the respective administering agency. In utilizing the listing, it should be noted that all governmental-type programs are subject to funding cutbacks and/or eliminations at any time. However, this listing may serve as a basis from which to obtain additional information.

A. State Programs

1. The Clean and Green Program

The Clean and Green Act of 1974 was established to preserve farmland, forestland and open space by taxing land according to its use rather than the prevailing market value. The program is voluntary and generally requires that a 10-acre minimum remain in designated use (agricultural use, agricultural reserve and forest reserve).

Eligibility: Parcels greater than 10 acres and capable of producing \$2000 annually from the sale of agricultural products are eligible for the agriculture use designation. Land taken out of the permitted use becomes subject to a rollback tax, imposed for up to seven years, and an interest penalty.

Administering Agency: The program is administered by county assessment offices.

2. **The Pennsylvania Agricultural Conservation Easement Purchase Program**

This program was developed in 1988 to help slow the loss of prime farmland to non-agricultural uses. The program enables state, county and local governments to purchase conservation easements (sometimes called development rights) from owners of quality farmland. The first easements were purchased in 1989. Counties participating in the program have appointed agricultural land preservation boards with a state board created to oversee this program..

Eligibility: Aside from being part of an ASA (Agricultural Security Area), the farm is rated against other eligible parcels according to the following criteria:

- Quality of the Farmland. State regulations require that easements be purchased on farms of a minimum of 50 acres in size. Parcels as small as 10 acres may be preserved if adjacent to existing preserved farmland or used for the production of crops unique to the area. At least half the tract must either be harvested cropland, pasture or grazing land and it must contain 50 soil capability classes I-N.
- Stewardship. Farms are rated on the use of conservation practices and best management practices of nutrient management and control of soil erosion and sedimentation.
- Likelihood of Conversion. Easements offered for sale to counties will be scored and ranked for acquisition based on a variety of factors such as:
 - Proximity of farm to sewer and water lines.
 - Extent and type of non -agricultural uses nearby.
 - Amount and type of agricultural use in the vicinity.
 - The amount of other preserved farmland in close proximity.

Administrative Agency:

Bureau of Farmland Preservation, Department of Agriculture,
2301 North Cameron Street, Harrisburg, PA 17110-9408

Local Contacts: Dauphin County Conservation District
1451 Peters Mountain Rd.
Dauphin, PA 17018
Telephone: 717.921.8100

Schuylkill Conservation District
1206 AG Center Drive
Pottsville, PA 17901-9733
Telephone: 570.622.3742
Fax: 570.622.4009
E-Mail: schuylcd@co.schuylkill.pa.us
Craig R. Morgan

3. **Community Revitalization Program (CR)**

Provides grant funds to support local initiatives that promote the stability of communities. The program also assists communities in achieving and maintaining social and economic diversity to ensure a productive tax base and a good quality of life.

Eligibility: Local governments, municipal and redevelopment authorities and agencies, industrial development agencies, and non-profit corporations incorporated under the laws of the Commonwealth.

Administrative Agency: Department of Community and Economic Development, 4th Floor, Commonwealth Keystone Building, Harrisburg, PA 17120-0225

4. **New Communities / Main Street Program**

The Main Street Manager Component is a five-year program designed to help a community's downtown economic development effort through: the establishment of a local organization dedicated to downtown revitalization; and the management of downtown revitalization efforts by hiring a full-time professional downtown coordinator. The Downtown Reinvestment and Anchor Building components use business district strategies to support eligible commercial related projects located within a central or neighborhood business district. This program has been merged into the New Communities Program.

Eligibility: In limited cases, a Main Street non-profit or Business District Authority with two years of audited records may apply for the funds.

Administrative Agency: Department of Community and Economic Development, 4th Floor, Commonwealth Keystone Building, Harrisburg, PA 17120-0225

5. **PENNVEST**

The Pennsylvania Infrastructure Investment Authority Act was created by Act 16 in 1988. PENNVEST provides low-interest loans and grants for new construction or for improvements to publicly or privately owned drinking water or sewer treatment facilities. This includes funding available to individual homeowners for repair or replacement of their malfunctioning on-lot septic system. PENNVEST can also fund municipally owned stormwater management systems.

Administering Agency: The Governor's Center for Local Government Services, Department of Community and Economic Development, 4th Floor, Commonwealth Keystone Building, Harrisburg, PA 17120-0225

6. **Land Use Planning and Technical Assistance Program (LUPTAP)**

The Land Use Planning and Technical Assistance Program (LUPTAP) is a financial resource that strengthens comprehensive land-use planning by encouraging cooperation and consistency among contiguous municipalities, counties and school districts, as well as broadening public- and private-sector involvement in the planning process.

Eligibility: Counties and local Governments

Administering Agency: The Governor's Center for Local Government Services, Department of Community and Economic Development, 4th Floor, Commonwealth Keystone Building, Harrisburg, PA 17120-0225

7. **Community Conservation Partnership Programs**

Funding program for the acquisition, development, planning, implementation, and technical assistance projects from the Keystone Recreation, Park and Conservation Fund, the Growing Greener Fund, and the PA Recreational Trails Fund.

Eligibility: Local Governments, Community Groups, Non-Profit Conservation organizations

Administering Agency: Pennsylvania Department of Conservation and Natural Resources, Bureau of Recreation and Conservation, Telephone: 717.787.7672

8. **Growing Greener Program**

Program uses Growing Greener funds to protect and restore watersheds and upgrade sewer and water infrastructure.

Eligibility: Conservation Districts, local governments, Watershed Associations, non-profits, and citizen groups.

Administering Agency: Pennsylvania Department of Environmental Protection, Growing Greener Grants Center. Telephone: 717.705.5400

B. **Federal Programs**

1. **Conservation Reserve Program**

The CRP is a voluntary program that offers annual rental payments, incentive payments, and annual maintenance payments for certain activities, and cost-share assistance to establish approved cover on eligible cropland.

The program encourages farmers to plant long-term resource-conserving covers to improve soil, water, and wildlife resources. CCC makes available cost-share assistance in an amount equal to not more than 50 percent of the participant's costs in establishing approved practices. Contract duration is between 10 and 15 years.

Eligibility: To be eligible for placement in the CRP land must be:
Cropland that is planted or considered planted to an agricultural commodity 2 of the 5 most recent crop years (including field margins) and which is physically and legally capable of being planted in a normal manner to an agricultural commodity; or Marginal pastureland that is either:

Certain acreage enrolled in the Water Bank Program; or Suitable for use as a riparian buffer to be planted to trees.

Administering Agency: CRP is administered by FSA. The Natural Resources Conservation Service, Cooperative State Research and Education Extension Service, state forestry agencies, and local soil and water conservation districts provide technical support.

Local Contacts: Dauphin County Conservation District
1451 Peters Mountain Rd.
Dauphin, PA 17018
Telephone: 717.921.8100

Schuylkill Conservation District
1206 AG Center Drive
Pottsville, PA 17901-9733
Telephone: 570.622.3742
Fax: 570.622.4009
E-Mail: schuylcd@co.schuylkill.pa.us
Craig R. Morgan

2. **Rural Housing and Economic Development (RHED)**

The Rural Housing and Economic Development (RHED) Program provides for capacity building at the State and local level for rural housing and economic development and to support innovative housing and economic development activities in rural areas.

Eligibility: Eligible applicants are local rural non-profits, community development corporations (CDCs), state housing finance agencies (HFAs), state community and/or economic development agencies, and Indian tribes. Funds are available in 2 categories, Capacity Building and Support for Innovative Housing and Economic Development activities.

Administering Agency: U.S. Department of Housing and Urban Development, Philadelphia Regional Office, The Wanamaker Building, 100 Penn Square East, Philadelphia, PA 19107-3380

XI. Recommended Actions

A. Goals/Objectives

In order to prepare a plan such as this, it is necessary to articulate goals and objectives, which represent the desires of area residents. The final document results in a planning program that seeks to relate, harmonize and balance the economic, physical and social functions of the watershed. The plan will then serve as a guide for future development, environmental and infrastructure needs, and other decisions concerning municipal affairs.

- To promote the conservation of the natural resources of the Wiconisco Creek Watershed.
- To conduct educational and scientific investigations and research related to natural resources conservation within and bordering the Wiconisco Creek Watershed as deemed necessary.
- To disseminate information pertaining to the natural resources of the watershed to interested parties and general public.
- To educate individuals and organizations in the value of stream controls and land activities.
- To improve financial, technical and other assistance from federal, state and local sources to implement the watershed's protection and development.
- To accelerate existing beneficial governmental programs on the watershed and promote necessary additional constructive programs beneficial to the watershed.

The overall project goal is stated as follows:

“To establish and maintain the best possible quality of life for all watershed residents”

In order to achieve this primary goal, the following more specific goals and objectives relating to the major elements of this plan were established.

1. Socio-Economics.

To assist in the development and support of public and private mechanisms in order to provide social services that adequately meet the needs of all watershed residents. And to promote the concept of decent, safe and affordable housing for every resident of the watershed in order to meet his or her physical and psychological needs.

- Supporting the municipal adoption and enforcement of codes and ordinances, which will eliminate and prevent conditions that contribute to and perpetuate blight in residential areas.
 - Encouraging a high level of care and maintenance for residential properties
 - Recommending and supporting strategies that expand residential opportunities by encouraging a variety of housing designs, types, and values to meet the residential needs of watershed households.
 - Promoting the growth of agricultural-related businesses and industries
 - Supporting the development of tourism and cultural resources including rails/trails development and encouraging historical and cultural institutions.
2. Land Use. Recommend a pattern of compatible land uses, which is responsive to the needs and desires of residents and to the limitations and potentials of both natural and man-made environment.
- Creation of functional environments for each major land use.
 - Recommending the municipal adoption and enforcement of effective land use standards that minimize conflicts between land uses.
 - Supporting inter-municipal land use planning efforts and the coordination of such efforts with county, regional and state plans.
 - Recognizing the watershed as an entity and that local municipal decisions and planning must consider the impact on the Watershed as a whole.
3. Infrastructure. Recommend the development and maintenance of a Watershed transportation circulation system and recommend the provision of complete and adequate public facilities and systems to service the developed areas of the Watershed by:
- Recommending the upgrading and extension of existing public systems.
 - Supporting the improvement and expansion of recreational facilities.
 - Recommending the municipal maintenance of an adequate level of police, fire and ambulance services commensurate with population and business needs.

B. Projects

The recommended actions and projects and priority levels are given in tabular form herein and follow the same format as the goals listed in section XI-A. Priority level 1 is of the highest importance and should be addressed first. Priority level 2 projects can be addressed after completion of the more immediate projects. And Priority level 3 projects can be addressed as time and funding opportunities allow. Priority levels were determined through public participation during the final public meeting on November 19, 2003.

Table 23.
Recommended Actions
Socio-economics

Recommended Action	Priority Level
Encourage programs that address the social services needs of the communities in the Watershed	2
Support and encourage appropriate health care programs	2
Provide incentives for inter municipal ordinances to prevent conditions that perpetuate blight.	2
Encouraging homeowners to maintain residential properties	2
Provide incentives for new businesses to locate within the watershed.	2
Encouraging the continued existence and vitality of the Watershed's existing commercial/industrial employers and service providers.	2
Encourage local public input for the development of social programs.	2

Table 24.
Recommended Actions
Land Use

Recommended Action	Priority Level
Provide workshops for municipal officials and others in better site design.	2
Promote the purchase of Agricultural Easements.	2
Encourage involvement of landowners in the CRP program	2
Encourage town re-vitalization programs	2
Promote the conservation of existing forested lands and steep slopes	2
Encourage the development of commercial/industrial sites with sound construction practices and Best Management Practices.	1
Develop land use restrictions to protect historical areas and structures.	2
Encourage and support local government in the development of zoning, ordinances, and comprehensive plans	1
Encourage Comprehensive Stormwater Best Management Practices	1
Encourage inter municipal zoning and ordinances.	2

Table 25.
Recommended Actions
Infrastructure

Recommended Action	Priority Level
Encourage and support municipalities in seeking grant funding for infrastructure improvements/upgrades.	1
Provide training on on-lot sewage treatment systems and alternatives for municipal officials	2
Encourage municipalities to develop a watershed –wide public transportation system	2
Encourage the development of trails and other facilities to promote pedestrian and bicycle use.	2
Seek funding opportunities for improving emergency services.	2

Table 26.
Recommended Actions
Natural Resources

Recommended Action	Priority Level
Seek funding for and provide mine drainage mitigation projects	1
Install Best Management Practices to reduce impacts of nutrients on surface and groundwater	1
Promote partnerships between associations and municipalities to remediate mine drainage.	2
Investigate opportunities for re-use of existing coal silt/culm	2
Protect important natural communities from development pressures	2
Maintenance of existing remediation/mitigation structures	1
Promote and assist in Nutrient Management Plans	2
Preserve threatened/endangered species	2
Mitigate the effects of atmospheric deposition in Rattling Creek	1
Restore disturbed and degraded riparian zones	2
Investigate opportunities for groundwater quality/quantity studies	2
Provide incentives for septic system upgrades	2
Assist municipalities with stormwater management strategies and BMP's.	2
Assist watershed associations and municipalities in their efforts to find funding for mine drainage remediation activities.	1
Encourage incentives for good silvicultural stewardship by landowners.	2
Promote and Encourage Agricultural Land Preservation	2
Promote sound agricultural practices that preserve natural communities	2

Table 27.
Recommended Actions
Education

Recommended Action	Priority Level
Create demonstration projects for mine drainage remediation as educational sites	2
Promote public involvement, Watershed Associations and Watershed Stewardship	1
Create recreational trails and support the rails/trails program	2
Promote water conservation	1
Begin demonstration projects for erosion/sediment control.	2
Update Watershed plan periodically to reflect changes in the watershed	2
Conduct community environmental seminars/meetings	2
Keep municipalities abreast of water quality conditions within the watershed.	1
Support community environmental education by the Ned Smith Center and other institutions.	2
Encourage environmental awareness programs in local schools that explain local environmental issues.	1

C. Contact Information

1. Mining Issues

The Eastern Pennsylvania Coalition for Abandoned Mine Reclamation (EPCAMR), County Conservation Districts, and P.A. Department of Environmental Protection are the best sources of information on coal mining issues and remediation within the Watershed.

EPCAMR

Mr. Robert Hughes, Regional Coordinator
Luzerne Conservation District
485 Smith Pond Road
Shavertown, PA 18708
Telephone: 570.674.7993
Fax: 570.674.7989
Website: www.epcamr.org

Schuylkill Conservation District
1206 Ag. Center Drive
Pottsville, PA 17901
Telephone: 570.622.3742 ext. 5

PA Department of Environmental Protection
Bureau of Abandoned Mine Reclamation
Rachel Carson State Office Building
P.O. Box 8476
Harrisburg, PA 17105-8476
Phone 717.783.2267
FAX 717.783.7442

Dauphin County Conservation District
1451 Peters Mountain Rd.
Dauphin, PA 17018
Telephone: 717.921.8100
Website: www.dauphincd.org

2. Agriculture

The Dauphin County Conservation District, Schuylkill Conservation District, and Penn State Cooperative Extension are the best sources for agriculture-related information, erosion and other issues relating to agriculture within the watershed.

Dauphin County Conservation District (DCCD) and Penn State Cooperative Extension Office (PSCEO)

1451 Peters Mountain Rd.

Dauphin, PA 17018

DCCD: 717.921.8100

PSCEO: 717.921.8803

Website: www.dauphincd.org

Schuylkill Conservation District

1206 Ag. Center Drive

Pottsville, PA 17901

Telephone: 570.622.3742 ext. 5

3. Aquatic Resources

The County Conservation Districts, the Wiconisco Creek Restoration Association, The Susquehanna River Basin Commission, and the PA Department of Environmental Protection are the best sources of information regarding aquatic resources, water quality and watershed projects within the Wiconisco Creek Watershed.

Dauphin County Conservation District

1451 Peters Mountain Rd.

Dauphin, PA 17018

717.921.8100

Website: www.dauphincd.org

Wiconisco Creek Restoration Association

C/O Dave Fennell, Secretary

630 East Wiconisco Ave

Tower City, PA 17980

PA Dept. of Environmental Protection

South central Region

909 Elmerton Ave.

Harrisburg, PA 17110-8200

Website: www.dep.state.pa.us

Susquehanna River Basin Commission

1721 N. Front St.

Harrisburg, PA 17102-2391

Website: www.srbc.net

Schuylkill Conservation District

1206 Ag. Center Drive

Pottsville, PA 17901

Telephone: 570.622.3742 ext. 5

4. Planning/Land Use

The County Planning Commissions and Tri-County Regional Planning Commission are the area's source for all types of planning information including: Transportation, Environmental, and contain a regional data inventory. The Governor's Center for Local Government Services assists local governments seeking to implement the land use objectives of the Commonwealth.

Tri-County Regional Planning Commission (TCRPC)
Dauphin County Veterans Memorial Building
112 Market Street, 2nd Floor
Harrisburg, PA 17109
Phone: 717.234.2639
Fax: 717.234.4058
E-mail: planning@tcrpc-pa.org
Website: www.tcrpc-pa.org

Dauphin County Planning Commission
Veterans Memorial Office Bldg.
112 Market St. , 8th Floor
Harrisburg, PA 17101
717.240.6377

Schuylkill County Planning & Zoning
Schuylkill County Courthouse
1st Floor
Charles M. Ross
Telephone: 570.628.1415

The Governor's Center for Local Government Services
Department of Community and Economic Development
4th Floor, Commonwealth Keystone Building
Harrisburg, PA 17120-0225
(voice) 888.223.6837
(fax) 717.783.1402

XII. Literature Cited

Dauphin County Planning Commission 1985. Wiconisco Creek Watershed Study, Phase I: Problem Identification/Recommendations. Harrisburg, PA.

_____. 1986. Wiconisco Creek Watershed Study, Phase II: Implementation. Harrisburg, PA.

_____. 1992. Dauphin County Comprehensive Plan 1992. Harrisburg, PA

_____. 2001. Dauphin County Planning Commission Annual Report 2001. Harrisburg, PA

_____. 2002. Dauphin County Draft Comprehensive Plan 2002. Harrisburg, PA

_____. 2002. Dauphin County Planning Commission Meeting Notes, February 4, 2002. Harrisburg, PA

Kunkle, W. Merrill, et. al. 1972. Soil Survey of Dauphin County, Pennsylvania. U.S. Department of Agriculture, Soil Conservation Service. Washington, DC.

Gilligan, Martin J. 1985. Wiconisco Creek Watershed Study. Effects of Anthracite Coal Mining Activities on General Water Quality. Pennsylvania Department of Environmental Protection, Bureau of Water Quality Management, Wilkes-Barre Regional Office. Wilkes-Barre, PA.

Hughey, Ronald E. 1977. Aquatic Biological Investigation of the Little Wiconisco Creek. Pennsylvania Department of Environmental Protection. Harrisburg, PA.

Lindsey, Bruce D. (U.S. Geological Survey, United States), et al. 1998. Water quality in the lower Susquehanna River basin, Pennsylvania and Maryland, Circular C 1168.

Pennsylvania Department of Environmental Protection. 1978. Floodplain Management Act (32 P.S. ss679.101-679.601)

_____. 1984. Stormwater Management Act (Act of October 9, 1978 P.L. 864, No. 167, as amended 1984, No. 63)

_____. 1997. Bureau of Abandoned Mine Reclamation. Comprehensive Plan for Abandoned Mine Reclamation.

_____. 1998. 303 (d) list of impaired stream segments

_____. 1999. Pennsylvania's Nonpoint Source Management Program 1999 Update. Harrisburg, PA.

_____. 2000. PA. Code Title 25, Chapter 87, Section 102 Erosion and Sediment Control (1972, as amended 2000). Harrisburg, PA.

_____. 2002. Pennsylvania Water Quality Assessment, 305 (b) Report. Harrisburg, PA.

Rathfon, Tony. 2002. P.A. Department of Environmental Protection. Personal Communication.

Ross, Charles. 2002. Schuylkill County Planning Commission. Personal Communication.

Sanders and Thomas, Inc. 1973. Wiconisco Creek Operation Scarlift Mine Drainage Pollution Abatement Project. Project SL 170. Pennsylvania Department of Environmental Protection, Bureau of Abandoned Mine Reclamation, Harrisburg, PA.

Schott, Robert J. 1982. Aquatic Biological Investigation of an Unnamed Tributary to Wiconisco Creek. Pennsylvania Department of Environmental Protection. Harrisburg, PA.

Stoe, T. 1998. Water Quality and Biological Assessment of the Wiconisco Creek Watershed. Publication No. 193, Susquehanna River Basin Commission. Harrisburg, PA.

_____. 1999. Wiconisco Creek Watershed Assessment and Plan. Publication No. 206, Susquehanna River Basin Commission. Harrisburg, PA.

The Nature Conservancy, Pennsylvania Science Office. 2000. Natural Areas Inventory, Dauphin County, Pennsylvania. Project for Tri-County Regional Planning Commission. Harrisburg, PA.

Tri-County Regional Planning Commission. 1995. Dauphin County Sewerage Plan. Harrisburg, PA.

_____. 1998. Susquehanna River Conservation Plan. Harrisburg, PA

_____. 2001. Tri-County Regional Planning Commission 2001 Annual Report. Harrisburg, PA

List of Aquatic Macroinvertebrate Taxa known to occur in the Wiconisco Creek Watershed

Little Wiconisco Creek Watershed

Class: Order	Family	Family/Genus
Turbellaria: Tricladida (Flatworms)		Turbellaria
Gordioidea: Dioctophymoidea (Horsehair Worms)		Nematomorpha
Oligochaeta: Tubificida (Worms)	Tubificidae	Tubificidae
Gastropoda: Basommatophora (Snails)	Physidae	Physidae
Bivalvia: Pelecypoda (Clams)	Corbiculidae	<u>Corbicula</u>
	Sphaeriidae	Sphaeriidae
Decapoda (Crayfish)	Cambaridae	<u>Orconectes</u>
Insecta: Ephemeroptera (Mayflies)	Baetidae	<u>Acentrella</u> <u>Baetis</u> <u>Centroptilum</u> <u>Cloeon</u>
	Ephemerellidae	<u>Ephemerella</u> <u>Serratella</u>
	Ephemeridae	<u>Ephemera</u>
	Heptageniidae	<u>Leucrocuta</u> <u>Stenonema</u>
	Isonychiidae	<u>Isonychia</u>
	Leptophlebiidae	<u>Leptophlebiidae</u>
	Nemouridae	<u>Amphinemura</u>
	Perlidae	<u>Acroneuria</u> <u>Agnatina</u> <u>Paragnetina</u>
Plecoptera (Stoneflies)	Perlodidae	<u>Isoperla</u>
	Coenagrionidae	<u>Argia</u>
Odonata (Dragonflies/Damselflies)		
Megaloptera (Alderflies/Dobsonflies)	Corydalidae	<u>Corydalis</u> <u>Nigronia</u>
	Sialidae	<u>Sialis</u>

List of Aquatic Macroinvertebrate Taxa known to occur in the Wiconisco Creek Watershed

Little Wiconisco Creek Watershed continued

Class: Order	Family	Family/Genus
Trichoptera (Caddisflies)	Hydropsychidae	<u>Ceratopsyche</u>
		<u>Cheumatopsyche</u>
		<u>Hydropsyche</u>
		<u>Macrostemum</u>
	Philopotamidae	<u>Chimarra</u> <u>Dolophilodes</u>
Coleoptera (Beetles)	Elmidae	<u>Dubiraphia</u>
		<u>Optioservus</u>
		<u>Stenelmis</u>
	Hydrophilidae	<u>Hydrobius</u>
	Psephenidae	<u>Psephenus</u>
Diptera (True Flies)	Athericidae	<u>Atherix</u>
	Ceratopogonidae	<u>Allaudomyia</u>
	Chironomidae	Chironomidae
	Empididae	<u>Hemerodromia</u>
	Simuliidae	Simuliidae
	Tipulidae	<u>Antocha</u>
		<u>Tipula</u>
Hemiptera (True Bugs)	Veliidae	<u>Rhagovelia</u>

List of Aquatic Macroinvertebrate Taxa known to occur in the Wiconisco Creek Watershed

Wiconisco Creek (mainstem and unnamed tributaries)

Class: Order	Family	Family/Genus
Oligochaeta: Haplotaxida (Worms)	Naididae	Naididae
Gastropoda: Basommatophora (Snails)	Physidae	<u>Physella</u>
	Planorbidae	<u>Planorbella</u>
Crustacea: Decapoda (Crayfish)	Cambaridae	<u>Cambarus</u>
Ephemeroptera (Mayflies)	Baetidae	<u>Acentrella</u>
		<u>Baetis</u>
		<u>Centroptilum</u>
		<u>Cloeon</u>
	Ephemerellidae	<u>Attenella</u>
		<u>Ephemerella</u>
	Ephemeridae	<u>Ephemera</u>
		<u>Hexagenia</u>
	Heptageniidae	<u>Epeorus</u>
		<u>Leucrocuta</u>
		<u>Macdunnoa</u>
		<u>Nixe</u>
		<u>Rhithrogena</u>
	<u>Stenacron</u>	
	<u>Stenonema</u>	
Isonychiidae	<u>Isonychia</u>	
Leptophlebiidae	<u>Leptophlebia</u>	
	<u>Paraleptophlebia</u>	
Tricorythidae	<u>Leptohypes</u>	
Plecoptera (Stoneflies)	Capniidae	<u>Capnia</u>
		<u>Paracapnia</u>
	Leuctridae	<u>Leuctra</u>
	Nemouridae	<u>Amphinemura</u>
	Perlidae	<u>Acroneuria</u>
		<u>Paragnetina</u>
		<u>Perlesta</u>
Perlodidae	<u>Isoperla</u>	

List of Aquatic Macroinvertebrate Taxa known to occur in the Wiconisco Creek Watershed

Wiconisco Creek (mainstem and unnamed tributaries) continued

Class: Order	Family	Family/Genus	
Odonata (Dragonflies/Damselflies)	Cordulegastridae	<u>Cordulegaster</u>	
	Calopterygidae	<u>Hataerina</u>	
Megaloptera (Alderflies/Dobsonflies)	Corydalidae	<u>Corydalus</u> <u>Nigronia</u>	
	Sialidae	<u>Sialis</u>	
	Glossosomatidae	<u>Glossosoma</u>	
Trichoptera (Caddisflies)	Hydropsychidae	<u>Ceratopsyche</u>	
		<u>Cheumatopsyche</u>	
		<u>Diplectronea</u>	
		<u>Hydropsyche</u>	
		<u>Macrostemum</u>	
		<u>Potamyia</u>	
	Philopotamidae	<u>Chimarra</u> <u>Dolophilodes</u>	
	Phryganeidae	<u>Oligostomis</u>	
	Polycentropodidae	<u>Polycentropus</u>	
Rhyacophilidae	<u>Rhyacophila</u>		
Coleoptera (Beetles)	Elmidae	<u>Ancyronyx</u> <u>Optioservus</u> <u>Stenelmis</u>	
		Psephenidae	<u>Psephenus</u>
	Diptera (True Flies)	Athericidae	<u>Atherix</u>
Ceratopogonidae		<u>Allaudomyia</u>	
Chironomidae		Chironomidae	
Empididae		<u>Hemerodromia</u>	
Simuliidae		Simuliidae	
Tipulidae		<u>Antocha</u> <u>Dicranota</u> <u>Hexatoma</u> <u>Limnophila</u> <u>Tipula</u>	
		Hemiptera (True Bugs)	Veliidae
	Collembola (Springtails)		Poduridae

List of Aquatic Macroinvertebrate Taxa known to occur in the Wiconisco Creek Watershed

Rattling Creek Sub-Watershed

Class: Order	Family	Family/Genus
Hirudinea: Rhynchobdellida (Leeches)	Glossiphoniidae	Glossiphoniidae
Oligochaeta: Enchytraeida (Worms) Lumbriculida Haplotaxida	Enchytraeidae	Enchytraeidae
	Lumbriculidae	Lumbriculidae
	Naididae	Naididae
	Tubificidae	Tubificidae
Arachnida: Acari (Water mites)		Acari
Insecta: Ephemeroptera (Mayflies)	Baetidae	<u>Acentrella</u> <u>Baetis</u>
	Ephemerellidae	<u>Ephemerella</u>
	Heptageniidae	<u>Epeorus</u> <u>Rhithrogena</u> <u>Stenonema</u>
Plecoptera (Stoneflies)	Capniidae	<u>Capnia</u>
	Leuctridae	<u>Leuctra</u>
	Nemouridae	<u>Amphinemura</u>
	Peltoperlidae	<u>Peltoperla</u> <u>Tallaperla</u>
	Perlidae	<u>Acroneuria</u> <u>Agnatina</u> <u>Eccoptura</u>
	Taeniopterygidae	<u>Taeniopteryx</u>
Odonata (Dragonflies/Damselflies)	Aeshnidae	<u>Boyeria</u>
Megaloptera (Alderflies/Dobsonflies)	Corydalidae	<u>Nigronia</u>

List of Aquatic Macroinvertebrate Taxa known to occur in the Wiconisco Creek Watershed

Rattling Creek Sub-Watershed continued

Class: Order	Family	Family/Genus
Trichoptera (Caddisflies)	Brachycentridae	<u>Brachycentrus</u>
	Hydropsychidae	<u>Ceratopsyche</u>
		<u>Cheumatopsyche</u>
		<u>Diplectrona</u>
		<u>Hydropsyche</u>
		<u>Oxyethira</u>
	Hydroptilidae	<u>Chimarra</u>
	Philopotamidae	<u>Dolophilodes</u>
	Polycentropodidae	<u>Neureclipsis</u>
		<u>Polycentropus</u>
Psychomyiidae	<u>Lype</u>	
Rhyacophilidae	<u>Rhyacophila</u>	
Coleoptera (Beetles)	Elmidae	<u>Optioservus</u>
		<u>Oulimnius</u>
		<u>Promoresia</u>
		<u>Stenelmis</u>
	Psephenidae	<u>Psephenus</u>
Diptera (True Flies)	Ceratopogonidae	<u>Bezzia</u>
	Chironomidae	Chironomidae
	Empididae	<u>Chelifera</u>
		<u>Hemerodromia</u>
	Simuliidae	<u>Prosimulium</u>
		Simuliidae
	Tabanidae	<u>Tabanus</u>
	Tipulidae	<u>Antocha</u>
<u>Dicranota</u>		
	<u>Hexatoma</u>	

List of Fish Taxa known to occur in the Wiconisco Creek Watershed

Little Wiconisco Creek Sub-Watershed

Species	Common Name
<u>Semotilus corporalis</u>	Fallfish
<u>Rhynchichthys atratulus</u>	Blacknose Dace
<u>Semotilus atromaculatus</u>	Creek Chub
	Central
<u>Campostoma anomalum</u>	Stoneroller
<u>Etheostoma zonale</u>	Banded Darter
<u>Exoglossum maxillingua</u>	Cutlips Minnow
<u>Hypertelium nigricans</u>	Northern Hognose Sucker
<u>Nocomis micropogon</u>	River Chub
<u>Notropis procer</u>	Swallowtail Shiner
<u>Rhynchichthys cataractae</u>	Longnose Dace
<u>Etheostoma olmstedii</u>	Tesselated Darter
<u>Lepomis auritus</u>	Redbreast Sunfish
<u>Lepomis macrochirus</u>	Bluegill Sunfish
<u>Noturus insignis</u>	Margined Madtom
<u>Luxilus cornutus</u>	Common Shiner
<u>Notropis hudsonius</u>	Spottail Shiner
<u>Cyprinella spiloptera</u>	Spotfin Shiner
<u>Etheostoma blenoides</u>	Greenside Darter
<u>Ameiurus natalis</u>	Yellow Bullhead
<u>Catostomus commersoni</u>	White Sucker
<u>Pimephales notatus</u>	Bluntnose Minnow
<u>Ambloplites rupestris</u>	Rock Bass
<u>Micropterus dolomieu</u>	Smallmouth Bass
<u>Esox niger</u>	Chain Pickerel
<u>Micropterus salmoides</u>	Largemouth Bass

List of Fish Taxa known to occur in the Wiconisco Creek Watershed

Wiconisco Creek (Mainstem)

Species	Common Name
<u>Catostomus commersoni</u>	White Sucker
<u>Esox niger</u>	Chain Pickerel
<u>Etheostoma blenoides</u>	Greenside Darter
<u>Etheostoma olmstedi</u>	Tessellated Darter
<u>Exoglossum maxillingua</u>	Cutlips Minnow
<u>Hypentelium nigricans</u>	Northern Hognose Sucker
<u>Rhynchithys atratulus</u>	Blacknose Dace
<u>Rhynchithys cataractae</u>	Longnose Dace
<u>Salmo trutta</u>	Brown Trout
<u>Semotilus corporalis</u>	Fallfish
<u>Lepomis macrochirus</u>	Bluegill Sunfish
<u>Percina peltata</u>	Shield Darter
<u>Campostoma anomalum</u>	Central Stoneroller
<u>Salvelinus fontinalis</u>	Brook Trout

Rattling Creek Sub-Watershed

Species	Common Name
<u>Salmo trutta</u>	Brown Trout
<u>Salvelinus fontinalis</u>	Brook Trout
<u>Rhynchithys cataractae</u>	Blacknose Dace

Bear Creek Sub-Watershed

Species	Common Name
<u>Salvelinus fontinalis</u>	Brook Trout