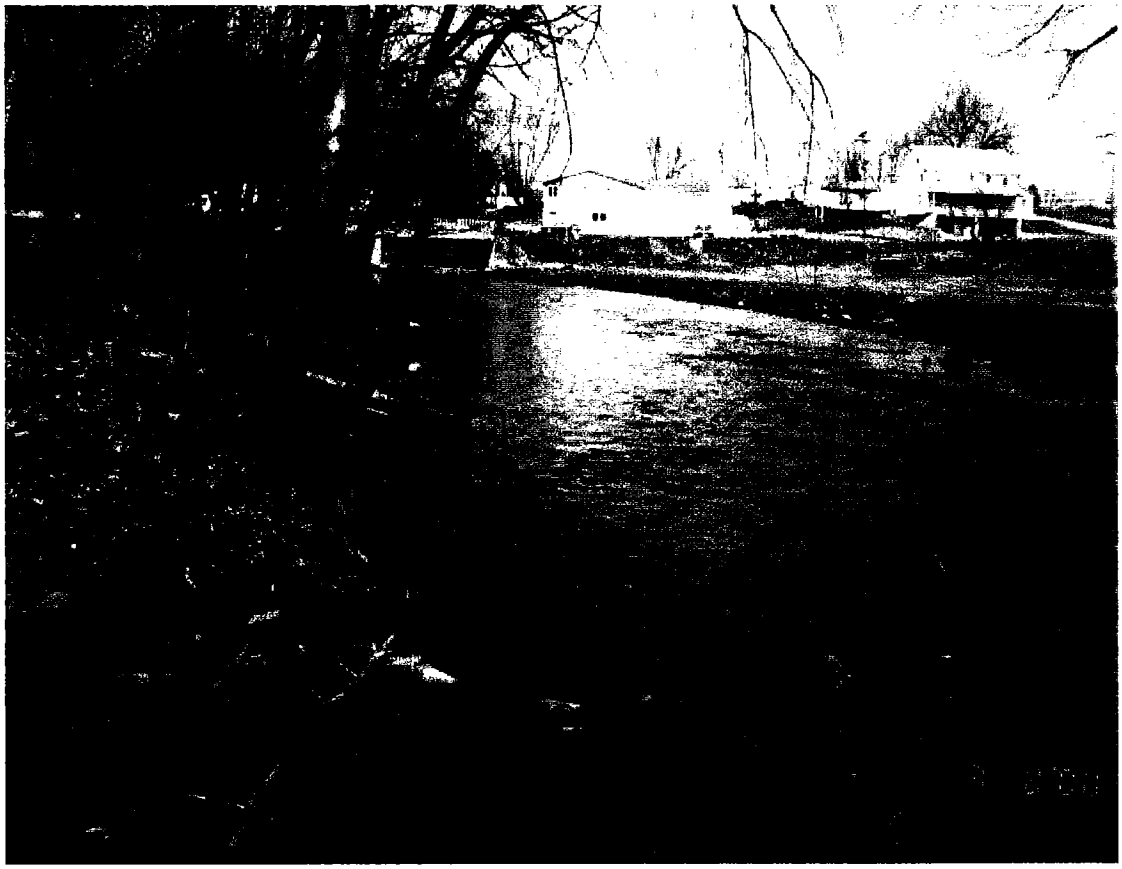
EXECUTIVE SUMMARY



EXECUTIVE SUMMARY

A. Introduction

Swatara Creek and its watershed have played an important and varied role in the history of south central Pennsylvania. From prehistoric times through today, the watershed has fulfilled the differing needs of its inhabitants. Early inhabitants utilized the watershed as primarily hunting and fishing grounds for their existence. Later, as European settlers colonized the watershed, it continued to provide for sustenance; but it also provided lumber, agricultural soils, and transportation for building a life in the area. The following generations of settlers used the streams of the Swatara Creek watershed to power mills and transport while they harvested the coal, iron, and limestone along their banks, bringing economic prosperity to the area. Today, Swatara Creek and its watershed provide prime agricultural soil for farming, land for development, wildlife habitat, and recreational opportunities for both residents and visitors.

All of these needs and uses have had an impact on the Swatara Creek watershed. Clearing the forests resulted in increased sediment entering the streams of the watershed. Damming these streams for power and transportation blocked the historic spawning runs of shad, herring, and salmon. Runoff from coal mining left many streams lifeless. Today, increases in the population of the watershed require greater volumes of water for drinking and industrial use. Development of the watershed is also resulting in greater runoff, increased flooding, damage to riparian areas, and less groundwater recharge from precipitation falling in the watershed.

Although problems persist, there have been numerous success stories within the watershed and there is much reason for optimism as a new millennium begins. Projects to address and correct degradation from mine drainage have been successful enough to return diverse fisheries to streams once considered sterile. Clean-ups of litter and refuse along streams and riparian areas have become annual events within the watershed. Projects to rehabilitate riparian buffers and reduce agricultural runoff have been implemented, and in-stream habitat development and water quality monitoring are also conducted within the watershed.

The River Conservation Plan (RCP) for the Swatara Creek watershed has been completed to develop a comprehensive, long term management plan that addresses the problems and concerns, and takes advantage of the opportunities present in the watershed today and the future.

B. Project Background

The RCP for the Swatara Creek watershed was initiated following the Swatara Watershed Expo sponsored by the Swatara Creek Watershed Association (SCWA) in 1996. Obtaining listing on the Pennsylvania Rivers Registry and the associated funding opportunities for restoration and management projects were the primary reasons for pursuing and receiving a Department of Conservation and Natural Resources (DCNR) - Rivers Conservation Planning Grant in 1997 and 1998 respectively. Additional funding and support for the project was provided by both public and private organizations; including the Department of Conservation and Natural Resources (DCNR), The William Penn Foundation, Canaan Valley Institute (CVI), IBM, The Greater Harrisburg Foundation, and the Ressler Mill Foundation. Following a series of 1998 public meetings to determine interest and concern for the project. SCWA contracted Mackin Engineering Company to assist in completing

the Swatara Creek River Conservation Plan in 1999. A "Draft" document was circulated for public review and comment in July, 2000. Two public meetings were held on July 12th and 13th to present the findings of the RCP plan. The comment period on the "Draft" plan ended August 15th, 2000. The comments received were incorporated into the "Final" RCP document.

C. Project Area Characteristics

The Swatara Creek watershed drains approximately 571 square miles in Schuylkill, Berks, Lebanon, and Dauphin Counties. Swatara Creek originates in Schuylkill County north of US Route 209 in Foster Township. It flows in a south and southwesterly direction for approximately 69 miles to its confluence with the Susquehanna River in Middletown, Dauphin County, PA. Swatara Creek flows through three physiographic provinces and numerous geologic formations.

The land use within the watershed varies from undeveloped forestland to agricultural fields and farms to residential and urban development. Agricultural land remains the dominant land use in the watershed; but residential and urban development is occurring in portions of the watershed at a rapid pace.

Population within the watershed is growing. From 1960 through 1990 the population of the watershed grew from approximately 179,500 people to approximately 252,300 an increase of 40.6 percent. Population figures from 1998 show the watershed with approximately 263,000 residents or 2.2 percent of the entire population of Pennsylvania. With the exception of the Schuylkill County portion of the watershed, the communities located in the Swatara Creek watershed generally have lower unemployment and higher per capita income than the statewide average.

D. Resource Data Analysis, Conclusions, and Management Options

A detailed analysis of available resource data revealed several issues, concerns, constraints, and opportunities within the watershed. Primary among these were issues of water quality, population growth, land use within the watershed, Swatara Creek State Park, and the Swatara Greenway.

Water quality within the watershed has seen great improvement in the last 30 years. Much of this improvement has been the result of mine restoration projects in the northern portion of the watershed. However, water quality issues, especially those associated with non-point-source (NPS) pollution, are considered the most important in the watershed. Abandoned mine drainage (AMD) from the coalfields of Schuylkill County, runoff and erosion associated with farming and agricultural practices, and runoff from developing and urban areas are all examples of NPS pollution within the watershed.

As stated previously, the Swatara Creek watershed, especially those parts in Berks, Lebanon, and Dauphin Counties, has seen significant population growth in the past 30 years. Projections indicate that this trend will continue for the foreseeable future. Most of the growth has occurred outside of traditional population centers, in areas historically used for agricultural production. This situation has resulted in the development of new roadways and infrastructure, increased congestion on local roadways, increased pollution, the loss of agricultural soils and farms, and the loss of the aesthetics associated with rural life.

Swatara State Park was identified as a significant resource within the watershed Swatara State Park is the only facility established under Project 70, a 1964 statewide initiative for the development of parks throughout the Commonwealth, that is still undeveloped. As a result, it is greatly underutilized.

Another potentially significant recreational resource is the Swatara Greenway, which is being developed in Dauphin County. The plan was developed as part of the Swatara Creek Greenway and Rivers Conservation Plan completed in 1997. Development of the greenway would increase protection and recreational opportunities along the riparian zone of the stream.

Additional issues, concerns, and opportunities associated with invasive species in the watershed, recreational opportunities and access, cultural resources protection and inventory, and migratory fisheries restoration were also identified.

Management Options were developed to address each of the areas of concern or opportunities in the watershed. A summary of the Management options is presented in the following paragraphs. These options are presented in further detail in Chapter10 and Appendix G of the "Final" RCP document.

Project Area Characteristics

Raise the sensitivity and awareness of County, Local, and Municipal Planning Organizations (MPO's) to farmland and habitat loss.

Work with local, county, and regional planning organizations to develop and carry out plans for the protection of environmental amenities in the watershed.

Complete a comprehensive examination the traffic conditions of the watershed. Identify areas of congestion, its causes, and impacts. Develop a strategy to address these problem areas utilizing alternative forms of transportation (mass transit, car-pooling, bike lanes) where possible.

Update comprehensive plans for the municipalities of the watershed that are over 10 years old. Include environmental resource inventories and protection of resources as part of the document. Complete multi-municipal/multi-county plans where prudent and feasible.

Support implementation of land conservation techniques in subdivision design.

Assess how increasing population is impacting the watershed. Explore establishing growth areas and rural areas within the municipalities of the watershed.

Update and implement Act 537 sewage management plans that are over 10 years old for the municipalities in the watershed. Replace on-lot septic systems in the established growth areas. Assist in upgrading older on lot systems in the established rural areas.

Actively enforce land uses controls for areas along waterways in the watershed. Especially keeping development out of floodplains. Develop strategies to protect riparian zones.

Partner with local universities to develop mutually beneficial programs for student education, and protection and enhancement of the watershed. Identify other volunteer and non-profit groups to coordinate activities and projects with to avoid duplication of effort.

Utilize the Rivers Conservation Plan as a tool in protecting, managing, and preserving the Swatara Creek watershed.

Land Resources

Expand upon the partnership in place between the Lebanon County Conservation District and Ft. Indiantown Gap (FIG) for environmental resource and endangered species protection.

Continue and expand watershed wide cleanup days.

Identify "Brownfield" areas within the watershed for possible assessment, cleanup, and redevelopment. Identify other potential hazard areas within the watershed.

Support current recycling efforts within the watershed. Consider expanding theses efforts as an alternative to further landfill development.

Develop an educational program for demonstrating and promoting riparian buffers, especially for use in FFA, 4H, scout groups, and secondary schools.

Support pollution control legislation (Bottle Bill)

Encourage local farmers to enroll their property in agricultural security areas, set aside programs and conservation easements.

Water Resources

Implement the remaining projects for reclaiming AMD impacted streams in the upper Swatara Creek watershed developed by Dan Koury in the Swatara Creek Reclamation Document.

Utilize the 1998 - Swatara Creek Watershed Rehabilitation Plan by Dan Koury as a model to develop rehabilitation plans for agricultural and urban runoff problems in each of the major drainages in the watershed.

Develop a comprehensive plan to protect and monitor water quality and the results of improvements to streams in the major drainages of the watershed. Tailor the monitoring programs to sources of potential degradation in each drainage. Utilize this information to develop a database of information for the entire watershed.

Develop and implement streambank stabilization and habitat enhancement projects for the streams in the watershed.

Develop a comprehensive management plan for the Quittapahilla Creek watershed.

Develop an agreement for habitat and water quality improvement in Manada Creek with Ft. Indiantown Gap.

Develop a watershed organization for protection and enhancement of the Little Swatara Creek.

Develop storm water management plans for developed areas in the major drainages of the watershed. Identify new technologies for enhancing infiltration and groundwater recharge, especially in areas of urban development.

Make the stream corridor more user friendly.

Develop a plan of action to preserve and rehabilitate the infrastructure of the publicly owned lakes in the watershed, especially Sweet Arrow Lake and Stoevers Dam.

Develop areas for handicap access to Swatara Creek or other tributaries in the watershed.

Continue work to restore the fishery on the northern section of the watershed. Expand these efforts to assist with reestablishing the migratory fish population in the watershed and development of a stream habitat enhancement plan for other stream sections in the watershed.

Support the development of the shad population into the watershed.

Develop an educational program for elementary and secondary schools on water quality and the responsible use of the watershed.

Inventory riparian buffers in the watershed. Identify areas that need to have riparian buffers established.

Inventory NPS pollution problems in the major drainages of the watershed, develop a hierarchy and implementation plan for addressing these problem areas. Promote the development of conservation landscaping and management practices to reduce this sediment load.

Expand sewage capacity in the areas with the highest projected growth rates.

Work to ensure that development does not occur in floodplain areas.

Investigate possible uses for by-products of mining operations in the watershed.

Stay involved with the Swatara State Park Project. Support completion of a study to determine if a reservoir

in the park is a preferred option for a supplementary water supply for Lebanon County and flow augmentation for the Susquehanna River.

Biological Resources

Preserve ecological and visual amenities in the watershed. Utilize both voluntary protection and market purchase for preservation. Develop funding sources and a regional land trust organization to facilitate these actions.

Identify areas of significant invasive species populations. Develop an integrative management plan to control these species.

Educate the public to the dangers and modes of transport of invasive species, including the zebra mussel, to reduce the chances of infestation in the watershed.

Identify riparian buffers in the major drainages of the watershed. Identify areas for further riparian buffers creation to assist wildlife travel corridors.

Consider and if appropriate complete Natural Heritage Inventories for Lebanon and Schuylkill Counties. Assess the watershed for species of special concern. Develop and implement a plan for protection of these resources.

Inventory wetlands in stream corridors for protection and possible enhancement.

Look into and if appropriate, establish a local chapter of PA Cleanways.

Cultural Resources

Encourage and develop educational programs on the environment in the watershed and especially Swatara State Park.

Develop better access to Swatara Creek and its tributaries for recreational use.

Develop rail trails from Swatara State Park Railroad Corridor to Lebanon and the Conewago Trail and in the Union Canal corridor from the Tulpehocken watershed boundary to Hershey and Middletown.

Expand upon the recently developed Swatara Creek Water Trail.

Increase recreational opportunities within the watershed, including park, recreational fields, stream accesses, etc.

Increase passive recreational opportunities in the watershed.

Complete proposed enhancements to Quittie Creek Nature Park.

Develop a plan for the preservation of historic resources in the watershed.

Complete a comprehensive park and recreation plan for the watershed. Address handicapped access as a portion of this report.

Swatara State Park

Maximize the recreational potential of the state park.

Support any development of the state park to increase tourism as an economic presence in the region.

Swatara Creek Greenway

Implement management options developed in the greenways plan.

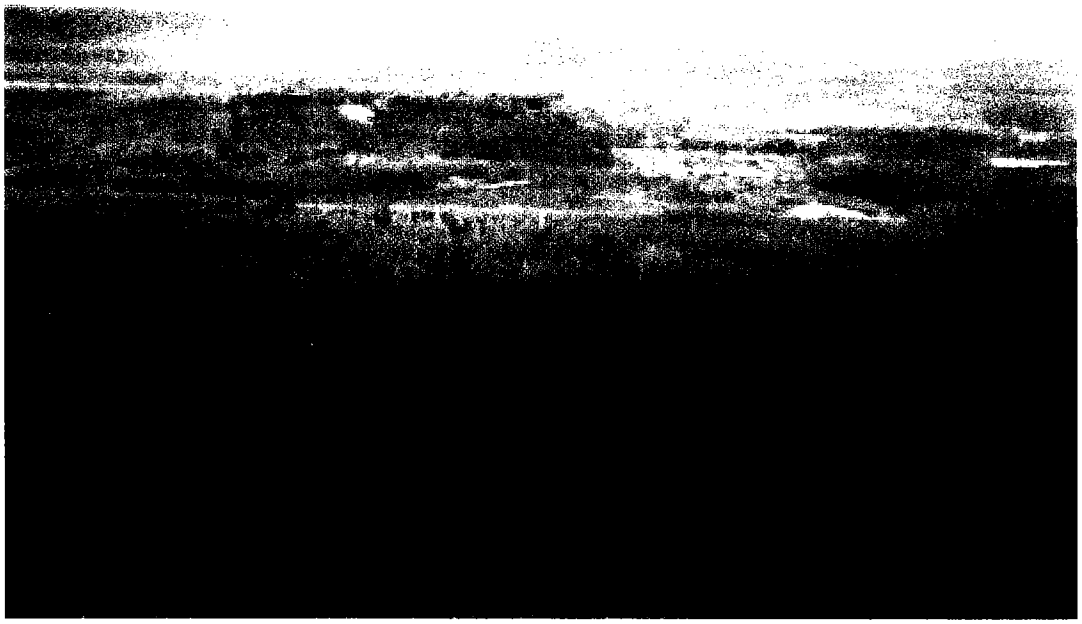
Develop a trail and greenway master plan for the entire watershed.

Create an overlay zone for stream buffers in the watershed.

Increase partnerships with public and private entities to foster land stewardship.

Expand greenway initiatives into Lebanon and Schuylkill Counties.

CHAPTER 1:



PROJECT INTRODUCTION

1. Introduction

A. Project Area Introduction

Swatara Creek and its encompassing watershed has had, and continues to have, a significant effect on the history and lives of the residents of Berks, Dauphin, Lebanon, and Schuylkill Counties in Central Pennsylvania. Swatara Creek has served as a provider of food, water, transportation, energy, and recreation for generations of inhabitants. The surrounding watershed supplied farmland, limestone, iron, coal, timber, and a host of other raw materials that aided in the establishment and subsequent development of the region, as well as the country.

From the time of the first prehistoric visitors, much has changed and continues to change about the "Swattie" and its watershed. The creek flowed unimpeded, teeming with fish and aquatic life in its earliest times, then experienced periods when pollution in the creek and tributaries essentially left the stream lifeless. Today, a new awareness and concern for the stream has brought it to the point of potentially becoming a major recreational resource.

Now though, new changes are taking place. Influxes of population and associated development, combined with changing agricultural practices, threaten to permanently alter the character of the stream and the watershed. Still, new conservation initiatives offer the potential for further improvements in water quality, recreation, and the aesthetic value of the stream and watershed, while allowing continued economic prosperity for the region.

It is in this context that the Swatara Creek Watershed Rivers Conservation Plan was initiated, and through this context that the recommendations and management options, presented in the following chapters, have been developed.

B. Project Background

The Swatara Creek Watershed Association (SCWA) initiated the Rivers Conservation Plan for the Swatara Creek watershed. From is inception in 1970, and subsequent rebirth in 1995, SCWA has played the primary role in the protection and enhancement of the Swatara Creek watershed. The reestablishment of the SCWA following its decline to inactivity circa 1980 was the result of joining forces with the group Citizens Coordinating for Clean Water (CCCW). A group that became active in the watershed in 1988, CCCW was voted by the former SCWA board to reactivate the organization, thereby providing CCCW with 501c(3) incorporation.

As a direct result of a SCWA sponsored Swatara Watershed Expo in 1996, a renewed vigor motivated the board of SCWA to seek the inclusion of Swatara Creek on the Pennsylvania Rivers Registry. This effort was driven by the enhanced status afforded waterways on the Registry when seeking public funds for river restoration and related projects.

A Rivers Conservation Planning Grant Application was submitted in 1997, and the Key-RCP-97-8 grant was awarded to SCWA. on May 8, 1998 and funded through December 31, 2001. The funding of the Rivers Conservation Plan was financed in part by a Keystone Recreation, Park, and Conservation Fund Program grant from the Pennsylvania Department of Conservation and Natural Resources (DCNR), Bureau of Recreation and Conservation. The 50 percent match required for the DCNR grant was funded through grants from the William Penn Foundation and Canaan Valley Institute and by in-kind contributions from County Conservation Districts, Municipal and County

planning organizations, local businesses, and conservation organizations within the watershed.

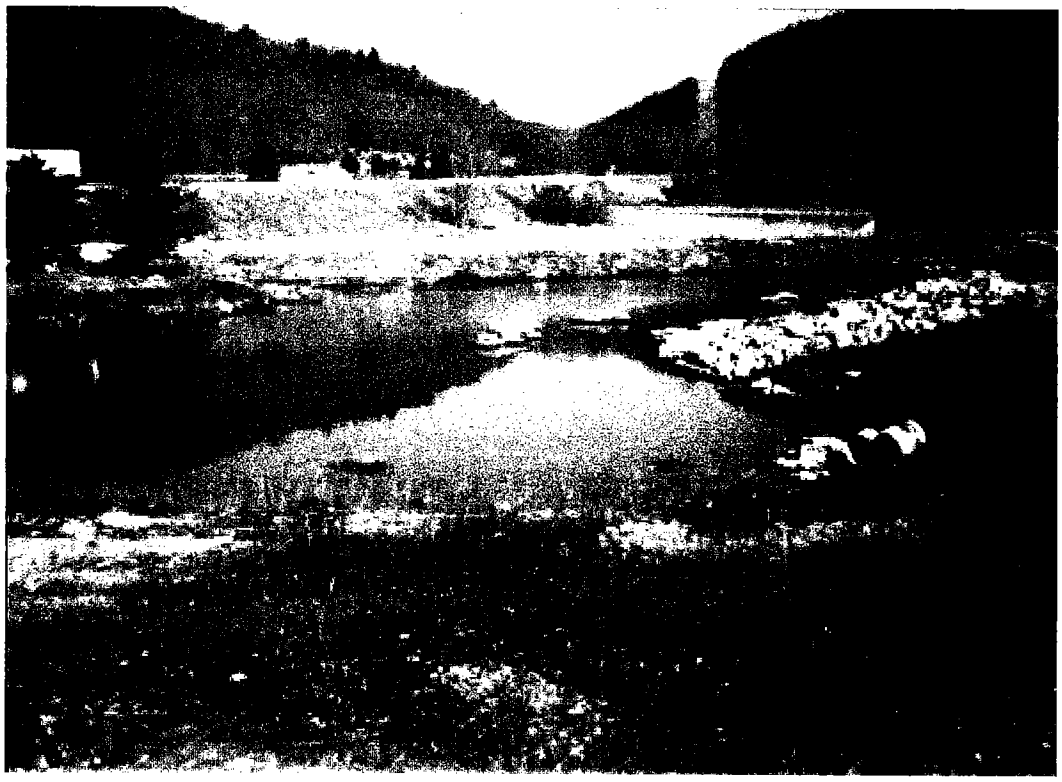
A series of three public meetings facilitated by the SCWA initiated the project in October 1998. At these meetings input from the public concerning the issues of importance in the watershed were determined. These issues were ranked by the membership of SCWA in order of importance and combined with the issues developed during the Swatara Watershed Expo. These issues were the primary focus for the remainder of the project.

Mackin Engineering Company (Mackin) was contracted by SCWA in June, 1999 to assist with the completion of the Swatara Creek Watershed Rivers Conservation Plan. Mackin Completed data collection for the project through December, 1999. After completing the data collection portion of the project, Mackin met with the project steering committee to present the preliminary findings of the RCP investigation.

Utilizing the collected information and input from the Project Steering Committee a "Draft" RCP was developed for the Swatara Creek Watershed. This document was circulated for public comment in July, 2000. Two public meetings (July 12 and 13, 2000) were held to present the findings of and solicit comment on the plan. The meetings were held within the watershed at the Northern Lebanon High School and Derry Township Middle School. Public comment was accepted on the document through August 14, 2000. Following the close of the comment period, Mackin met with members of the project steering committee to review and address the comments received on the document. Appendix A presents a summary of the Public Meetings, comments received on the "Draft" Document, and response to those comments. A contact list for the municipalities in the watershed is also found in Appendix A.

The following chapters present the final findings and recommendations of the Rivers Conservation Plan prepared by Mackin in conjunction with SCWA, the Project Steering Committee, and input received from the public.

CHAPTER 2:



PROJECT AREA CHARACTERISTICS

2. Project Area Characteristics

A. Location

The Swatara Creek watershed is situated in the south-central section of Pennsylvania. The watershed extends from the southern anthracite coalfields of Schuylkill County through the Karst limestone formations of Lebanon and Dauphin Counties before emptying into the Susquehanna River at Royalton and Middletown, Pennsylvania. The Swatara Creek watershed encompasses parts of Schuylkill, Berks, Lebanon, and Dauphin Counties. Swatara Creek originates near the village of Branchdale and flows in a southerly and southwesterly direction for approximately 69 miles to its confluence with the Susquehanna River. The Swatara Creek watershed is referenced by US Geologic Service's (USGS) Hydrologic Code (1974) 02050305 in the Mid-Atlantic Region (US Department of the Interior, 1974), it is also designated as sub-basin 7 of the Susquehanna River Basin by the Susquehanna River Basin Commission (SRBC) and the Pennsylvania Department of Environmental Protection (PADEP).

B. Size

The majority of references list the Swatara Creek Watershed as draining approximately 576 square miles of the Susquehanna River basin (McCarren, Wark, and George, 1964). However, GIS calculations and the Pennsylvania Gazetteer of Streams (PADEP, 1989) measures the watershed as draining 571 square miles. For this document, 571 square miles will be utilized as the watershed drainage area for both presentation and calculation purposes. This River Conservation Plan covers this entire watershed, including six (6) major tributaries (Upper Little Swatara, Lower Little Swatara, Little Swatara, Quittapahilla, Manada, and Beaver Creeks) as well as other named and unnamed tributaries. The watershed includes four counties and contains all or part of 46 municipalities (Appendix A). Table 2-1 lists the municipalities located within the watershed. The Swatara Creek watershed encompasses all or parts of 17 different school districts. These school districts are presented in Figure 2-1.

C. Topography

The Swatara Creek watershed is located within two different physiographic provinces, the Ridge and Valley, and the Piedmont. The watershed contains both the Appalachian Mountain and Great Valley Sections of the Ridge and Valley Province, and the Gettysburg-Newark Lowlands Section of the Piedmont Province. The varied physiographic settings of the watershed translate into a variety of landforms found within it.

Located in the northern end of the watershed (Schuylkill, northern Lebanon, and the northwestern edge of Berks Counties), the Appalachian Mountain Section of the watershed is characterized by long narrow ridges interspersed by narrow to broad valleys. The southern edge of the southern anthracite coalfields comprises the headwaters of the Swatara Creek. The ridges are primarily composed of resistant sandstones and the valleys of softer shales and siltstone. The vertical relief in this area is moderate to very steep. The elevation of Swatara Creek at its headwaters is approximately 1,510 feet above sea level. When it exits the Appalachian Mountains Section in Lebanon County, the elevation is approximately 425 feet above sea level. Over the approximately 25.6 mile length of this section, this would equate to a 0.8 percent slope.

Table 2-1
Municipalities of the Swatara Creek Watershed

County	Municipality	County	Municipality
Lebanon		**Schuylkill**	
	Annville Township		Branch Township
	Bethel Township		Foster Township
	City of Lebanon		Frailey Township
	Cleona Borough		Pine Grove Borough
	Cornwall Borough		Pine Grove Township
	East Hanover Township		Porter Township
	Jackson Township		Reilly Township
	Jonestown Borough		Tremont Borough
	North Annville Township		Tremont Township
	North Cornwall Township		Washington Township
	North Lebanon Township		Wayne Township
	North Londonderry Township	**Dauphin**	
	Palmyra Borough		Conewago Township
	South Annville Township		Derry Township
	South Lebanon Township		East Hanover Township
	South Londonderry Township		Hummelstown Borough
	Swatara Township		Londonderry Township
	Union Township		Lower Paxton Township
	West Cornwall Township		Lower Swatara Township
	West Lebanon Borough		Middletown Borough
			Royalton Borough
Berks	Bethel Township		South Hanover Township
	Tulpehocken Township		Swatara Township
	Upper Tulpehocken Township		West Hanover Township

The central section of the watershed (Lebanon, Berks and central Dauphin Counties) is located in the Great Valley Section of the Ridge and Valley Province. This area, as its name suggests, is a broad lowland area south of Blue Mountain. As Swatara Creek flows from the Appalachian Mountain Section into the Great Valley Section, the valley is primarily composed of shales and siltstone. Further south in the watershed and the physiographic section, Quittapahilla Creek, a major tributary enters Swatara Creek. The Quittapahilla flows over the limestones, dolomites, and calciferous sandstones that make up the southern portion of the physiographic province. The vertical relief in this area is mild to moderately steep. The elevation of Swatara Creek entering the Great Valley Section is approximately 425 feet above sea level, and it exits the physiographic province at

approximately 295 feet. Over the approximate 39-mile length of this section, this would equate to a 0.06% slope. The final section of the watershed (southern Dauphin and Lebanon Counties) is located within the Gettysburg-Newark Lowland Section of the Piedmont Physiographic Province. This area is characterized by rolling hills and valleys. Within the watershed, this physiographic section is primarily composed of shales with intrusions of Triassic diabase (a hard volcanic rock). The vertical relief in this section is mild to moderately steep. The elevation of Swatara Creek entering this physiographic section is approximately 295 feet above sea level, and the elevation as it empties into the Susquehanna River is approximately 279 feet above sea level. Over the approximately 4-mile length of this section, this would equate to a 0.1% slope.

D. Watershed Characteristics

1. Land Use

Land use information was collected through a combination of map review and field verification. The field investigation took place in October, 1999. A total of six (6) land use categories were identified. These land uses include Forested, Agricultural, Developed, Wetland, Water, and Barren. Figure 2-2 at the end of the chapter illustrates the land uses found in the watershed.

Land use throughout the Swatara Creek Watershed is diverse and ranges from vast areas of deciduous forests to regional commercial centers. Figure 2-1, Land Use/Land Cover displays the relationship between these various land uses and the natural features found within the watershed.

The Anderson Land Use and Land Cover Classification System was used to determine land use types for the watershed. The land use and land cover system presented in this report includes the more generalized first and second levels. A description of the land use/land cover types found within the watershed is presented in Appendix B. Table 2-2, Existing Land Use presents the Level 1 classifications and their subcategories as a percent of the total land within the watershed.

Within the watershed agricultural land was the most prevalent land use totaling over 206,658 acres (56.5 percent) of the entire watershed. Nearly all of the agricultural land was cropland/ pasture. It is the primary land use south of Blue Mountain, which traverses from east to west in the northern section of the watershed. Other land uses do occur in the southern section of the watershed, however, minimal in acreage when compared to agricultural land. Most of the municipalities in this area are large townships with small village centers and boroughs, which provide small commercial centers sufficient to provide for the day-to-day needs of the residents.

Forestland also comprised a high percentage of land, approximately 118,623 acres (32.5 percent), within the watershed. With the exception of a few scattered areas in the southern region, forestland is located along the mountains in the northern section of the watershed. Mountains of this area include Blue Mountain, Second Mountain, Peters Mountain, and Little Mountain. The highest percentage of Forestland in the watershed was deciduous, although stands of Mixed Forest and Evergreen Forest existed throughout the northern mountainous areas.

Most of the Urban/Built Up land was identified along the PA Rt. 422 corridor. Large commercial/ service districts were visible in Lebanon, Cleona, Annville, Palmyra, Hershey, Hummelstown, and Middletown. The largest single area of commercial/service land is located at the Fort Indiantown Gap; however, the majority of this area is utilized for military training exercises and is not in commercial development. Much of the residential land in the watershed surrounds these commercial centers or other small commercial areas south of Blue Mountain.

Table 2-2
Land Use Categories and Acreages of the Swatara Creek Watershed

LAND USE		ACRES	PERCENTAGE OF TOTAL WATERSHED
Level 1	**Level 2**		
Urban/Built-Up		*29,395.42*	*8.04*
	Residential	14,623.46	4
	Commercial	7,287.39	1.99
	Industrial	849.17	0.23
	Transportation	3,866.23	1.06
	Mixed Urban	605.34	0.17
	Other Urban	2,163.83	0.59
Agricultural		*206,658.19*	*56.54*
	Cropland/Pasture	205,926.16	56.34
	Orchards	700.2	0.19
	Feeding Operations	31.84	0.01
Forest		*118,623.68*	*32.45*
	Deciduous Forest	104,942.80	28.71
	Evergreen Forest	7,563.65	2.07
	Mixed Forest	6,117.23	1.67
Water		*609.5*	*0.17*
	Streams	93.73	0.03
	Lakes	117.98	0.03
	Reservoirs	397.8	0.11
Wetland		*244.62*	*0.07*
	Forested Wetland	244.62	0.07
Barren		*9,967.42*	*2.73*
	Strip Mines	9,752.07	2.67
	Transitional Areas	215.35	0.06
	Totals	**365,498.83**	**100**

Barren Land primarily consisted of strip mine/ quarry land located in the extreme north section of the watershed in Reilly, Frailey, Porter, and Tremont Townships of Schuykill County. Other areas of strip mine/ quarry land existed in Annville, North Annville, North Lebanon East Hanover and North Londonderry Townships in Lebanon County. These were primarily limestone and shale quarries. Limestone quarries in Derry, South Hanover, and Lower Swatara Townships in Dauphin County were also identified.

A summary of the major land uses of the counties in the watershed are presented in the following paragraphs:

Berks County

A small (northwestern) corner of Berks County is located within the Swatara Creek watershed. Only 10.5% (Approx. 38,315 ac) of the entire watershed is located in Berks County. The majority of the watershed in Berks County is composed of farmland, much of this area is intensively farmed, especially the area in close proximity to Little Swatara Creek. The northern end of the watershed in Berks County adjacent to Schuylkill County is forested. Four small communities (Bethel, Frystown, Mount Aetna, and Rehersburg) are the only major residential development located within the Berks County portion of the watershed.

Dauphin County

Dauphin County makes up 22.3% (Approx. 81,544 ac) of the Swatara Creek watershed. The majority of the watershed in Dauphin County is composed of agricultural lands and recently developed residential areas. The exception to this statement is lands adjacent to Swatara Creek and its tributaries, which are primarily forested. The Boroughs of Hummelstown, Middletown, and Royalton are the largest incorporated communities in the Dauphin County portion of the watershed. Additional urbanized population centers include unincorporated communities of Linglestown, Paxtonia, and Colonial Park in Lower Paxton Township; Rutherford Heights in Swatara Township; Skyline View in West Hanover Township; and Hershey in Derry Township. These communities also contain the largest area of commercial and industrial land use in this portion of the watershed.

Lebanon County

The majority of the Swatara Creek watershed, 42.7% (Approx. 156,025 ac), is located in Lebanon County. The majority of this portion of the watershed is agricultural land use. However, the section of watershed north of State Route 443 is primarily forested. Lebanon County also contains a portion of Swatara State Park. The City of Lebanon and Boroughs of Palmyra, Cleona, and Jonestown, and the Township of Annville are the largest population centers in the Lebanon County. These communities also contain the majority of the commercial and industrial land use in the Lebanon County portion of the watershed. Additional residential development is located in the communities of Fredericksburg and Cornwall. Ft. Indiantown Gap, a National Guard training facility, is also located within the watershed in Lebanon County. The facility is used as a training ground for military personnel and subsequently has a variety of land types on site. The mountainous areas on the northern portion of the site are forested. The remainder of the property is primarily a mixture of scrub shrub and field areas. Finally, the southern end of Swatara State Park is located in the watershed near the Lebanon/Schuylkill County line.

Schuylkill County

Schuylkill County comprises 24.5% (Approx. 89,640 ac) of the Swatara Creek watershed. This area is located in the northern and northwestern ends of the watershed and the majority of it is forested. In addition, the southern anthracite coalfields also extend into this portion of the watershed. This results in significant acreage in barren or mining land use. A substantial portion of the watershed in Schuylkill County is in farmland. These farmed areas are located primarily in the southeastern end of the county. The major population centers within the Schuylkill County portion of the watershed are the Boroughs of Pine Grove and Tremont. These communities also contain the largest commercial and industrial land use acreages. The communities of Donaldson and Newtown also contain some residential and commercial lands. Finally, a large portion of Swatara State Park, which also includes parts of Lebanon County, is located in the watershed between Interstate 81 and PA Route 443 along the southern boundary of the county.

2. Zoning

The Swatara Creek study area contains all, or part of 46 municipalities in four counties. With the exception of two municipalities in Schuylkill County, the remaining 44 municipalities have enacted zoning ordinances. 43 of these municipal ordinances have been obtained for use on the project. The municipalities donated many of the ordinances; others were purchased by SCWA.

Mackin Engineering Company analyzed the zoning ordinance and map for each of these municipalities. All of the existing zoning districts for the municipalities were placed into one of the following categories: residential, commercial, industrial, agricultural, institutional, or conservation. A composite map of the project area was developed utilizing these categories. The composite map (see Figure 2-3) provides an overview of the uses allowed in the watershed; however, this map should not be used for planning purposes since it is not an accurate reflection of specific existing zoning.

Agriculture is the primary zoning found in the watershed. Potential conflicts could exist between agricultural land uses located directly next to the streams and conservation efforts. A majority of the farms in these locations allow their livestock direct access to the streams. This presents the potential for stream contamination.

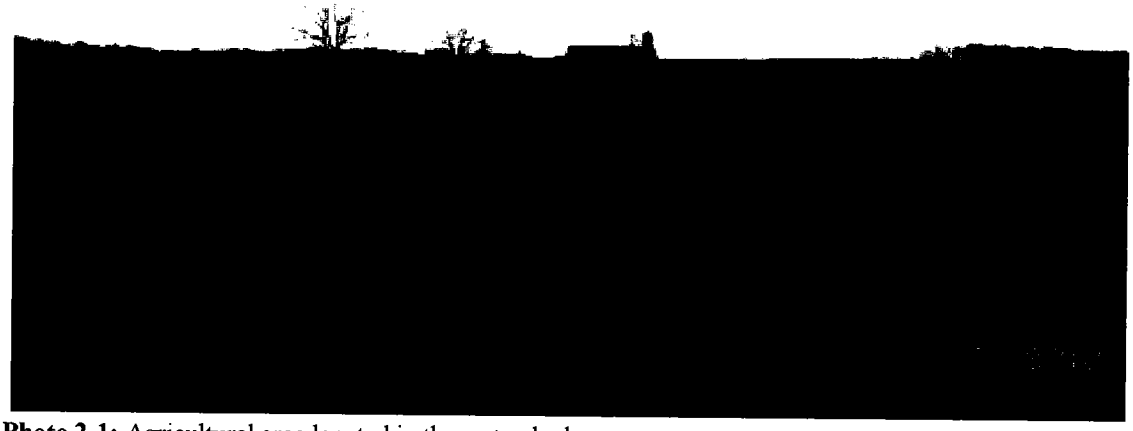


Photo 2-1: Agricultural area located in the watershed

Additional conflicts could arise from the increased residential development occurring in the watershed. New housing developments not only encroach on the streams of the watershed, but landscaping, the planting of new grass, and the associated large scale use of chemical herbicides and pesticides could create contamination problems within the watershed.

Photo 2-2: Recent residential development in the vicinity of Snitz Creek

Pockets of commercial zoning are concentrated in the more developed urban areas, while agricultural zoning districts are found in the less developed rural areas. Land included in the 100-year floodplain is designated as conservation areas in many of the municipalities. In these conservation zones, development is usually restricted to uses that will not damage or cause pollution during flooding events.

E. Socio-Economic Profile

1. Population

The Swatara Creek Watershed encompasses approximately 571 square miles and covers sections of Dauphin, Lebanon, Berks and Schuylkill Counties (PADEP, 1989). There were an estimated 290,869 persons living within the watershed boundaries in 1998, which is approximately 2.4 percent of Pennsylvania's 1998 population (Pennsylvania State Data Center, 1999). Estimates revealed that the population within the watershed increased by 4.3 percent between 1990 and 1998. In contrast, the growth rate for the state of Pennsylvania has been 1.0 percent for the same time period.

Lebanon County experienced an overall growth rate of 3.2 percent between 1990 and 1998, while its municipalities within the watershed experienced a slightly smaller population growth rate of 2.7 percent. The countywide population for Dauphin County grew at a 3.3 percent rate during this time and Dauphin County watershed municipalities grew at a 6.6 percent rate. Berks County has experienced the largest population growth within the past decade with a 5.8 percent increase in countywide population and a 6.9 percent increase for watershed municipalities. During the past decade, Schuylkill County was the only county within the study area to experience a decrease in countywide population (-2.8 percent); however, the population within the municipalities of the watershed decreased at a slightly slower rate of 2.1 percent. Table 2-3 compares the change in population from 1990 - 1998 for the counties within the watershed.

When identifying population characteristics of the study area, it is important to consider the distribution of population by age group. Each age group has specialized needs that impose different demands upon various municipal and county services. For instance, the "wage-earner" group (ages 18-64) is that portion of the population which is of working age and able to provide for a family. Ideally, this sector of the population should have the largest amount of persons in order to support those persons not able to work or contribute to the tax base. Age groups such as *65 and over* normally include retired persons who eventually require additional medical services and specialized housing needs. Similarly, those under the age of 18 also require specialized services, such as, infants and toddlers who require specialized child care services or children aged 5-18 that utilize the public education system. It is important that government leaders know the characteristics of their population to properly plan for future population demands such as additional schools or assisted living facilities.

Table 2-3
Population Growth Within the Swatara Creek Watershed

	Total Population, 1990	Total Population, 1998	Percent of Population Change, 1990-1998
Berks County	**336,523**	**355,956**	**5.8**
Population within watershed (Berks County)	*7,808*	*8,343*	*6.9*
Dauphin County	**237,813**	**245,579**	**3.3**
Population within watershed (Dauphin County)	*121,736*	*129,722*	*6.6*
Lebanon County	**113,744**	**117,434**	**3.2**
Population within watershed (Lebanon County)	*102,261*	*105,048*	*2.7*
Schuylkill County	**152,585**	**148,266**	**-2.8**
Population within watershed (Schuykill County)	*20,542*	*20,106*	*-2.1*
Pennsylvania	**11,881,643**	**12,001,451**	**1**
Population within Study Area (Pennsylvania)	*252,347*	*290,869*	*4.3*

The Pennsylvania State Data Center, 1999

As shown in Table 2-4, the population distribution for the four counties within the watershed is similar to the state's; except for Schuylkill County, whose percent of population for the *Age 64+* category is 5 percentage points higher than the Pennsylvania average of 15%.

It is important to compare the specific municipal data to the county average in order to determine the characteristics of the Swatara Creek Watershed study area. For instance, watershed municipalities in Berks County have two categories that vary from the county average; the *"age 18 and under"* group which was 6 percentage points higher than the county average and the percent of the population *"64+"* was 6 percentage points lower than the county average. Similarly, comparing the Schuylkill County municipalities reveals that the *"64+"* population was lower by 5 percentage points than the county average. The remaining two age groups, the *"18-64"* age group and the *"under 18"* age group were comparable to the county averages.

Table 2-4, provides an age comparison of the region as a whole compared to Pennsylvania, the specific municipalities within the study area, and their respective counties.

Table 2-4
Population Distribution by Age Groups, 1990

	Total Population	Percent of Population <18	Percent of Population 18-64	Percent of Population 64+
Berks County	**336,523**	**23**	**61**	**16**
Population within watershed (Berks County)	*7,808*	*29*	*62*	*10*
Dauphin County	**237,813**	**24**	**62**	**16**
Population within watershed (Dauphin County)	*121,736*	*22*	*64*	*14*
Lebanon County	**113,744**	**24**	**62**	**14**
Population within watershed (Lebanon County)	*102,261*	*24*	*61*	*15*
Schuylkill County	**152,585**	**22**	**58**	**20**
Population within watershed (Schuykill County)	*20,542*	*24*	*60*	*15*
Pennsylvania	**11,881,643**	**24**	**61**	**15**
Population within Study Area (Pennsylvania)	*252,347*	*23*	*62*	*14*

The Pennsylvania State Data Center, 1999

Population trends become apparent when comparing the increase or decrease of persons within a location over a period of time. The 30-year period between 1960 and 1990 was used to identify trends within the Swatara Creek Watershed. Berks, Dauphin and Lebanon Counties all experienced an increase in population over this thirty-year period. However, the growth varied from Lebanon's 25.2 percent to a smaller increase of 22.2 percent in Berks County and an 8 percent increase in Dauphin County. The only county to experience a decrease in population was Schuylkill County, which lost of 11.8 percent of its population from 1960 to1990 (Table 2-5).

During this 30-year time period, Berks County had the largest average population increase for municipalities located within the Watershed (77.6 percent) (see Table 2-5). Dauphin County, which had the smallest population growth rate of the study area, had a 58.8 percent growth in its watershed population. Lebanon County municipalities in the watershed experienced a population increase of 26.0 percent, which was comparable to the overall county growth rate. Schuylkill was the only county within the watershed to experience a decrease in countywide population; however, the municipalities located within the study area experienced an average population increase of 18.6 percent.

Table 2-5
Comparison of Swatara Creek Municipality Population Changes
To County Population Changes

Population 1960-1990 and Percent Change	*Population 1960*	*Population 1990*	*% Change 1960-1990*
Berks County	***275,414***	***336,523***	***22.2***
Average for Berks County Municipalities within Study Area and % Change	*1,466*	*2,603*	*77.6*
Dauphin County	***220,255***	***237,813***	***8***
Average for Dauphin County Municipalities within Study Area and % Change	*6,387*	*10,145*	*58.8*
Lebanon County	***90,853***	***113,744***	***25.2***
Average for Lebanon County Municipalities within Study Area and % Change	*4,057*	*5,113*	*26*
Schuylkill County	***173,027***	***152,585***	***-11.8***
Average for Schuylkill County Municipalities within Study Area and % Change	*1,575*	*1,867*	*18.6*

The Pennsylvania State Data Center, 1999

Following a nationwide trend, the watershed municipalities had a population shift of persons moving from boroughs to townships, which was an movement of persons from urban areas to rural areas. Both Dauphin and Lebanon Counties are good examples of this trend. Dauphin County experienced a decrease in population for each of the three boroughs within the study area while the townships within the same area had an increase in population. Significant to Dauphin County, was a population loss of 17.2 percent in the Borough of Middletown while five townships within the study area all had a population increase over 100 percent (see Table 2-6).

For Lebanon County, the increase of persons residing in the county occurred primarily in the townships of North Londonderry (234.3 percent) and South Annville (147.8 percent). The significant decrease in population occurred in the City of Lebanon (-17.5 percent) and the urbanized Township of West Lebanon (-17.3 percent) (Table 2-7).

All of the municipalities in the Berks County portion of the watershed are rural and all experienced over 70%

population growth during the past 30 years. Upper Tulpehocken Township had the greatest growth rate (99.4%) within the watershed. Table 2-8 summarizes the growth rates for all of the watershed municipalities in Berks County.

Table 2-6
Population Changes of Dauphin County Communities
Located In The Swatara Creek Watershed

Population 1960-1990 and Percent Change	*Population 1960*	*Population 1990*	*% Change 1960-1990*
Pennsylvania	***11,319,336***	***11,881,643***	***5***
Dauphin County	***220,255***	***237,813***	***8***
East Hanover Township	1,535	4,569	197.7
West Hanover Township	2,770	6,125	121.1
Lower Paxton Township	17,618	39,162	122.3
South Hanover Township	1,841	4,626	151.3
Hummelstown Borough	4,474	3,981	-11
Londonderry Township	3,053	4,926	61.3
Middletown Borough	11,182	9,254	-17.2
Royalton	1,128	1,120	-0.7
Lower Swatara Township	4,508	7,072	56.9
Swatara Township	14,795	19,661	32.9
Derry Township	12,388	18,408	48.6
Conewago Township	1,353	2,832	109.3
Total population within the Dauphin County study area and % Change	*76,645*	*121,736*	*58.8*

The Pennsylvania State Data Center, 1999

Table 2-7
Population Changes of Berks County Communities
Located In The Swatara Creek Watershed

Population 1960-1990 and Percent Change	*Population 1960*	*Population 1990*	*% Change 1960-1990*
Pennsylvania	***11,319,336***	***11,881,643***	***5***
Berks County	***275,414***	***336,523***	***22.2***
Upper Tulpehocken Township	663	1,289	94.4
Bethel Township	2,152	3,676	70.8
Tulpehocken Township	1,583	2,843	79.6
Total population within Berks County study area and % Change	*4,398*	*7,808*	*77.6*

The Pennsylvania State Data Center, 1999

Table 2-8
Population Changes Of Lebanon County Communities
Located In The Swatara Creek Watershed

Population 1960-1990 and Percent Change	*Population 1960*	*Population 1990*	*% Change 1960-1990*
Pennsylvania	***11,319,336***	***11,881,643***	***5***
Lebanon County	***90,853***	***113,744***	***25.2***
Bethel Township	2,433	4,343	78.5
Swatara Township	2,164	3,318	53.3
Jonestown Borough	813	931	14.5
Union Township	1,967	2,755	40.1
East Hanover Township	2,140	3,058	42.9
Jackson Township	2,778	5,732	106.3
North Lebanon Township	4,713	9,741	106.7
City of Lebanon	30,045	24,800	-17.5
West Lebanon Township	1,054	872	-17.3
Cleona Borough	1,988	2,322	16.8
North Annvillle Township	1,813	2,441	34.6
Annville Borough	4,264	4,294	0.7
North Londonderry Township	1,684	5,630	234.3
Palmyra Borough	6,999	6,910	-1.3
South Lebanon Township	6,584	7,491	13.8
North Cornwall Township	2,624	4,886	86.2
South Annville Township	1,214	3,008	147.8
Cornwall Township	1,934	3,231	67.1
West Cornwall Township	1,020	1,996	95.7
South Londonderry Township	2,911	4,502	54.7
Total population within Lebanon County study area and % Change	*81,142*	*102,261*	*26*

The Pennsylvania State Data Center, 1999

While experiencing a decrease in countywide population, Schuylkill County municipalities located within the study area experienced an average increase of 18.6 percent, which ranged from a decrease of 50.3 percent in Foster Township to an increase of 127.2 percent in Wayne Township (Table 2-9).

Overall, the Swatara Creek Watershed is an area that is attracting new residents. The population within each age group is typical of the state average, with the exception of Berks County, which has a higher percentage of persons under the age of 18 than the other three counties. Trends indicate that the population is shifting from boroughs to the more rural townships. The population growth trend has continued over the past thirty years for all counties in the watershed, except for Schuylkill County. Although Schuylkill County experienced a countywide population decline, its watershed municipalities experienced an increase in population. The population trend for the Swatara Creek Watershed is one of continued growth as people continue to move to the area.

Table 2-9
Population Changes Of Schuylkill County Communities
Located In the Swatara Creek Watershed

Population 1960-1990 and Percent Change	*Population 1960*	*Population 1990*	*% Change 1960-1990*
Pennsylvania	***11,319,336***	***11,881,643***	***5***
Schuylkill County	***173,027***	***152,585***	***-11.8***
Foster Township	600	298	-50.3
Branch Township	1,749	2,051	17.3
Reilly Township	1,088	835	-23.3
Frailey Township	637	518	-18.7
Porter Township	2,738	2,560	-6.5
Tremont Township	442	297	32.8
Tremont Borough	1,893	1,814	-4.2
Wayne Township	1,729	3,929	127.2
Washington Township	1,292	2,423	87.5
Pine Grove Borough	2,267	2,118	-6.6
Pine Grove Township	2,887	3,699	28.1
Total population within Schuylkill County study area and % Change	*17,322*	*20,542*	*18.6*

The Pennsylvania State Data Center, 1999

2. Transportation Facilities

The mobility of residents and travelers is central to the economic and social vitality of a community and region. From roads and bridges to railroads and airfields, transportation infrastructure can lend itself to the economic vitality of a region and improve the quality of life.

Several modes of transportation are represented within the transportation network of the Swatara Creek Watershed. The project area includes Interstate, U.S., and PA Highways, as well as Municipal and private roads. In addition, the project area has a strong rail system with two primary operators that can move both goods and people across the region. Air transport is available throughout the project area with a concentration of public airports in Lebanon County. Transportation facilities in the watershed are detailed on Figure 2-4 at the end of this chapter.

ROADWAY

Within the Swatara Creek Watershed, there are currently 2,360 miles of roads that provide residents with vehicular access. The Pennsylvania Department of Transportation classifies roads as either major or local, and further classifies them as, Interstate Highways, U.S. Highways, PA Highways, State Routes, Township Roads, and Other Roads. An important consideration regarding the roadway system in the Swatara Creek Watershed is to understand how they function. Transportation facilities are classified by the relative importance of the movement and access function assigned to them. The access function detracts from the movement function

and vise versa. In the hierarchy of highway facilities, freeways and major arterials constitute the major highway system (most efficient), while collector and local roads comprise the local street system (most access). The classification of streets essentially is determined by the degree of efficiency and access that they provide. Each of the classifications is mentioned briefly below.

Roadway Inventory

Based on function, roads within the watershed can be classified into one of the following categories.

Major Highway Network (function to efficiently move traffic)

Controlled Access Highway - A highway to which owners of abutting land have no easement or access. (Interstates)

Major Highway (Arterial) – A facility on which geometric design and/or traffic control measures are used to expedite through traffic, while access to abutting property may be restricted but not eliminated. (PA and US Highways)

Local Street System (function to provide access to adjacent land)

Collector Street – A Street that serves traffic movements within a neighborhood and connects this area with the major highway system. It is not intended to handle long through trips, but performs the same land service function as local roads.

Local Street – A facility having the sole function of providing access to immediately adjacent land.

Using Table 2-10 below, a comparison can be made between major and local roads within the watershed, giving a representation as to the total amount of miles existing in the watershed.

Table 2-10
Summary Of Roadway Miles In Swatara Creek Watershed According to Penn DOT

Major Roads	
Interstate Highway	62 Miles
U.S. Highways	105 Miles
PA Highways	197 Miles
Total Miles for Major Roads = 364	
Local Roads	
State Routes	273 Miles
Township Roads	982 Miles
Other Roads (includes private roads)	741 Miles
Total Miles for Local Roads = 1,996	

(Source PennDOT 1995)

The road network within the Swatara Creek Watershed study area is comprised of Interstates, U.S. Traffic Routes, PA Highways, State Routes, Township Roads and Other. All roadways are presented on Figure 2-3.

Within the watershed there are three fully controlled access Major Highways, they are Interstates 78 (I-78) and 76 (I-76), which run east west and Interstate 81 (I-81) which travels north to south.

INTERSTATE SYSTEM

I-78

This Interstate, traveling east to west, begins at I-81 in Lebanon County southwest of Fredricksburg. It provides travelers on I-81 with access to Allentown. This interstate parallels the U.S. Route 22 corridor for the length of the watershed. Full interchange exits provide access to the following PA Route systems, 645, 501, 419, and 183.

I-81

Traveling north to south, Interstate 81 enters the United States in New York and ends in Tennessee. This road skirts Harrisburg south of the Swatara Creek watershed. I-81 provides access to Pine Grove and Minersville in Schuylkill County, Lickdale and Ft. Indiantown Gap in Lebanon County, and Grantville and Manada Hill in Dauphin County. In addition to connecting with I-78, full interchange exits provide access to the following PA Route systems, 39, 743, 934, 443, 125, 25, and 901. I-81 also provides access to U.S. 209 to Tremont in Schuylkill County.

I-76

This fully controlled access toll-road begins at the border of New Jersey and continues west to Ohio. I-76 enters the southernmost tip of the study area in Dauphin County near the borders of Conewago and Londonderry Townships. Although the toll-road moves west past Harrisburg, there are no access points located within the watershed study area.

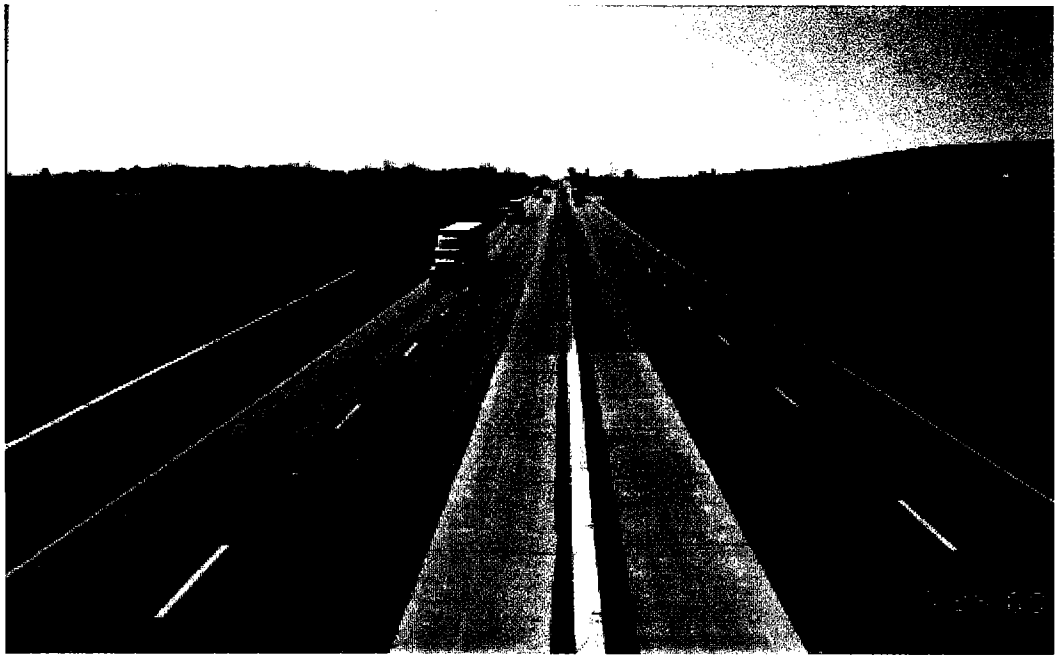


Photo 2-3: View of Interstate 78 in the watershed

US TRAFFIC ROUTES

Four US Traffic Routes are located within the Swatara Creek Watershed, US 322, US 422, US 22, and US 209.

US 422

Route 422 is classified as a major through traffic route and begins near Norristown and extends west to Hershey, where it joins with US 322. Within the watershed Route 422 provides access to Myerstown, Lebanon, Cleona, Palmyra, and Hershey.

US 322

Originating in New Jersey US 322 travels west through the study area and continues into Ohio. US 322 enters the southern section of the watershed in Lebanon County and extends west through Dauphin County. This section of US 322 is considered a secondary traffic route and provides access to Cornwall, and Campbelltown.

US 22

US Route 22 runs east and west through the entire state. Within the watershed US 22 runs north of Swatara Creek in Dauphin and Lebanon Counties, US 22 parallels I-81 to the south before joining I-78 near Hamlin. US 22 provides access to the municipalities of Fredericksburg, Jonestown, Ono, Harpers Tavern, and East Hanover.

US 209

US Route 209 runs from Millersburg, PA North into the state of New York. Route 209 only runs through the Schuylkill County portion of the watershed. It runs from the Village of Joliett to Branch Dale at the headwaters of Swatara Creek. In addition to Joliett and Branch Dale, Route 209 provides access to the communities of Tremont and Newtown in the watershed.

PA TRAFFIC ROUTES

The state traffic routes can be classified as roadways that interconnect communities to Major Highways within the study area. PA State Traffic Routes include; PA 441, PA 283, PA 230, PA 743, PA 39, PA 117, PA 241, PA 72, PA 419, PA 89, PA 934, PA 443, PA 343, PA 645, PA 501, PA 895, PA 125, PA 25.

At the county level, the road network for the four Swatara Creek watershed counties is extensive and covers a total of 8,101± miles. Within Schuylkill County, there are 1,263 miles of local roads and 623.93 miles of major road. Berks County has 2,257.26 miles of local roads and a major road network consisting of 964± miles. Lebanon County has 386 miles of major roads and 754± local roads. Dauphin County has 1,264± miles of local roads and 587± miles of major roads. Only a small portion of Berks County and less than half of Schuylkill and Dauphin Counties are located in the Swatara Creek watershed. Therefore, the listed amounts of roadways are not the totals found in the watershed.

RAIL

Complimenting the extensive network of roads within the study area are a freight rail and passenger rail system. Rail systems have historically moved large amounts of goods in and out of the watershed. They have also served as a source of transportation for people through the watershed. Today the rail systems in the watershed are freight haulers, with the exception of one passenger line that runs through and stops in the watershed. Freight rail systems are also being used as a tourist related resource as sightseeing trips are becoming increasingly popular.

The Swatara Creek Watershed contains the following rail lines – Amtrak, Norfolk Southern (formerly Conrail), Penn Central, Middletown and Hummelstown, Reading and Northern, Reading and Blue Mountain, and Steelton and Highspire. This rail network is categorized into three Penn Dot Classifications – Passenger Transport, Freight Rails (Operating) and Freight Rails (Other). Freight Rail (Operating) move freight from one location to another on major rail lines. Freight Rails (Other) could be minor rail line operators, excursion operations, abandoned, or in transition.

Of the above listed rail lines, Amtrak is the sole passenger line. It has one stop (Middletown) in the watershed and less than 2 miles of rail line in the watershed. Norfolk Southern and Reading and Northern, are Freight Rail (Operating) and have 47 miles of rail line in the watershed. The Freight Rails (Other) category has 49 miles or rail line and contains the other operators.

RAIL TRAIL

Within the Swatara Creek Watershed there are several recreational walking and bicycling trail-ways. Some of these trail-ways have been converted from abandoned rail lines. This form of recreation has become increasingly popular as communities recognize the benefits to both economic and quality of life issues. Studies have shown increases in tourism and money spent in relation to the development of a trail system. In addition, property values and business support have been shown to increase with this form of recreation. The Swatara Creek Watershed will have a small portion of completed rail trail by the end of the summer. Acquisition and completion of the remaining 11 miles of trail into the City of Lebanon is scheduled for completion in 2001. A feasibility study for extending the trail to Swatara State Park is scheduled for the future as well (Wengert, 2000).

AIR

Assisting in the movement of people and goods into and from the watershed is a comprehensive system of air travel. Serving as a convenient and faster way to move items from one area to another, air travel is also used for medical emergencies and military transport. The Swatara Creek Watershed has four public airports within the study area and one privately owned airport, Rover Landing Strip in Lebanon County. As indicated in Table 2-11, Public Airports in Project Area, Lebanon County has three public air facilities and Berks County has one public facility, while Dauphin and Schuylkill have none located within the project area.

Table 2-11
Public Airports in the Swatara Creek Watershed

County	Type	Name
Lebanon	Public	Reigle Airport
Lebanon	Public	Millard Airport
Lebanon	Public	Farmers Pride Airport
Berks	Public	Grimes Airport

(Source PennDOT 1995)

The Harrisburg International Airport is located in Middletown, PA adjacent to the Susquehanna River, just outside of the watershed. Two heliports are located within the watershed, one privately owned facility in Berks County, the Summit Heliport, and one public facility located at the M.S. Hershey Medical Center in Dauphin County.

Lebanon County has the only military use air transport. These facilities are located North of I-78 and East of I-81 in Lebanon County. The military airfields are West Grass Field, Muir Field and East Grass Field. A feasibility study for a public/private airport with FIG and Lebanon County is currently being completed.

According to 1995 PennDOT data, two other airport classifications exist, Statewide Airport (Special) and Other (Airpark/landing strip). These facilities are identified in Table 2-12.

Table 2-12
Additional Airports Within The Project Area

County	Type	Name
	Other	Hershey Airpark
	Other	Brookside Landing Strip
Dauphin	Statewide Airport	Ecko Field
Lebanon	Military Airfield	Muir Army Airfield
	Statewide Airport	Sky Classics Field
Berks	Statewide Airport	Brubaker's
	Statewide Airport	Krill
Schuylkill	Statewide Airport	Fairview Farms
	Statewide Airport	Cider Field

(Source PennDOT 1995)

Photo 2-4: Muir Airfield at Ft. Indiantown Gap National Guard Training Center

3. Major Sources of Employment

In the last decade, the four counties that lie within the Swatara Creek watershed (Dauphin, Lebanon, Berks and Schuylkill Counties) have experienced varying degrees of growth in employment with a steady rise in the service industry and various degrees of growth in the manufacturing industry.

Data for this section was acquired from second quarter unemployment compensation tax reports filed by employers (Pennsylvania County Industry Trends 1994-1998).

Dauphin County

The study area in Dauphin County is located in the southern third of the county from Middletown, it skirts the City of Harrisburg to the east, and extends north to the Second Mountain ridgeline that separates the Swatara Creek watershed from the Stony Creek watershed. During the period from 1994-98, Dauphin County experienced a growth in the Agriculture, Forestry and Fishing; Mining; Construction; Transportation; Wholesale and Retail Trade; Finance, Insurance, Real Estate; Services, and Public Administration sectors. The county experienced a small (3.0%) decrease in the Manufacturing sector, more specifically, apparel products, furniture/fixtures, and primary metal industries over this period.

Lebanon County

The study area within Lebanon County covers all but the northwestern corner and the southern most portion of the county. The primary employment in the study area portion of the county is manufacturing. Industry in the county experienced growth in the Agriculture, Forestry, and Fishing (16.7%),

Manufacturing (7.1%), Transportation and Other Utilities (5.7%), Wholesale Trade (15.0%), Retail Trade (2.8%), Finance, Insurance and Real Estate (7.9%), and Services (9.2%) sectors.

The largest employer in the county is the Department of Military and Veteran Affairs with 1,200 employees. Three health care providers, the Veterans Administration Hospital (980 employees), the Good Samaritan Hospital (814 employees), and the Philhaven Hospital (396 employees) are major employers within the county.

Berks County

The Swatara Creek Watershed study area covers only a small portion of Berks County that is located in the northwestern corner of the county. Berks County has a broad economic base, 28% of all jobs are in the Manufacturing Sector, and the remaining jobs largely consist of the agricultural, metal production, textile and apparel, and retail trade industries. During the period of 1994-1998, the county as a whole has seen an increase in the number of establishments for the following industry sectors: Agriculture, Forestry and Finance; Mining, Construction, Manufacturing; Transportation; Wholesale Trade; Finance, Insurance and Real Estate; Services and Public Administration. The county experienced a decline in Retail Trade during the same time period, primarily in General Merchandise, Food Stores, and, Apparel and Accessory Stores.

During this period, a growth increase of over 10% occurred for Agriculture, Forestry, and Fishing (12.7%); Transportation and Other Utilities (24.9%); and, Finance, Insurance and Real Estate (14.7%). The largest growth sector within Transportation & Other Utilities was Electrical, Gas and Sanitary Services, which grew from 38 establishments in 1994 to 57 in 1998.

Schuylkill County

The study area within Schuylkill County is located in the southwestern corner of the county and borders Berks and Lebanon counties. Schuylkill has experienced an increase in agricultural production including areas of Agriculture, Forestry, and Fishing. No other industrial sector experienced a growth over 10%. Decreases in the industrial sectors included Mining (-14.1%), Wholesale Trade (-3.6%), Retail Trade (-2.8%), Finance, Insurance, and Real Estate (-4.6%), and Public Administration (-1%).

Workforce and employment figures show that the study area is located in an area that is generally experiencing good economic conditions and employment opportunities. These economic statistics show a region with a generally low unemployment rate, with the exception of Schuylkill County at 6.2% (Table 2-13).

Table 2-13
Swatara Creek Watershed
1999 Area Employment and Unemployment

	Labor force	Employment	Unemployment	Unemployment rate
Berks County	186,000	178,500	79,000	3.20%
Dauphin County	144,200	138,500	5,600	3.50%
Lebanon County	67,000	65,100	1,900	2.80%
Schuylkill County	70,400	65,800	4,600	6.20%
Pennsylvania	*5,971,300*	*5,729,600*	*241,800*	*4.00%*

Pennsylvania Department of Labor and Industry, 1999

According to the 1990 Census Figures and the Department of Labor and Industry, the median household income for Berks County ($32,048) was higher than the state average of $29,069. Per Capita Income in 1994 for Berks County was $22,465 that was almost equal to the state average of $22,471 and higher than the national average of $21,696. The average weekly wage for persons employed in Berks County was $557 while the statewide average weekly wage was $594. Within Berks County there were a total of 8,014 firms in 1999 that helped to keep the 1999 unemployment rate around 3.2%. The unemployment rate for Berks County has varied from the 1970 rate of 2.9% to the high in 1980 of 7.4%.

Dauphin County's 1990 Median Household Income ($30,985) was also higher than the state average. 1994 Per Capita income for Dauphin County was $23,277, higher than both the state and national averages. The average weekly wage for persons employed in Dauphin County, $589, was slightly lower than the state average. In 1999 there were 6,361 firms in Dauphin County. These firms provided employment to residents and helped to keep the 1999 unemployment rate at 3.5%. The unemployment rate for Dauphin County has varied from a low in 1970 of 2.9% to the high in the 1980's of 6.1%.

1990 Median Household Income for Lebanon County ($29,469) was lower than Berks and Dauphin Counties but still higher than the statewide average. The 1994 Per Capita Income for Lebanon County ($19,937) was lower than the state's average of $22,471 and also the national average of $21,696. In 1999, the average weekly wage for the county was $479, which was lower than Dauphin and Berks counties as well as the statewide average. In 1999 there were 2,391 firms located within the Lebanon County, employing 40,690 persons. The unemployment rate for Lebanon County mirrors the previous two counties having a low unemployment rate of 2.9% in the 1970's and the highest unemployment rate in the 1980's at 6.6%.

When comparing Median Household Income, Schuylkill County has the lowest average of the counties within the Swatara Creek Watershed at $23,028 in 1990. The results from the comparison are similar when relating 1994 Per Capita Income as well. Per Capita Income was $18,031 in 1994, much lower than any other county within the watershed. In 1999, the average weekly wage was $412 for Schuylkill County and there were a total of 3,089 firms employing 54,207 persons. Schuylkill County currently has the highest unemployment rate of the four counties within the Swatara Creek Watershed. Since 1970, high unemployment rates have been found within Schuylkill County. In the 1970's, Schuylkill County had an unemployment rate of 5.1% that rose to a high of 9.9% in the 1980's.

Major Employers located within the Swatara Creek Watershed were identified as those firms employing 100 or more persons. Tables 2-14 through 2-17 list the names of the employer, general location within the watershed and the product or service. Each table list firms employing 100 or more persons, except for Berks County where the largest employer in the watershed is listed; but does not employ over 100 persons.

Table 2-14
Dauphin County Major Employers Within the Swatara Creek Watershed

Name	Location	Product or service
Giant Food Stores, Inc.	Derry Township	Retail Food
K-Mart Corporation	Derry Township	Retail
Hershey Foods Corporation	Derry Township	Chocolate/Confectionery
Hershey Medical Center	Derry Township	Health Care
HERCO Inc./ Hershey Entertainment and Resorts	Derry Township	Resorts
Milton Hershey School And Trust Company.	Derry Township	Education/ Private School
H.B. Reese Candy Company	Derry Township	Confectionery
Mt. View Thoroughbred Racing Association (Penn National)	East Hanover Township	Horse Racing / Entertainment
Ingram Micro CLBT	Lower Paxton	Computer Technology
Lower Dauphin School District	Conewago, East Hanover, South Hanover Twps. and Hummelstown Borough	Education
Derry Township School District	Derry Township	Education
Verdelli Farms East, Inc.	Swatara Township Hummelstown	Food Processing
Watkins Motor Lines, Inc.	Swatara Township	Freight Trucking
Weis Markets, Inc.	Derry Township	Retail Food
Walmart	Swatara Township	Retail

Table 2-15
Lebanon County Major Employers within the Swatara Creek Watershed

Name	Location	Product or service
Dept. of Military & Veterans Affairs	Annville	Military
Veterans Administration Hospital	Lebanon	Health Care
Lebanon County Government	Lebanon	Government
AMP	Jonestown	Manufacturing/ Electronics
Good Samaritan Hospital	Lebanon	Health Care
Farmer's Pride, Inc./Bell & Evans	Fredericksburg	Poultry
Walter H. Weaber & Sons, Inc.	Lebanon	Lumber
Cornwall-Lebanon School District	Lebanon	Education
Lebanon City School District	Lebanon	Education
Temp Force	Lebanon	Temporary Employment Agency
Supreme Mid-Atlantic Corp.	Jonestown	Truck Body Manufacturing
ALCOA-Foil Products Division	Lebanon	Aluminum Products
New World Pasta/ San Giorgio Plant	Lebanon	Food Production

Table 2-16
Berks County Major Employers within the Swatara Creek Watershed

Name	Location	Product or service
Peifer Machine	Tulpehocken Township	Machine Repair Service

Table 2-17
Schuylkill County Major Employers within the Swatara Creek Watershed

Name	Location	Product or service
Guilford Mills, Inc.	Pine Grove	Textile

As stated previously, the Swatara Creek Watershed is an area that is experiencing economic growth. This is indicated by the increase in employees and corresponding low unemployment rates. Unemployment rates are generally lower than the state's rate of 4.0% with the exception of Schuylkill County. This increase in employment can be attributed to rises in the manufacturing and service industries in the region.

As economic conditions improve, area wages and household income increases as well. Generally, the study area is above the state and national averages for Median Household Income, Per Capita Income and Weekly Wage. However, Schuylkill County once again falls below the state and national averages and lags behind the other three counties in employment and income earned.

Figure 2-1

SWATARA CREEK
River Conservation Plan

prepared for the

Swatara Creek Watershed Association

September, 2000

School Districts

School District Boundary

Other Features

Swatara Creek Watershed

Interstate Highway

Municipal Boundary

County Boundary

Scale in Miles

Scale = 1 : 253,440

1 Inch = 4 Miles (approx.)

SOURCES:

Pennsylvania Department of Environmental Protection
Pennsylvania Department of Transportation
Susquehanna River Basin Commission

Mackin

Figure 2-1 -- Schoo...stricts

Figure 2-2

SWATARA CREEK

River Conservation Plan

prepared for the

Swatara Creek Watershed Association

September, 2000

Land Use / Land Cover (Anderson Level 1)

- Urban/Built-up
- Agricultural
- Forest
- Wetland
- Barren
- Water
- Other

Other Features

- Swatara Creek Watershed
- River / Stream
- Interstate Highway
- Municipal Boundary
- County Boundary

4 3 2 1 0 2 4 6 8

Scale in Miles

Scale = 1 : 253,440

1 Inch = 4 Miles (approx.)

SOURCES:

U.S. Environmental Protection Agency/
Geographic Information Retrieval & Analysis System
(EPA/GIRAS)

Pennsylvania Department of Transportation

Susquehanna River Basin Commission

Mackin

Figure 2-2 -- Land Cover

Figure 2-3

SWATARA CREEK

River Conservation Plan

prepared for the

Swatara Creek Watershed Association

September, 2000

Zoning

- Residential
- Commercial
- Agricultural
- Mining (Earth Excavation)
- Manufacturing / Industrial
- Conservation
- Service / Public Facility
- No Zoning or No Data

Other Features

- Swatara Creek Watershed
- Interstate Highway
- Municipal Boundary
- County Boundary

4 3 2 1 0 2 4 6 8

Scale in Miles

Scale = 1 : 253,440

1 Inch = 4 Miles (approx.)

SOURCES:

Municipalities in the
Swatara Creek Watershed
Pennsylvania Department of Transportation
Susquehanna River Basin Commission

Mackin

Figure 2-3 -- Zoning

Figure 2-4

SWATARA CREEK

River Conservation Plan

prepared for the

Swatara Creek Watershed Association

September, 2000

Transportation Features

- Interstate Highway
- State Highway / State Route
- Local Road
- Railroad
- Union Canal
- Aqueduct
- Appalachian Trail
- Horshoe Trail
- Airport / Heliport

Other Features

- Swatara Creek Watershed
- Municipal Boundary
- County Boundary

Scale in Miles

Scale = 1 : 253,440

1 Inch = 4 Miles (approx.)

SOURCES:

Municipalities in the Swatara Creek Watershed

Pennsylvania Department of Transportation

Susquehanna River Basin Commission

Mackin

Figure 2-4 -- Transportation Features

CHAPTER 3:

LAND RESOURCES

3. Land Resources

A. Soil Characteristics

The primary factors causing soil variations within the Swatara Creek Watershed are the nature of the parent material, climate, topographic relief, flora and fauna that live in and on the soil, human influences, and the length of time that these factors have affected development of the soil. These factors have created soil associations, which within the watershed basin, consist of 19 major soils and combinations of minor soils (Table 3-1). Soil characteristic information was collected from the soil surveys of Berks, Dauphin, Lebanon and Schuylkill Counties. These surveys were developed by the U.S. Department of Agriculture (USDA) in conjunction with the Pennsylvania State University.

1. Schuylkill County

Along the headwaters of Swatara Creek, Udorthents-Dekalb-Hazelton soils predominate. Most land associated with this soil unit is in woodland; however, there are also small areas of urban development. These well drained, steeply sloping soils exhibit good potential for trees and woodlands. The predominance of large stones on the surface, the shallow depth to bedrock, and steep slope of these soils limit their potential for farming and development.

Upper and Lower Little Swatara Creeks form the remainder of the watershed in Schuylkill County. Berks-Hartleton-Weikert soils predominate along these waters. Land associated with this soil unit is mostly in agr and urban use. These well-drained soils are well suited for farming. Soil permeability, shallow bedrock, and the large amount of coarse fragments are limits to these soils for non-farm use.

Schuylkill County is located in the Valley and Ridge Physiographic Province, Appalachian Mountain Section. Synclines and anticlines are numerous and result from the folding and faulting of bedrock in this area. The physical makeup of the Appalachian Mountain Section consists of a series of parallel valleys and ridges cut through by numerous streams. The ridges are composed of sandstone and conglomerate and trend in a northeast direction across the county. The southern end of the anthracite coalfields is located in the Swatara Creek watershed. Anthracite coalfields, historically the most important mineral resource to the area, are located in the ridges of the northern headwaters of the watershed. The valleys of the region are primarily composed of shale and siltstone.

Table 3-1
Soil Associations of the Swatara Creek Watershed

Soil Association	Characteristics	County
Leck Kill-Meckesville-Calvin	Gently sloping to moderately steep, deep and moderately deep, well drained soils; on uplands	Schuylkill
Berks-Hartleton-Weikert	Gently sloping to very steep, deep to shallow, well drained soils; on uplands	Schuylkill
Dekalb-Buchanan-Hazelton	Gently sloping to very steep, deep and moderately deep, well drained to somewhat poorly drained soils; on uplands	Schuylkill
Udorthents-Dekalb-Hazelton	Gently sloping to very steep, deep and moderately deep, well drained soils; on uplands	Schuylkill
Hagerstown-Duffield-Clarksburg	Deep, nearly level to moderately steep, well drained and moderately well drained soils in limestone valleys	Lebanon
Berks-Weikert-Bedington	Shallow to deep, nearly level to very steep, well drained soils on uplands	Lebanon
Laidig-Hazelton-Leck Kill	Deep, nearly level to very steep, well drained soils on mountains, ridges, and summits	Lebanon
Ungers-Neshaminy-Watchung	Deep, nearly level to very steep, well drained and poorly drained soils on mountains and ridges	Lebanon
Bedington-Berks-Holly	Deep and moderately deep, nearly level to moderately steep, well drained and very poorly drained to poorly drained soils on uplands and flood plains	Lebanon
Neshaminy-Berks-Holly	Deep and moderately deep, nearly level to very steep, well drained and poorly drained to very poorly drained soils on uplands and flood plains	Lebanon
Chester-Murrill-Hazelton	Deep, nearly level to very steep, well drained soils on mountains, ridges, and benches	Lebanon
Edgemont-Dekalb	Deep and Moderately deep well drained soil formed from weathered sandstone along Blue Mountain in the watershed	Berks
Laidig-Buchanan-Andover	Deep soils formed from the colluvium on the lower slopes of Blue Mountain	Berks
Berks-Weikert-Beddington	Shallow to deep well drained soils of rolling topography, formed from the weathering of shale and siltstone	Berks
Berks-Bedington-Weikert	Deep to shallow, well-drained, nearly level to steep soils that have a shaly silt loam to shaly silty clay loam subsoil; on uplands	Dauphin
Hagerstown-Duffield	Deep, well-drained, nearly level to gently sloping soils that have a silty clay loam to clay subsoil; on uplands	Dauphin
Lewisberry-Penn-Athol	Deep and moderately deep, well-drained, gently sloping and sloping soils that have a dominantly gravelly sandy clay loam to shaly silty clay loam subsoil; on uplands	Dauphin
Brecknock-Neshaminy	Deep, well-drained, gently sloping and sloping soils that have a clay loam and silty clay loam subsoil; on uplands	Dauphin
Duncannon-Chavies-Tioga	Deep well-drained, nearly level and gently sloping soils that have a fine sandy loam to silt loam subsoil; on terraces and flood plains mostly along the Susquehanna River	Dauphin

Source: Soil Surveys of Berks, Dauphin, Lebanon and Schuylkill Counties

2. Lebanon County

Along Swatara Creek in the northeastern corner of Lebanon County, the Laidig-Hazelton-Leck-Kill soil association is dominant. This association gives way to Berks-Weikert-Bedington soils that predominate along the creek through the remainder of the county as the stream flows to the southwest. The Laidig-Hazelton-Leck Kill soils are found on tops, side slopes and foot slopes of mountains, summits, and ridges in northern Lebanon County. The soils are primarily in woodland because the soils' stony and steep nature and slow permeability limit its use for cultivation or development. The Berks-Weikert-Bedington soils are found in the west central and northern portions of Lebanon County. These soils are generally well suited for most agricultural uses, but shallow bedrock and limited available water are limitations for other uses.

Little Swatara Creek flows from its headwaters in Berks County through the central portion of Lebanon County to its confluence with Swatara Creek near Jonestown, PA. This section of the Swatara Creek watershed is mainly associated with the Bedington-Berks-Holly and Neshaminy-Berks-Holly soils located along tops, side slopes, and foot slopes of broad hills and flood plains. Although these soils are predominantly used for crops and hay, some woodland and urban development exists. Other sub-watersheds to the south and west within the watershed lie within Hagerstown-Duffield-Clarksburg soils found on broad plains and tops, benches, and side slopes and foot slopes of low limestone ridges in broad valleys. This soil unit is predominantly used for crops, hay, and pasture. Other uses include limestone quarries and some urban and industrial development.

Photo 3-1: View of Hagerstown-Duffield-Clarksburg association along Snitz Creek in Lebanon County.

Lebanon County is located within the Ridge and Valley physiographic province. A small portion to the north is in the Appalachian Mountain Section of the province while the remainder of the county is in the Great Valley Section. Where Swatara Creek enters the county from Schuylkill County to the east, bedrock is Middle Paleozoic sandstone, shale, and conglomerate formations. In contrast, where Little Swatara Creek flows through the county, bedrock of the Lower Paleozoic shale, limestone, and dolomite formations predominate. Further south in the watershed, sinkholes and solution cavities are common within the carbonate rocks associated with the karst topography. Limestone, dolomite, and shale are common within this section of the watershed. Andesite extrusions are also present within his section of the watershed

3. Dauphin County

As Swatara Creek progresses into Dauphin County flowing in a westerly direction, it passes through the Berks-Bedington-Weikert association. These soils of mostly low-lying areas are used for general farming and for dairy and livestock businesses. As Swatara Creek continues and begins to flow towards the south-southwest, it passes through the Hagerstown-Duffield association. These soils are best suited for general farming. The creek then turns to the southwest toward the Susquehanna River and passes through the Lewisberry-Penn-Athol association. These soils are also best suited for general farming. To the east of the creek is the Duncannon-Chavies-Tioga association; these soils are best suited for general farming and urban development.

The Dauphin County portion of the Swatara Creek watershed contains parts of three sections in two physiographic provinces. The northern end of the watershed is located in the Appalachian Mountain Section of the Ridge and Valley Province. The portion of the watershed in the central region of Dauphin County is in the Great Valley Section of the Ridge and Valley Province. These geologic sections closely resemble the descriptions given in the discussions of Schuylkill and Lebanon Counties. Finally, in the southern end of both the watershed and the county, Swatara Creek flows into the Gettysburg-Newark Lowland Section of the Piedmont Physiographic Province. This section of the Piedmont Region is characterized by rolling lowlands with some isolated hills. The bedrock is composed primarily of gray and red sandstone, shales, conglomerate, and diabase.

4. Berks County

The headwaters of Little Swatara Creek originate along the Berks/Schuylkill County border on Blue Mountain in the Edgemont-Dekalb Association. The soils of this association are found on the steep slopes of Blue Mountain and are moderately deep and well drained. Because of the steep slopes and low nutrient content, these soils are not well suited for agricultural or other development; therefore, virtually all of these soils found in the watershed are forested. Further downstream the watershed is located in the Laidig-Buchanan-Andover Association. These soils are generally deep and moderately well drained, but due to stony conditions and seasonal high water tables, they are limited for use in crop cultivation. Pasture farming, campsites, cabins, and forested land are the primary land uses for these soils. Finally, as the watershed continues eastward towards Lebanon County, it enters the Berks-Weikert-Bedington Association. Although the Weikert soils are considered low in nutrients and are prone to droughty conditions, the majority of these soils are in some type of cultivation. If slopes or runoff are too great, some of these areas are left in woodland or used for pasture. Other types of

development are limited due to the shallow depth to bedrock.

The Berks County section of the Swatara Creek Watershed contains both the Appalachian Mountain and Great Valley Sections of the Ridge and Valley Physiographic Province. The section of the watershed located on Blue Mountain is in the Appalachian Mountain Section, while the remainder of the watershed is in the Great Valley Section. The descriptions of these physiographic provinces are the same as those given for Schuylkill and Lebanon Counties.

B. Prime Agricultural Soils, Agricultural Security Areas, and Farmland Preservation

1. Prime Agricultural Soils

The USDA, Natural Resources Conservation Service (NRCS) designates prime agricultural soils in each of the counties in the watershed. Prime agricultural soils contain soil factors and slope features that are extremely well suited for agricultural purposes. These soils are deep, well drained, and level to nearly level. The same factors that make these soil types ideal for agriculture also make them an excellent soil type for development. Therefore, the locations and acreage of prime agricultural soils are important tools that can be used to plan for future development without removing important agricultural resources.

Within the watershed, the majority of prime agricultural soil is located within the Great Valley section of the watershed. Much of this soil acreage is found in Lebanon County; however, significant acreage is also found in Dauphin and Berks Counties. Fewer prime farmland soils are found within the Appalachian Mountain Section of the watershed, Schuylkill County, the northern half of Dauphin County, and the northern end and edge of Lebanon and Berks Counties respectively. Much of the watershed in Schuylkill County has been mined, or is located among very steep slopes, which preclude it from being considered prime farmland. The Swatara Creek Valley, south of Sharp Mountain in southern Schuylkill County, contains the greatest amount of prime agricultural soils in this section of the watershed.

2. Agricultural Security Areas

Agricultural Security Areas (ASA's) are actively farmed lands, which have been enrolled into a statewide program that restricts development options for the properties. In addition, ASA's protect the areas from indiscriminant condemnation, allow for farming of the area in the future, and prevent nuisance legislation detrimental to farming operations. A minimum of 250 acres is required for an ASA and they must be renewed every seven years. Local municipalities and counties administer ASA's. Total acreage of ASA's in the municipalities of the watershed is presented in Table 3-2 and locations of the ASA's are presented on Figure 3-1. Totals are based upon February, 2000 information received from the Pennsylvania Farm Preservation Bureau.

Table 3-2
Agricultural Security Areas of the Swatara Creek Watershed

County	Township	# Of Farmers	Acreage
Berks	Bethel	16	2,278
Berks	Tulpehocken*	42	4,022
Berks	Upper Tulpehocken*	32	3,833
Dauphin	Conewago*	36	3,314
Dauphin	East Hanover*	28	1,761
Dauphin	Londonderry*	48	4,985
Dauphin	South Hanover	16	1,208
Dauphin	West Hanover*	35	2,375
Lebanon	Bethel	46	5,022
Lebanon	Jackson*	61	6,434
Lebanon	North Annville	86	6,085
Lebanon	North Cornwall	39	2,446
Lebanon	North Lebanon	42	3,609
Lebanon	South Annville*	73	5,413
Lebanon	South Lebanon*	65	5,315
Lebanon	South Londonderry*	34	2,707
Lebanon	Swatara	42	7,565
Lebanon	West Cornwall*	17	1,597
Schuylkill	Pine Grove	19	1,626
Schuylkill	Washington	28	3,641
Schuylkill	Wayne I*	43	4,099
Schuylkill	Wayne II*	73	1,969
Totals	**23**	**921**	**81,304**

* = Township extends beyond watershed boundary

3. Farmland Preservation

In addition to ASA's, Pennsylvania and county governments are also purchasing development easements of prime agricultural lands, located within ASA's, for the purpose of preserving the areas in agricultural production, in perpetuity. Each of the counties in the watershed has farmland in the easement program; however, Lebanon and Berks Counties have much higher acreages than Dauphin and Schuylkill. Table 3-3 presents the total acreage found within the watershed by county and municipality.

Table 3-3
Agricultural Conservation Easements of the Swatara Creek Watershed

County	Township	Name	Acreage
Berks	Bethel	Hoover Farm	148.7
Berks	Bethel	Christiabnson Farm	150.9
Dauphin	Londonderry	Kane Farm	107
Lebanon	North Cornwall	Bomberger Farm	181
Lebanon	North Cornwall	Forney Farm	141
Lebanon	North Cornwall	Harnish Farm	90
Lebanon	N. Cornwall, S. Annville, W. Cornwall	Martin Farm	153.7
Lebanon	North Cornwall	Martin Farm	100
Lebanon	North Cornwall	Nolt Farm	125
Lebanon	North Cornwall	Schott Farm	25.9
Lebanon	South Annville	BergerFarm	138.8
Lebanon	South Annville	Brandt Farm	149.2
Lebanon	South Annville	Copenhave Farm	121
Lebanon	South Annville	Hoffer Farm	61.7
Lebanon	S. Annville, S. Lebanon	Hoover Farm 2	105.4
Lebanon	South Annville	Hoover Farm 3	96
Lebanon	South Lebanon	Hoover Farm 1	60.2
Lebanon	S. Annville, W. Cornwall	Mase Farm*	121.5
Lebanon	South Annville	McCue Farm*	55.6
Lebanon	South Annville	Sollenberger Farm	118
Lebanon	South Annville	Wampler Farms (2)	256.8
Lebanon	Bethel	Deaven Farm	131.5
Lebanon	Bethel	Kunkle Farm	50
Lebanon	Bethel	Ziegler Farm	163.5
Lebanon	North Annville	Bomgardner Farm 1	197
Lebanon	North Annville	Bomgardner Farm 2	98
Lebanon	South Lebanon	Ebenshade Farm	100.6
Lebanon	South Lebanon	Laicha Farm	77.7
Lebanon	South Lebanon	Zimmerman Farm*	198
Lebanon	S. Lebanon, Cornwall Borough	Wenger Farms (2)	328.3
Lebanon	North Lebanon	Meily Farm*	58.6
Schuylkill	Wayne	Fiddler Farms	248
Schuylkill	Wayne	Jersey Acres	127
Schuylkill	Wayne	Schaffer Farm	80.5
Schuylkill	Wayne	Frantz Farm*	162
Schuylkill	Washington	Ziegler Farm*	136
Totals		**36**	**4,664.10**

* Conservation easement process initiated but not finalized

C. Ownership

Industrial companies or individuals privately own the majority of the land within the watershed. Both large and small companies own land related to industrial uses such as rail corridors, mining operations, and light industrial manufacturing. Privately owned and operated farms form a considerable portion of ownership especially in Lebanon County.

Publicly owned land includes a number of state game lands, state forests, state parks and to a lesser extent, institutional buildings, river access sites, open space, and local parks and recreational facilities. These areas are detailed in the Cultural Resources Section of this report. Public land accounts for approximately 49,000 ac (13%) of the land within the watershed. The remainder of the land in the watershed is privately owned.

Figure 3-1 presents the breakdown between publicly and privately owned lands.

Photo 3-2 View of Pennsylvania Fish and Boat Commission's Sweet Arrow Lake Public Access Point, one of many publicly controlled lands throughout the watershed

D. Landfills

There are no active permitted landfills within the watershed in Berks or Dauphin Counties. However, the Harrisburg Waste to Energy incinerator located in Middletown is a short-term repository for waste. In addition, there are two closed landfills located in the watershed in Dauphin County. One was located in Derry Township and one was located in West Hanover Township.

1. Lebanon County

The Greater Lebanon Refuse Authority owns and operates a 400-acre landfill site located approximately 3.5 miles north of the City of Lebanon. The landfill serves some 26 different cities, townships, and boroughs within Lebanon County. Estimates predict 74,000 tons of waste annually, of which 60% is from residential sources, 20% from commercial sources, 14% from construction/demolition sources, and 6% from industrial sources (Giefer, 1999).

2. Schuylkill County

Pine Grove Landfill located in Pine Grove Township, Schuylkill County and is a privately 77-acre site owned and operated by The Pine Grove Landfill, Inc. This landfill has been in operation for several years and is currently seeking to expand the facility. The operation accepts municipal waste from surrounding communities and some residual waste, which has to be approved by the DEP prior to placement within the facility. Pine Grove Landfill was found to be in violation on numerous occasions due to malodors and odors emanating from the landfill in 1995.

Commonwealth Environmental Services Landfill is a 240 acre (34 in actual landfill) privately operated landfill located within Foster Township. This operation was permitted in 1994 and currently has a permit modification pending. The landfill accepts municipal waste. No notices of violation were recorded for the operation.

Two other landfills were formerly in operation within the Schuylkill County portion of the watershed. These operations, the Pine Grove Twp. and John Fry landfills are currently inactive, although there are permits on file for the facilities. Two composting facilities are also located in Schuylkill County. They are the Branch Twp. Yard Waste Composting Facility and the Hillside Composting Facility. The Branch Twp. facility was permitted in 1997. The Hillside facility's permit is pending.

E. Hazard Areas

1. Waste Sites

An inventory of hazardous and toxic waste sites was conducted for the entire Swatara Creek watershed using the Environmental Protection Agencies' (EPA) database and the Right to Know Network. This query system identified waste management facilities listed within the following regulatory databases:

- Resource Conservation and Recovery Information System (RCRIS)
- Comprehensive Environmental Response, Cleanup, and Liability Information System (CERCLIS)
- Toxic Release Inventory (TRI)
- Permit Compliance System (PCS)

Summaries of information obtained through the search are contained in Appendix B of this document. Up to date and complete results of this database search, as well as descriptions of the federal environmental legislation regulating each of these facilities can be located by accessing the Right To Know Network on the Internet at **www.rtk.net**.

RCRIS LIST

The Right To Know Network Database was used to identify any Large Quantity Generators (LQG) located within the watershed. LQGs are operations that produce > 2,200 Lbs. of hazardous waste in any given month of the year. In addition, a review of RCRIS list was also used to quantify the number of Small Quantity Generators (SQG), Waste Transporters (WT) located within the watershed. No RCRIS listed Storage, Treatment, and Disposal (STD) facilities were located within the watershed.

No LQGs were located within the Berks County portion of the watershed. A total of 11 LQGs were identified within the remainder of the watershed. Table 3-6 presents these sites as well as information pertinent to these sites. This information was current as of March, 2000. Summaries of each of these sites can be found in Appendix C.

Table 3-4
Summary of Large Quantity Generators within the Swatara Creek Watershed

County	Facility Name	RCRIS Violations
Dauphin	Texas Eastern Grantville Station	1 Violation
	Dynamic Products Corporation	0 Violations
Schuylkill	Gold Mills Inc.	0 Violations
	Pine Grove Landfill Inc.	0 Violations
Lebanon	AMP Incorporated- Lickdale Plant	0 Violations
	The Sherwin Williams Company	2 Violations
	Lebanon Finished Products	0 Violations
	Hoover Containment Company	0 Violations
	Alcoa Inc.	4 Violations
	Lebanon Steel Factory	0 Violations
	Printed Terry Finishing Company	3 Violations

A total of 214 SQGs (70 in Dauphin, 133 in Lebanon, 9 in Schuylkill, and 2 in Berks County) and 13 WTs (11 in Dauphin, 1 in Lebanon, and 1 in Berks Counties) were listed within the watershed.

CERCLIS LIST

No Pennsylvania Superfund Sites (NPLs) were identified within the watershed. No active CERCLIS sites were identified within either the Dauphin, Schuylkill or Berks County sections of the watershed.

One CERCLIS site was identified within Lebanon County. The U.S. Army Indiantown Gap Landfill (EPA ID

PA8210020444) located at Fort Indiantown Gap Reservation in Annville, PA is not listed on the NPL. The most recently listed action on the database is a Preliminary Assessment of the site for higher priority on the Federal Facilities List. This assessment was completed in 1992.

Toxic Release Inventory

The Toxic Release Inventory (TRI) is a public information Right-To-Know report that presents information about chemical releases and discharges associated with manufacturing industries. Information from this database was obtained from the Right To Know Network.

The information obtained from the TRI is presented in Appendix C. A total of five industries were identified as having releases within the watershed. No violations regarding these discharges were noted and all facilities are assumed to be in compliance with applicable regulations. Updated information from the TRI can be obtained from the Right To Know Network Internet site at **www.rtk.net.**

Permit Compliance System

The Permit Compliance System (PCS) provides information on National Pollution Discharge Elimination System (NPDES) Permits for surface water discharges under the Clean Water Act. Utilizing the Right To Know Database, a total of 17 permitted facilities were identified in the watershed. There is insufficient data to determine compliance with permit parameters or the severity of any potential violations. Updated information for the PCS can be obtained from the Right To Know Network Internet site at **www.rtk.net.**

2. Abandoned Mines/Quarries

Numerous abandoned coalmines and limestone quarries are located within the watershed. All of the abandoned mines are located within Schuylkill County in the northern end of the watershed. These abandoned mines run the gamut from small family worked mines to huge corporate operations that cover hundreds of acres. Abandoned mines are located in Frailey Township, Tremont Township, Tremont Borough, and to a lesser extent within Reilly and Porter Townships. Processing coal from underground deep mines and surface strip mines has left a legacy of coal refuse piles, surface scars, and abandoned mine drainage (AMD).

Existing refuse piles pose a danger to the water quality of streams within their watersheds as well as potential air quality problems resulting from fires burning on the steep slopes of these piles. Underground mine pools resulting from deep mining efforts of the past threaten both groundwater and surface waters with AMD. Lorberry Creek in Tremont Township, Good Spring Creek in Fraily Township, the Rowe Tunnel and the Tracy Airhole represent major sub-watersheds contributing to AMD problems within Swatara Creek.

Photo 3-3: View of AMD discharge associated with Tracy Airhole in Schuylkill County.

3. Active Mines/Quarries

Based upon information received from Mr. Dan Koury of the Pennsylvania Department of Environmental Protection's Pottsville Mining office, there are a total of 22 permitted non-coal-mining operations in the Swatara Creek watershed (Appendix D). Eighteen of these operations are currently active. The other four have not yet started operations. The non-coal operations are primarily located in Lebanon and Dauphin Counties with ten and six operations respectively. Berks and Schuylkill counties have three operations each. These operations are primarily shale and limestone quarries.

In addition to the non-coal mining operations, coal-mining permits are also active within the watershed. Of these permits, 37 are currently active an additional 13 are not started, inactive, forfeited, or regraded. All of the coal mining permits are located in Schuylkill County. The coal operations are made up of deep mining operations, strip mining operations, coal preparation, and reprocessing.

The current list of coal and non-coal mining permits is located in Appendix D.

Photo 3-4: Active limestone quarry along Route 422 between Lebanon and Annville.

4. Sink Holes

Within the watershed, sinkholes are prevalent in portions of Dauphin and Lebanon Counties. These areas are located over limestone and dolomite bedrock formations associated with portions of the Great Valley Physiographic Section. These sinkholes result from long term dissolution of the limestone rock by infiltrating water. They serve as conduits for surface water to reach underlying limestone formations and serve as a direct link to groundwater. In rural location sinkholes have historically been used as dumps and the potential for groundwater contamination is great in these areas. Greater knowledge and education regarding sinkholes and the special environmental hazards that they pose has increased efforts to eliminate dumping into sinkholes as well as prevent their formation in developed areas.

No sinkholes were identified within the Swatara Creek watershed in Berks and Schuylkill Counties.

a. Lebanon County

The Bureau of Topographic and Geologic Survey has identified a total of 93 sinkholes within the watershed in Lebanon County. Lebanon Counties' sinkhole concentration is primarily located along the Route 422 corridor. It runs through Palmyra Borough where the concentrations are the greatest. Additional concentrations of sinkholes are located along U.S. 322 in South Annville Township and in the City of Lebanon. The majority of these sinkholes are located on the Epler geologic formation. The sinkholes located in urbanized areas are often the result of storm water runoff or waterline breaks. In addition to the Bureau of Topographic and Geologic Survey sinkhole database, a study of sinkholes, funded by the League of Women Voters and PADEP, was

completed for Lebanon County. The study information can be found in the Report titled *Sinkholes of Lebanon County, Pennsylvania* published in 1998.

b. Dauphin County

The Bureau of Topographic and Geologic Survey has identified a total of 37 sinkholes within the watershed in Dauphin County. Areas of sinkhole concentration within the Dauphin County portion of the watershed are found within Derry Township in the vicinity of Hershey and extending south within the township towards the Pennsylvania Turnpike (I-76). Again, the majority of the sinkholes are found on the Epler geologic formation. No outside studies have been completed on the sinkholes of Dauphin County.

Appendix D presents the Bureau of Topographic and Geologic Survey sinkhole data for both Lebanon and Dauphin Counties.

Figure 3-1

SWATARA CREEK

River Conservation Plan

prepared for the

Swatara Creek Watershed Association

September, 2000

Public / Private Lands

- State Forest
- State Park
- State Gameland
- Fort Indiantown Gap Military Reservation

Other Features

- Swatara Creek Watershed
- Interstate Highway
- Municipal Boundary
- County Boundary

Scale in Miles

Scale = 1 : 253,440

1 Inch = 4 Miles (approx.)

SOURCES:

Pennsylvania Department of Environmental Protection
Pennsylvania Department of Transportation
Susquehanna River Basin Commission
Fort Indiantown Gap Military Reservation

Mackin

Figure 3-1 -- Public ivate Lands

CHAPTER 4:

WATER RESOURCES

4. WATER RESOURCES

A. MAJOR TRIBUTARIES

Although the main stem of Swatara Creek receives drainage from over 25 tributaries (Table 4-1, Figure 4-1), seven major tributaries (> 20 mi^2 drainage area) account for over 319 mi^2 (55%) of the total drainage area. Located in the headwater region of the watershed, the Upper Little Swatara Creek and Lower Little Swatara Creek are situated in Schuylkill County. These two tributaries, which account for approximately 70 mi^2 of headwater drainage area, have historically been under the influence of some of the most significant abandoned mine drainage (AMD) in the watershed.

Some 20 miles downstream Swatara's largest tributary, Little Swatara Creek, winds through the agricultural and developed regions of Berks and Lebanon Counties before its confluence with Swatara Creek near Jonestown. Situated within the Ridge and Valley physiographic province, the shale and slate valleys surrounding Little Swatara characterize this tributary as a poorly buffered system. Although known for its excellent aquatic habitat, Little Swatara suffers from poor water quality as a result of high metals and nutrient concentrations (Traver, 1997).

Also located within the developed regions of Lebanon County near Annville and Lebanon, Swatara's second ·est tributary, Quittapahilla Creek, is more heavily influenced by the effects of surrounding agriculture. As a ·lt of this land use, Traver (1997) describes the biological condition of the Quittapahilla as moderately ·aired. Water chemistry indicates excessive amounts of dissolved residuals, nitrogen and nitrates, phosphorus, and iron.

The remaining tributaries, Manada Creek, Spring Creek, and Beaver Creek, occupy the lower watershed near Hershey in Dauphin County. Cumulatively, these systems account for nearly 15% of Swatara's total drainage area. Beaver and Spring Creeks occupy the limestone and dolomite valleys of the Central Appalachian ecoregion while Manada Creek is situated in the shale and slate valleys of the Ridge and Valley ecoregion. Although all three streams have been described as offering supporting to excellent aquatic habitat, chemical analysis indicated fair to poor conditions that was reflected in a macroinvertebrate community, which was moderately impaired with a low species diversity and trophic structure (Traver, 1997).

The water quality, aquatic habitat, and biological condition associated with each of these systems is discussed in greater detail under the Water Quality subsection.

Table 4-1

Major Tributaries to Swatara Creek[1]

Tributary	Drainage Area (mi^2)	PA DEP Water Use[2]	River Mile
Panther Creek	1.82	CWF	68.77
Middle Creek	5.8	CWF	65.7
Black Creek	6.91	CWF	63.7
Lower Rausch Creek	8.88	CWF	62.5
Adams Run	1.12	CWF	62
Upper Little Swatara Creek	24.3	CWF	59.15
Lower Little Swatara	35.6	CWF	57.8
Swope Valley Run	5.53	CWF	57.45
Mill Creek	17.8	EV, CWF	52.75
Bear Hole Run	3.13	CWF	52.05
Trout Run	8.62	CWF	47.05
Monroe Creek	7.81	HQ-CWF, WWF	44.5
Forge Creek	1.84	WWF	43.15
Oil Creek	3.6	WWF	41.9
Red Run	1.2	WWF	41.35
Little Swatara Creek	99.2	CWF, WWF	38.65
Reeds Creek	9.3	WWF	29.7
Indiantown Run	11.6	WWF, CWF, TSF	29
Quittapahilla Creek	77.3	TSF	22.2
Bow Creek	9.46	WWF	17.18
Manada Creek	32.2	WWF, CWF	15.43
Spring Creek	24	WWF	14
Kellock Run	4.37	WWF	10.1
Beaver Creek	27.2	WWF	8.9
Iron Run	7.61	WWF	2.13

[1] Contributory drainage > 1 mi

[2] PADEP Chapter 93 Water Quality Standards abbreviations are: WWF - Warm Water Fisheries, CWF - Cold Water Fisheries, TSF - Trout Stocked Fisheries, HQ - High Quality Waters, EV - Exceptional Value Waters

Source: Pennsylvania Gazetteer of Streams by Pennsylvania Department of Environmental Protection in cooperation with the United States Department of the Interior Geological Survey, 1989, Harrisburg: Author.

B. Wetlands

Wetlands occupying the Swatara Creek watershed study corridor were identified through a review of National Wetlands Inventory (NWI).

Wetlands can be defined as transitional areas between terrestrial and aquatic environments where the water table often exists at or near the surface, or the land is inundated by water (Cowardin, Carter, Golet, LaRoe, 1979). As such, wetlands frequently exhibit a combination of physical and biological characteristics of each system. Three factors are recognized as criteria for wetland classification: the presence of hydric soils (soils characteristic of a reducing environment due to lack of oxygen); inundation or saturated conditions during part of the growing season; and a dominance of hydrophytic (water-loving) vegetation (Environmental Laboratory, 1987). Within this general framework, many different wetland ecosystems and classifications exist.

C. Floodplains

The greatest threat to floodplains within the Swatara Creek watershed) consists of encroachments by agricultural and urban development. As discussed in the Water Quality section, nitrogen enrichment throughout the central basin and urban effluents in the lower watershed constitute two of the three major non-point pollution source regimes. One of the reasons for this is development within and adjacent to floodplain and riparian zones.

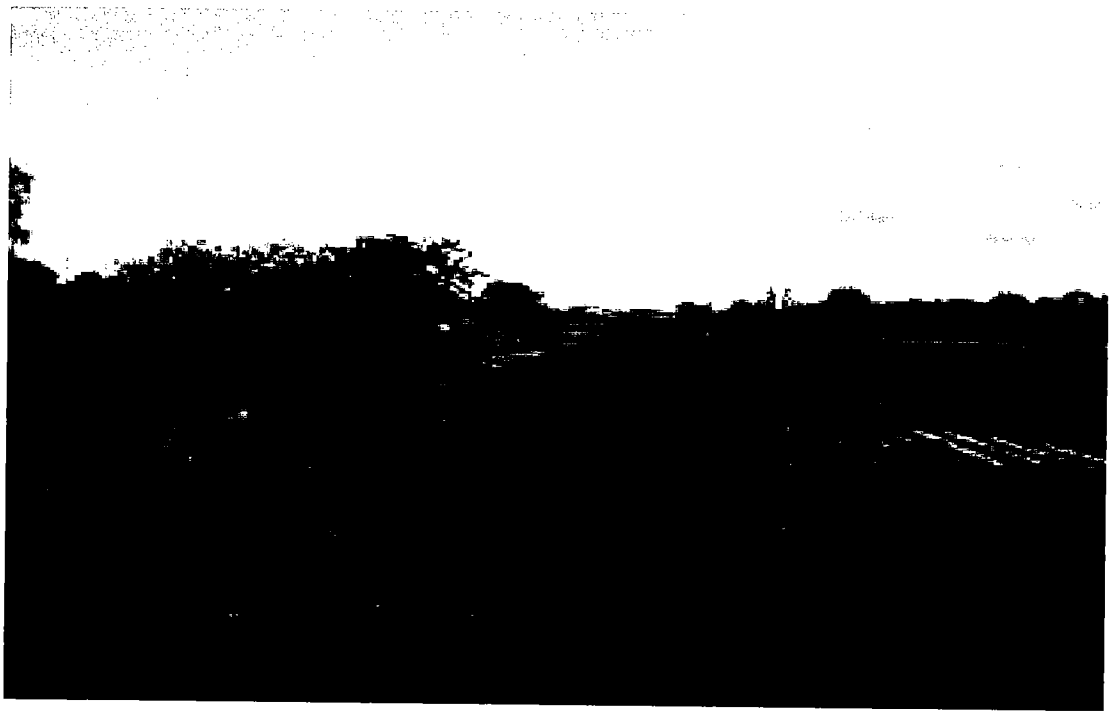


Photo 4-1: Channelization and agricultural encroachment located along the floodplain of Snitz Creek in Lebanon County.

Undisturbed floodplains and riparian zones serve a variety of ecological functions including the retention and gradual release of surface and groundwater; the vegetative stabilization of stream banks, the filtering of sediments and toxicants from surrounding uplands; and supply food sources, cover, and thermal protection.

Photos 4-2 and 4-3: Examples of well-developed riparian zone along Swatara's main stem at Jonestown in Lebanon County and along Mill Creek downstream from the Lebanon Reservoir in Schuylkill County.

When encroachments occur, the buffering capacity of these regions is compromised. The result is increased pollutant runoff into streams, bank erosion and slips, inability to detain and gradually release floodwaters, and extreme alterations in channel morphology. Although an increase in runoff pollutants has a significant effect on the biological health of the stream ecosystem, it is the destruction of riparian habitat which has the greatest influence. In fact, except in extreme cases of contamination by various chemical species, such as those found in AMD, degradation of floodplain and riparian habitat by agricultural and urban land uses within the Swatara Creek watershed has the greatest influence on aquatic fauna.

Photo 4-4: Livestock access along Earlakill Run in Lebanon County is a major cause of streambank erosion, i ncreased turbidity and sedimentation, and nutrient loading.

Encroachments by residential developments are also responsible for impacts to the floodplain. Future development and land use plans should be coordinated with the FEMA and the National Flood Insurance Program to determine floodplain and special flood hazard areas within the corridor.

Flood management and insurance rates are coordinated through the National Flood Insurance Program. This program, which was established by the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973, was an effort to reduce the damage and hazards associated with flood events. To accomplish these goals, the Federal Emergency Management Agency (FEMA), conducts routine flood insurance studies that investigate the severity and existence of flood hazards throughout the country. The results of these studies are then used to develop risk data that can then be applied during land use planning and floodplain development.

Photo 4-5: Pennsylvania Fish and Boat Commission Adopt-A-Stream projects like this one along Lower Little Swatara Creek in Schuylkill County restore and preserve riparian habitat.

D. Lakes and Ponds

"Significant" lakes and ponds within the Swatara Creek watershed were identified through a review of the *Commonwealth of Pennsylvania 1996 Water Quality Assessment* (Frey, 1996), and are presented in Table 4-2 and on Figure 4-1. As defined in this assessment, a "significant lake" is "a publicly-owned lake with a retention time of 14 days or greater". According to Frey (1996), Pennsylvania's definition of a publicly-owned lake is consistent with the EPA definition set forth in 45 CFR Part 35, FR Volume 25, which is "A fresh water lake that offers public access to the lake through publicly-owned contiguous land so that any person has the same opportunity to enjoy non-consumptive privileges and benefits of the lake as any other person".

Table 4-2
Publicly Owned Lakes in the Swatara Creek Watershed

Lake	Acres	County	Use
Stoevers Dam	25	Lebanon	TSF
Lions Lake/Ebenezer Dam	10	Lebanon	WWF
Memorial Lake	85	Lebanon	WWF
Sweet Arrow Lake	100	Schuylkill	CWF

Source: Commonwealth of Pennsylvania 1998 Water Quality Assessment (Section 305(b), Federal Clean Water Act) by R. F. Frey, 1998, Harrisburg: Pennsylvania Department of Environmental Protection.

Photo 4-6: Sweet Arrow Lake in Schuylkill County is fed by Upper Little Swatara Creek.

Additional lakes identified include those listed by the Pennsylvania Fish and Boat Commission (PFBC) as Approved Trout Waters (Table 4-3, Figure 4-1), as well as Lake Weis, Lake Strause, and Shuey Lake in Lebanon County; and Lebanon Reservoir in Schuylkill County (Figure 4-1).

Table 4-3
PFBC Approved Trout Lakes within the Swatara Creek Watershed

Lake	County	Use
Marquette Lake	Lebanon	TSF
Stovers Dam	Lebanon	TSF
Middletown Reservoir	Dauphin	TSF

Source: 1999 Pennsylvania Summary of Fishing Regulations and Laws by Pennsylvania Fish and Boat Commission, 1999, Bellefonte, PA: Author.

E. Water Quality

1. General Watershed Characteristics

The Swatara Creek watershed encompasses an approximately 571 mi^2 area in Schuylkill, Berks, Lebanon, and Dauphin counties (PADEP, 1989) Figure 4-1). A 5th order stream at its mouth near the Susquehanna River, the Swatara originates in the southern Pocono's geologic formation at Broad Mountain in Schuylkill County's Southern Anthracite Coal Field (Lindsey, Breen, Bilger, & Brightbill, 1998) (*a stream with no tributaries is a 1st order stream, when two 1st order streams intersect they form a 2nd order stream, when two 2nd order streams intersect they from a 3rd order stream, and so forth*). According to McCarren,

Wark, and George (cited in Skelly and Loy, 1987), the average gradient in the headwater region is 47 feet per mile, while overall, the gradient is approximately 17 feet per mile. From the heavily mined coal deposits of Schuylkill County, the Swatara continues southwest through agricultural and developed lands in Lebanon and Dauphin County's limestone region.

The Swatara watershed has been designated as a High Priority on the Nonpoint Source (NPS) Priority Degraded Watershed List (DWL) under the PADEP's Nonpoint Source Control Program (Frey, 1994,1996). The NPS DWL identifies streams or stream segments impacted by non-point sources of pollution. PADEP uses information about the stream degradation level, in conjunction with interest from public and local groups, to determine the watersheds that would most likely benefit from remediation projects. Impaired waters are presented in Figure 4-2.

Included in the High-Priority designation are approximately 35.6 miles degraded by nonpoint source (NPS) agricultural runoff and an additional 62.8 miles degraded by AMD (Frey, 1994). In addition, according to Koury (1998) there were 48 mining operations in the watershed including 29 active and 19 inactive or under planning. For perspective, the 1996 Annual Production Report indicates that 631,272 tons of coal were extracted from Swatara's watershed (cited in Koury, 1998).

Researchers delineate the Swatara watershed into different ecoregions and physiographic provinces based on several key parameters. The generally recognized subunits are outlined in Table 4-4.

Table 4-4
Watershed Subunits and Physiographic Provinces

Subunit	Physiographic Province	Bedrock Type	Land Use
Great Valley Limestone	Ridge and Valley (Great Valley)	Limestone and Dolomite	Agricultural
Great Valley Limestone	Ridge and Valley (Great Valley)	Limestone and Dolomite	Urban
Appalachian Mountain Sandstone and Shale	Ridge and Valley (Appalachian Mountain)	Sandstone and Shale	Agricultural
Appalachian Mountain Sandstone and Shale	Ridge and Valley (Appalachian Mountain)	Sandstone and Shale	Forest

Source: Water Quality in the Lower Susquehanna River Basin, Pennsylvania and Maryland, 1992-95 by B.D. Lindsey, K.J. Breen, M.D. Bilger, and R.A. Brightbill, 1998, Reston, VA: U.S. Geological Survey.

Situated within the Ridge and Valley (Appalachian Mountain Section) physiographic province throughout southeastern Schuylkill and western Berks counties, the upper watershed is dominated by sandstone and shale formations. The dominant land use within this region is forestland and agriculture. The middle and lower watershed is situated in Lebanon and Dauphin counties and is part of the Ridge and Valley (Great Valley) physiographic province. Agricultural land use intensifies throughout this region, as well as significant increases in residential and urban areas. Unlike the Ridge and Valley region, the geology within this province is composed of limestone and dolomite bedrock.

The underlying bedrock in the Swatara basin has a significant effect on the concentration of pollutants in surface and groundwater. According to Lindsey et al. (1998), land use and bedrock type accounted for most of the variation in nitrogen and pesticide concentrations found in ground and surface waters. When compared with other bedrock types in the watershed, agricultural areas underlain by limestone had groundwater and surface water nitrate concentrations that frequently exceeded the Environmental Protection Agency's Maximum Contaminant Level (MCL). Conversely, urban areas underlain by limestone and forested and agricultural areas underlain by sandstone and shale had nitrate concentrations that rarely exceeded MCL's. Limestone regions were also more likely to have pesticide-contaminated wells than sandstone and shale regions.

As expected, the surrounding land use and geology correlates well with the observed differences in water quality throughout the Swatara basin. According to Bednarczyk, Camann, Hurst, Jones, Lamoncha, & Williams (1996), at least three nonpoint source discharge regimes exist within the Swatara Creek watershed: 1) AMD from anthracite coal-mining operations in the upper rural areas; 2) nitrogen enrichment from agricultural runoff, primarily in the central basin; and 3) urban effluents from the lower regions of the watershed.

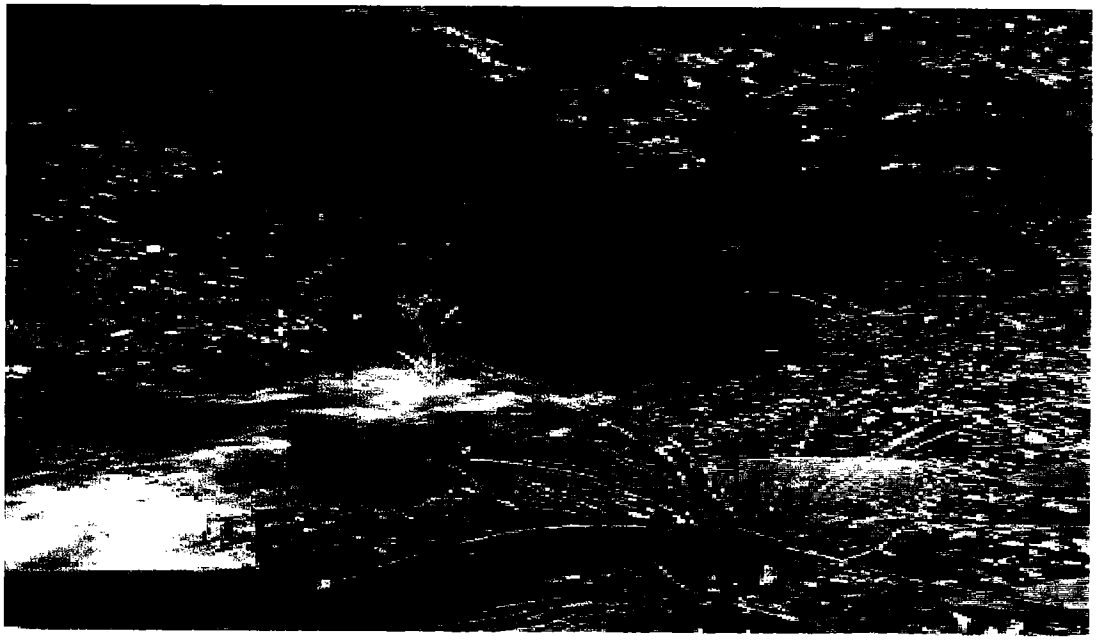


Photo 4-7: Iron precipitate is a primary indicator of AMD.

Photo 4-8: *Agricultural encroachment within the floodplain leads to increased erosion, turbidity, and pollutants within the stream.*

2. General Water Quality Trends

The ever-increasing demands of urban and residential development, industry, resource extraction, and agriculture have fostered an exhaustive amount of research on the Chesapeake Bay ecosystem. One of the primary focuses of this research has been the Lower Susquehanna River Basin that provides more than half of the freshwater to the bay (Natural Lands Trust, 1997). As a major part of this basin, the Swatara Creek watershed has been the focus of numerous investigations attempting to characterize the chemical, biological, and habitat parameters that affect the overall integrity of this ecosystem. Extensive farming, urban development, and mining throughout Swatara's basin have historically been the primary threats to water quality.

One the most ambitious, nationwide watershed studies was initiated in 1991 by the United States Geological Survey (USGS). The USGS National Water Quality Assessment Program (NAWQA) was designed to collect consistent water quality data, report on the status and trends of water resources, and identify factors that affect water quality throughout the United States. To meet these objectives, the USGS established approximately 60 study units, or major watersheds, throughout the country. Information regarding the physical, chemical, and biological condition of the Lower Susquehanna watershed was conducted between 1992 and 1995.

Photo 4-9: Swatara Creek's confluence with the Susquehanna River at Middletown.

According to Lindsey et al. (1998), water quality data suggests several trends in chemical constituents throughout the Lower Susquehanna Basin. A basin-wide summary of the findings is as follows:

- Nutrient concentrations in streams are high, and often exceed drinking water standards (DWS) in agricultural areas.
- Pesticide concentrations are near the national median and rarely exceed DWS.
- Polychlorinated Biphenyls (PCB) and organohalide pesticides in fish tissue are among the highest in the nation.
- Nitrate concentrations of water wells in areas underlain by limestone are among the highest nationwide and represent a human health concern.
- Detected pesticides were high compared to the national average.

Within the Swatara basin, just west of Lebanon, NAWQA maintains a study unit at Bachman Run. When data from Bachman Run was compared to all of the NAWQA study units nationwide, Lindsey et al. (1998) identified the following trends:

- Nutrients; including nitrates, phosphates, and ammonia, were among the highest 25% of all sites in the country (75th %).
- Organochloride pesticides and PCB's in streambed sediments and biological tissue were between the median and the 75th %.
- Trace elements in streambed sediments were between the median and the 75th %.
- Semivolatile Organic Compounds (SVOC) in streambed sediments were greater than the 75th %.

- Stream habitat degradation was greater than the 75th %.
- Degradation of the fish community was greater than the 75th %.

As indicated by these results, the Bachman Run sub-basin of the Swatara Creek watershed was among the most degraded in the nation for these constituents.

On a more regional level, PADEP maintains hundreds of fixed Water Quality Network (WQN) stations throughout the state. Information obtained at each location is used in assessing surface water quality, identifying trends, and evaluating the effectiveness of the Water Quality Management Program (Shertzer & Schreffler, 1996).

Results from the WQN between 1988 and 1992 indicated that the majority of degradation reported in the Lower Susquehanna River sub-basin was attributable to agricultural sources; however, the problems within Swatara's watershed were apparently dominated by resource extraction.

Photo 4-10: Agricultural development and floodplain encroachment along Killinger Creek in Lebanon County.

Data from the WQN Station near Swatara's mouth indicated that total aluminum, total iron, and total manganese exhibited yearly changes in concentration of 40.7 *u*g/l, 43.7 *u*g/l, and 5.0 *u*g/l, respectively (Frey, 1994). Because these chemical species are common constituents associated with AMD, this may indicate an increase in AMD. Conversely, total phosphorus and dissolved solids, both indicators of agricultural pollutants, exhibited estimated marginal annual decreases of 0.010 *u*g/l and 5.0 *u*g/l, respectively. These decreases may be associated with implementation of the Pennsylvania Nutrient Management law, which required animal operations with more than 2,000 pounds of livestock per acre to develop and implement approved nutrient management plans.

Photo 4-11: Streambank fencing and controlled livestock access along Upper Little Swatara Creek in Schuylkill County.

Section 303(b) of the Clean Water Act of 1972 requires that states adopt specific water quality standards that include uses designated for their water bodies. These standards specify maximum ambient levels of pollutants that will ensure that waters can be used for their designated purposes. Water uses and levels of specific chemical parameters are to be protected and maintained with the goal of eliminating and preventing water pollution. A synopsis of Pennsylvania's designated water uses includes fish and aquatic life; public, industrial, livestock, wildlife, and irrigational water supply; and boating, fishing, water contact sports, aesthetics, and recreational uses (Frey, 1996).

In accordance with section 303(b), the major goal of Pennsylvania's Water Quality Assessment Program is to evaluate whether these water quality standards are being met. Data from the program is compiled and presented to Congress and the public in accordance with section 305(b), which requires states to conduct biennial water quality assessments on the condition of their waterways and report on these findings. Section 303(d) of the Act further requires states to evaluate the impaired waters to determine which waters, even after an appropriate water pollution control measure had been taken, would not support the designated water use. These waters would then be listed on PADEP's Section 303(d) List of Impaired Waters. Table 4-5 lists the Section 303(d) listed streams within the Swatara Creek watershed. (PADEP, 1999b)

Table 4-5

Summary of Section 303(d) List of Impaired Waters within the Swatara Creek Watershed

Stream	Source of Impairment	Cause of Impairment	Priority
Rausch Creek	AMD	pH	High
Bachman Run	Agriculture	Nutrients	High
Earlakill Run	Agriculture	Nutrients, Siltation	High
Beach Run	Agriculture, Urban Runoff	Nutrients, Siltation	High
Baird Run	AMD	Metals	High
Beck Creek	Agriculture	Nutrients	High
Crosskill Creek	Agriculture	Pathogens	High
Deep Run	Industry, Agriculture, Municipal, Urban Runoff	Suspended Solids, Nutrients, Siltation	High
Elizabeth Run	Municipal, Industrial, Agriculture	Nutrients, Suspended Solids, Siltation	High
Good Spring Creek	AMD, Agriculture	Metals, Nutrients	High
Gingrich Run	Agriculture, Urban Runoff	Suspended Solids, Organic Enrichment, Low D.O.	High
Killinger Creek	Agriculture	Nutrients	High
Little Swatara Creek	Wastewater, Agriculture, Urban Runoff	Organic Enrichment, Low D.O., Nutrients, Siltation,	High
Lorberry Creek	AMD	Metals, Suspended Solids	High
Lower Little Swatara Creek	Agriculture	Nutrients, Siltation	High
Lower Rausch Creek	AMD	Metals	High
Middle Creek	AMD	Metals	High
Panther Creek	AMD	Metals	High
Poplar Creek	AMD	Metals	High
Snitz Creek	Agriculture	Nutrients	High
Spring Creek	Urban Runoff, Agriculture, Municipal, Natural Sources	Suspended Solids, Siltation, Water Flow, Organic Enrichment, Low D.O.	High
Stumps Run	AMD	Suspended Solids, Metals	High
Swatara Creek	Agriculture, AMD, Construction, Urban Runoff,	Organic Enrichment, Low D.O., Metals, pH, Suspended Solids, Priority Organics, Siltation	High
Trout Run	Agriculture	Nutrients, Siltation	High

Source: Section 303(d) List, 1999 (Available from PADEP]).

3. Abandoned Mine Drainage

AMD involves a complex set of chemical reactions; but begins by exposing sulfides to oxygen during the mining process. Sulfides almost invariably occur within bituminous and anthracite coal seams, in rocks and clays surrounding the seams, and within roof shales. Typically in the mineral form pyrite or marcasite (FeS_2), exposure to oxygen oxidizes the pyrite and liberates sulfate ions (SO_4^{2-}), hydrogen ions (H^+), and ferrous iron (Fe^{2+}). The sulfate and hydrogen ions constitute the components of the familiar compound sulfuric acid (H_2SO_4).

Further oxidation of the ferrous iron is often facilitated by iron bacterium such as *Thiobacillus ferrooxidans*, *Metallogenium spp.*, *Thiobacillus thiooxidans*, and *Bacillus ferrooxidans* (Manahan, 1994). The additional oxidation has two consequences. First, the conversion of Fe^{2+} to Fe^{3+} causes the pyrite to further dissolve,

thus perpetuating the cycle. Second, the ferric acid ($Fe(H_2O)_6^{3+}$) remains in solution only at a very low pH (≤ 3). When diluted by receiving waters, the pH rises, $Fe(OH)_3$ precipitates, and the familiar yellow-orange sediment found in many of Pennsylvania waterways is formed.

Photo 4-12: Extensive iron precipitate at the Tracey Airhole discharge in Schuylkill County.

The sediments produced by AMD can cause aesthetic damage by discoloring stream substrates, clog the gills of aquatic organisms, and increase toxic levels of metals. However, the most damaging component of AMD is the production of sulfuric acid, which is acutely toxic to all aquatic organisms (Manahan, 1994).

Research on the effects of AMD within the Swatara Creek watershed has been generally been divided between studies on the effects of AMD within the upper and middle watersheds (Koury, 1998; Skelly and Loy, 1987), and basin-wide water quality studies which evaluate chemistry, biological composition, and aquatic habitat (PADEP, 1998; Traver, 1997).

Investigators agree that there are several major AMD issues affecting water quality in Swatara's basin. The major nonpoint AMD sources are the Lorberry Creek and Good Spring Creek abandoned mine areas. In fact, in a 1987 study, Skelly and Loy estimated that discharges from these regions accounted for 37% of all suspended solids in the watershed. The two major point source AMD discharges, Rowe Tunnel and the Tracey Airhole, are directly associated with Lorberry and Good Spring Creeks. Rowe Tunnel contributes 80% of the pollution to Lorberry Creek while the Tracey Airhole, which drains the Colket and Good Spring #3

Mine Pools, is the greatest single source of AMD in the Good Spring watershed (Koury, 1998; PADER, 1972; Skelly and Loy, 1987).

According to Skelly & Loy (1987) and others (Bednarczyk et al., 1996; Koury, 1998; PADEP, 1998; Traver, 1997) the extreme presence of AMD in the upper watershed creates a longitudinal difference in water quality, which is often manifested in the macroinvertebrate community. Macroinvertebrate sampling generally indicates both low diversity and productivity. Factors responsible for these results include sedimentation from coal fines and iron hydroxide, scouring, and water chemistry. A more detailed discussion on the effects of pollution on Swatara's aquatic life and habitat composition is located in the Aquatic Life and Habitat section of this document.

Koury (1998) conducted one of the more comprehensive studies on the effects of AMD and rehabilitation strategies in the Upper Swatara Creek watershed. Historically, this area has been the center of the most intense resource extraction in the basin. In fact, the 43 mi^2 focus of Koury's study near the town of Ravine, Schuylkill County has been degraded by AMD for over 150 years with over 100 discharges identified from mine openings, culm piles, and surface mines. Nine major mine pools are responsible for the majority of AMD discharges and include: Blackwood, Colket, Good Spring #3, Indian Head, Lincoln, Middle Creek, New Lincoln, Rausch Creek East Franklin, and Westwood. According to Operation Scarlift reports, four of these pools contain a cumulative excess of 1.68 billion gallons of mine-contaminated water (PADER, 1972).

Water quality for the upper Swatara, Good Spring Creek, Middle Creek, Lower Rausch Creek, and Lorberry Creek watersheds indicates that significant decreases in AMD discharges have been achieved through a myriad of reclamation projects (Koury, 1998). Trends in the biological composition also indicate continuous improvement over the past 10 years. However, sample stations at Middle Creek, Swatara Creek, and Lower Rausch Creek still attest to the extreme influence of AMD on the biological community. The following is a brief summary of Koury's findings for each subwatershed. A more detailed discussion of these watersheds can be found in Koury (1998).

Lorberry Creek (3.99 mi^2) - Headwaters originate as a discharge of the abandoned Lincoln Colliery workings at Rowe Tunnel, one of the two primary discharges to Lorberry Creek (Skelly and Loy, 1987). The Shadle Coal Company deep mine is partially reclaimed but still discharges to this basin and is under review by PADEP. Several smaller discharges also exist along Lorberry Creek but the Rowe Tunnel masks these.

Photo 4-13: The Lorberry Junction Wetland Project on Lorberry Creek utilizes man-made wetlands and sedimentation ponds to reduce AMD in the Swatara Creek Watershed

Lower Rausch Creek (4.86 mi²) - Originates from abandoned surface mine pits north of the I-81/S.R. 0209 intersection. Numerous abandoned deep mine discharges exist in this subwatershed including: New Lincoln Tunnel, Rausch Creek Tunnel, East Franklin Discharge, and North and South Orchard Drift. The only treatment along Lower Rausch Creek at the time of Koury's assessment was the Lorberry Junction Treatment Wetland Project, which was completed in 1997 by PADEP.

Good Spring Creek (14.8 mi²) - Headwaters originate from regions of abandoned strip pits with an estimated 2,650 acres of unreclaimed surface and coal reprocessing operations throughout this subwatershed. AMD from the abandoned Good Spring #3 and Colket minepools is the major contaminant in the subwatershed; with the Tracy Airhole discharge, an abandoned airway serving as the main drainage point for Good Spring #3.

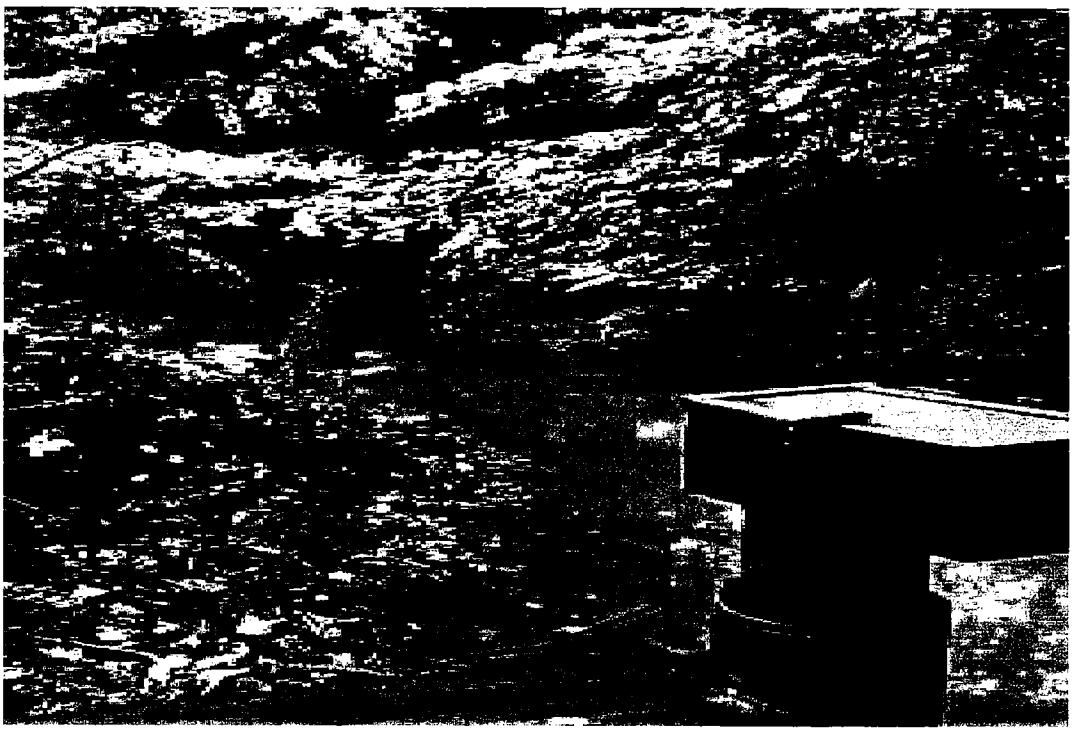


Photo 4-14: Monitoring station at the Tracey Airhole discharge in the Good Spring Creek watershed.

Middle Creek (8.5 mi²) - This subwatershed was identified as containing the leading sources of AMD in Operation Scarlift, 1972 (cited in Koury, 1998). Although significantly impacted by AMD in the past, due to extensive reclamation of abandoned deep and surface mines along Gebhard Run, Middle Creek, Coal Run, and Bailey Run, this area no longer contributes acid load to Swatara Creek.

Upper Swatara Creek (10 mi²) - Originates from abandoned pits with significant sources of aluminum originating from an abandoned drift mine known as Hegins Run. Diversion projects have been undertaken as mitigation for Hegins Run and although the remaining discharges are numerous, they appear to have little effect on Swatara's water quality. The Upper Swatara was also the focus of a 1997 study by PADEP and USGS to monitor the effectiveness of three passive treatment systems utilizing limestone. The results indicated that Anoxic Limestone Drains were the most effective.

4. Aquatic Life and Habitat

Much of the research on Swatara's aquatic biota and habitat focuses on the correlation between point and nonpoint source pollution and its effects on the aquatic ecosystem. Within the upper watershed, AMD was identified as the dominant source of pollution (Bednarczyk et al. 1996; Koury, 1998; Lindsey et al. 1998; PADEP, 1998; Skelly and Loy, 1987). Benthic communities in AMD impacted streams typically exhibit a low relative abundance and species diversity, low to moderate community diversity, and dominance by relatively few taxa. Conversely, streams receiving no AMD influence characteristically display a diversity of species, complex trophic levels, higher relative abundance, and a lack of pronounced dominance by pollution tolerant

Results from Bednarczyk et al. (1996), for several upper watershed tributaries validate the effects of AMD on the aquatic community. As shown, the more heavily AMD impacted tributaries of Gebhard Run, Good Spring Creek, and Lower Rausch Creek were evidenced by either a low pH or elevated sulfate concentrations, while the less impacted tributaries of Black Creek, Upper and Lower Little Swatara Creeks, and Swope Valley Run exhibited a more neutral pH and moderate sulfate concentrations. These findings corresponded with variations in biological composition, which included significant differences in species diversity, relative abundance, and abundances of the pollution intolerant macroinvertebrate families of Ephemeroptera, Plecoptera, and Tricoptera. Manganese and aluminum concentrations were also significantly higher in streams with the lowest taxonomic abundance and as Bednarczyk et al. indicates, the single best predictor of AMD damage to total macroarthropod abundance was sulfate concentration.

A comprehensive study, Traver (1997) investigated the interrelationship of water quality, habitat, and biological condition in the Lower Susquehanna Basin. Nine sample sites in the Swatara Creek watershed, from the headwaters to the mouth, were analyzed (Table 4-6).

Several trends relative to bedrock type and ecoregion are evident from these results and as Traver (1997) points out, restoration efforts should focus on the observed correlation between habitat and biological condition.

Within the northern piedmont ecoregion, levels of ammonia and nutrients near Swatara Creek's mouth (r.m. 2.3) point to the widespread, upstream influence of agriculture and wastewater treatment in the watershed. Despite these impacts however, the biological community was found to be non-impaired and exhibited relatively high species diversity.

Tributaries to the northeast in the limestone and dolomite region of the Ridge and Valley province generally exhibited good aquatic habitat with moderate water quality. When coupled with modest habitat conditions, healthy biological communities were observed. However, as with many other streams in the lower watershed, the influence of agriculture and development was evidenced by an impaired biological condition.

According to Traver (1997), the small shale and slate valley streams within the Ridge and Valley province displayed a strong positive correlation between habitat and biological health. When combined with the poorly buffered nature of streams in this region, the generally poor chemical parameters exert a tremendous influence on the aquatic community. In fact, results from stations on Little Swatara Creek, Quittapahilla Creek, and Swatara Creek (r.m 39.0 and 56.0) all indicated high concentrations of metals and/or nutrients with corresponding impairment to the aquatic community.

Table 4-6

Summary of Water Quality and Biological Assessment of the Swatara Creek Watershed

Sample Site (r.m.)	Physiographic Province	Bedrock	Results
Swatara Cr. (56)	Ridge and Valley	Shale and Slate	• Moderately impaired biological community • High levels of iron, manganese, zinc, nickel, aluminum, sulfate, and ammonia • Supporting habitat conditions
Swatara Cr. (39)	Ridge and Valley	Shale and Slate	• Slight biological impairment, decreased pollution tolerance, increased diversity • Metals remain high but are less than half that at 56.0 • Excellent habitat
Swatara Cr. (21.7)	Ridge and Valley	Shale and Slate	• Supporting habitat • Water quality near the mean for the watershed
Quittapahilla Cr. (0.3)	Ridge and Valley	Shale and Slate	• Moderately impaired biological community, similar to r.m. 56.0 • Excessive dissolved residuals, nitrogen, nitrates, phosphorus, iron, and ions in solution • Habitat is supporting with agriculture as dominant land use
Manada Cr. (0.1)	Ridge and Valley	Shale and Slate	• Slightly impaired biological condition • Supporting habitat • Fair water quality with low levels of iron
L. Swatara (0.6)	Ridge and Valley	Shale and Slate	• Poor water quality with high metals and nutrients • Moderately impaired biological condition • Excellent habitat
Spring Cr. (0.1)	Ridge and Valley	Limestone & Dolomite	• Water quality is at the mean for the watershed • Biological condition is moderately impaired with low diversity • Habitat is excellent
Beaver Cr. (0.6)	Ridge and Valley	Limestone & Dolomite	• Low alkalinity and calcium, high nickel • Slightly impaired biological condition, low diversity and trophic structure • Supporting habitat
Swatara Cr. (2.3)	Northern Piedmont	-	• Nonimpaired biological condition with highest species diversity • Water quality near the mean but with high ammonia and nutrients • Extreme influence of agriculture and industry

Source: Water Quality and Biological Assessment of the Lower Susquehanna Basin (Publication 190) by C.L. Traver, 1997, Harrisburg, Susquehanna River Basin Commission.

Assessments of fish populations in the Swatara Creek watershed have revealed mixed results over the past 10 years. Historically, Swatara's main stem from the proposed dam to the confluence of Lower Little Swatara was classified as a CWF by PADEP. This classification defines the fishery as one that is to be maintained for the propagation of fish species, including the family Salmonidae, indigenous to a cold water habitat. Although studies conducted by PFBC in 1994 and 1996, and by PADEP in 1995 (PADEP, 1998) identified a total of 29 different fish species, all of these species were typical of a warm water habitat. Subsequent to this study, PADEP recommended that Swatara's designation be changed to WWF between the proposed dam and Lower Little Swatara's confluence. At the time of this report Swatara remained a CWF; however, in April, 2000 a petition for reclassification as a WWF was made by PADEP. Table 4-7 lists species composition results from PFBC and PADEP sampling efforts conducted between 1987 and 1996.

Table 4-7
Fish Species Composition for the
Swatara Creek Watershed

Common Name	Scientific Name
Largemouth bass	*Micropterus salmoides*
Smallmouth bass	*Micropterus dolomieui*
Bluegill	*Lepomis macrochirus*
Pumpkinseed	*Lepomis gibbosus*
Green sunfish	*Lepomis cyanellus*
Rock bass	*Ambloplites rupestris*
Brown trout	*Salmo trutta*
Brook trout	*Salvelinus fontinalis*
Rainbow trout	*Salmo gairdneri*
Redbreast sunfish	*Lepomis auritus*
Chain pickerel	*Esox niger*
Golden shiner	*Notemigonus crysoleucas*
Satinfin shiner	*Cyprinella analostana*
Cutlips minnow	*Exoglossum maxillingua*
Bluntnose minnow	*Pimephales notatus*
River chub	*Nocomis micropogon*
Common shiner	*Notropis cornutus*
Spottail shiner	*Notropis hudsonius*
Swallowtail shiner	*Notropis procne*
Rosyface shiner	*Notropis rubellus*
Blacknose dace	*Rhinichthys atralatus*
Longnose dace	*Rhinichthys cataractae*
Creek chub	*Semotilis atromaculatus*
Fallfish	*Semotilis corporalis*
White sucker	*Catostomus commersoni*
Northern hog sucker	*Hypentelium nigricans*
Shorthead redhorse	*Moxostoma macrolepidotum*
Yellow bullhead	*Ameiurus natalis*
Marginated madtom	*Noturus insignis*
Sculpin	*Cottus spp.*
Tessellated darter	*Etheostoma olmstedi*
Yellow perch	*Perca flavescens*
Shield darter	*Percina peltata*
Common carp	*Cyprinus carpio*
Black crappie	*Pomoxis nigromaculatus*
Muskellunge	*Esox masquinongy*

Source: Swatara Creek, Lebanon and Schuylkill Counties: Aquatic Life Use Attainability Water Quality Standards Review by PADEP, 1998, Harrisburg: Author; [Fish Occurrence Data], Unpublished data by Pennsylvania Fish and Boat Commission, 1987.

F. Water Supply

1. Effluent Discharge

Section 402 of the Clean Water Act of 1972 establishes a national permit program, the National Pollution Discharge Elimination System (NPDES), that may be administered by the EPA or by individual states as delegated by the EPA. Essentially, the NPDES permit program translates general effluent limitations into specific obligations of a discharger. Thus, "...the discharge of any pollutant by any person shall be unlawful" except as specifically permitted by the regulatory agency (Percival, Miller, Schroeder, & Leape, 1996).

Effluent dischargers in the Swatara Creek watershed were identified through a review of PADEP NPDES databases (PADEP, 1999a). 79 active permits were identified. Although the majority of these permits are owned by industrial and municipal/sewage treatment facilities, several were issued to private individuals and retail businesses (Appendix D).

2. Water Use

83 public water facilities were identified within the Swatara Creek watershed. They supply a population of over 547,000 (United States Geological Survey [USGS], 1999). According to USGS (1999), surface water and groundwater withdrawal within the watershed totaled 223 million gallons per day (MGD) in 1990. Table 4-8 lists these water withdrawals by use

Table 4-8
Water Use within the Lower Susquehanna - Swatara Creek Watershed

Type	Groundwater (Mgal/d)	Surface Water (Mgal/d)
Public	5.66	56.96
Commercial	2.49	1.25
Industrial	22.58	34.1
Mining	39.2	1.64
Livestock	3.62	0.54
Irrigation	0.37	1.07
Wastewater[1]	0	54.67

[1] represents wastewater return

Source: 1990 Water Use for Lower Susquehanna-Swatara [Online], by United States Geological Survey, September, 1999, Available: http://www.usgs.gov.

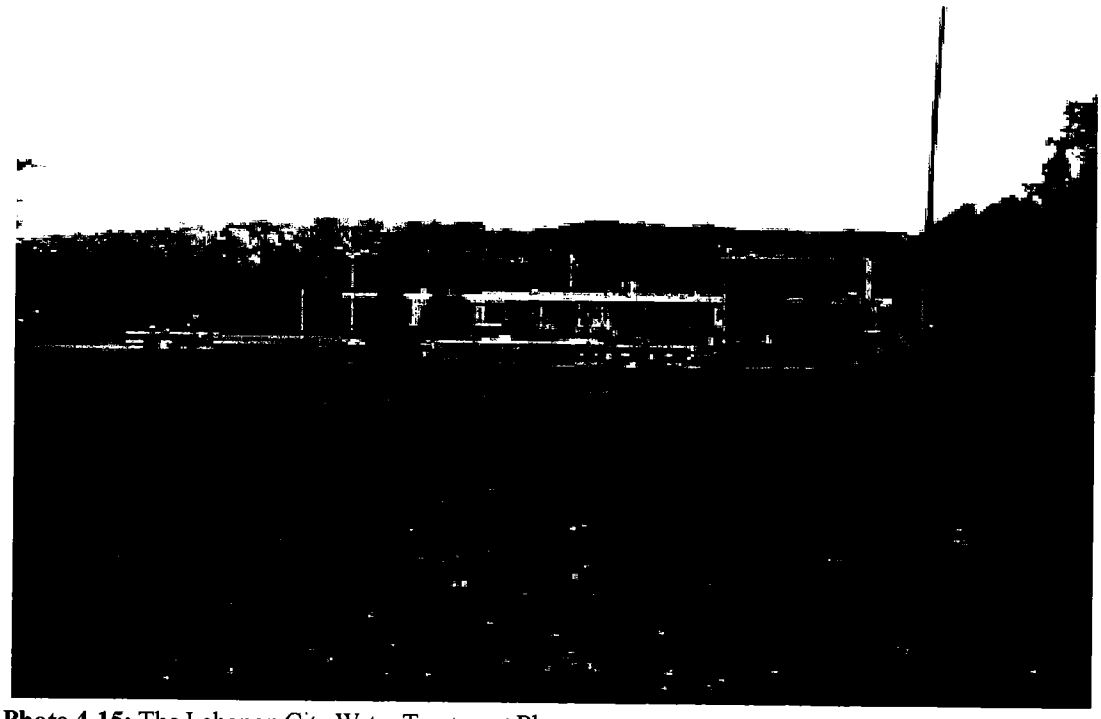


Photo 4-15: The Lebanon City Water Treatment Plant.

As indicated in Table 4-8 the majority of consumptive water use was by the public sector. These figures translate to a per capita usage of 176.51 gallons per day. Although this figure may appear high, the public sector accounts for only 29% of the total surface water use. This is typical of most developed areas, were the largest water withdrawals are generally by industries and electric generation facilities. For example, non-public water withdrawal (industrial and fossil fuel thermoelectric generation) from the Monongahela River near Pittsburgh accounts for approximately 9 times as much surface water withdrawal from the river as public suppliers (Mackin Engineering, 1998). Also of significance is the number of active mining operations, which account for 53% of groundwater usage in the watershed.

Figure 4-1

SWATARA CREEK

River Conservation Plan

prepared for the

Swatara Creek Watershed Association

September, 2000

Named Tributaries

- Swatara Creek Watershed
- Watershed Sub-Basin
- River / Stream

Other Features

- Municipal Boundary
- County Boundary
- Interstate Highway

4 3 2 1 0 2 4 6 8

Scale in Miles

Scale = 1 : 253,440

1 Inch = 4 Miles (approx.)

SOURCES:

Pennsylvania Department of Environmental Protection
Pennsylvania Department of Transportation
Susquehanna River Basin Commission

Mackin

Figure 4-1 -- Named utaries

Figure 4-2

SWATARA CREEK

River Conservation Plan

prepared for the

Swatara Creek Watershed Association

September, 2000

Surface Water Sources and Discharge Points

- Surface Water Source
- Water Discharge Point
- Swatara Creek Watershed
- River / Stream

Other Features

- Municipal Boundary
- County Boundary
- Interstate Highway

4 3 2 1 0 2 4 6 8

Scale in Miles

Scale = 1 : 253,440

1 Inch = 4 Miles (approx.)

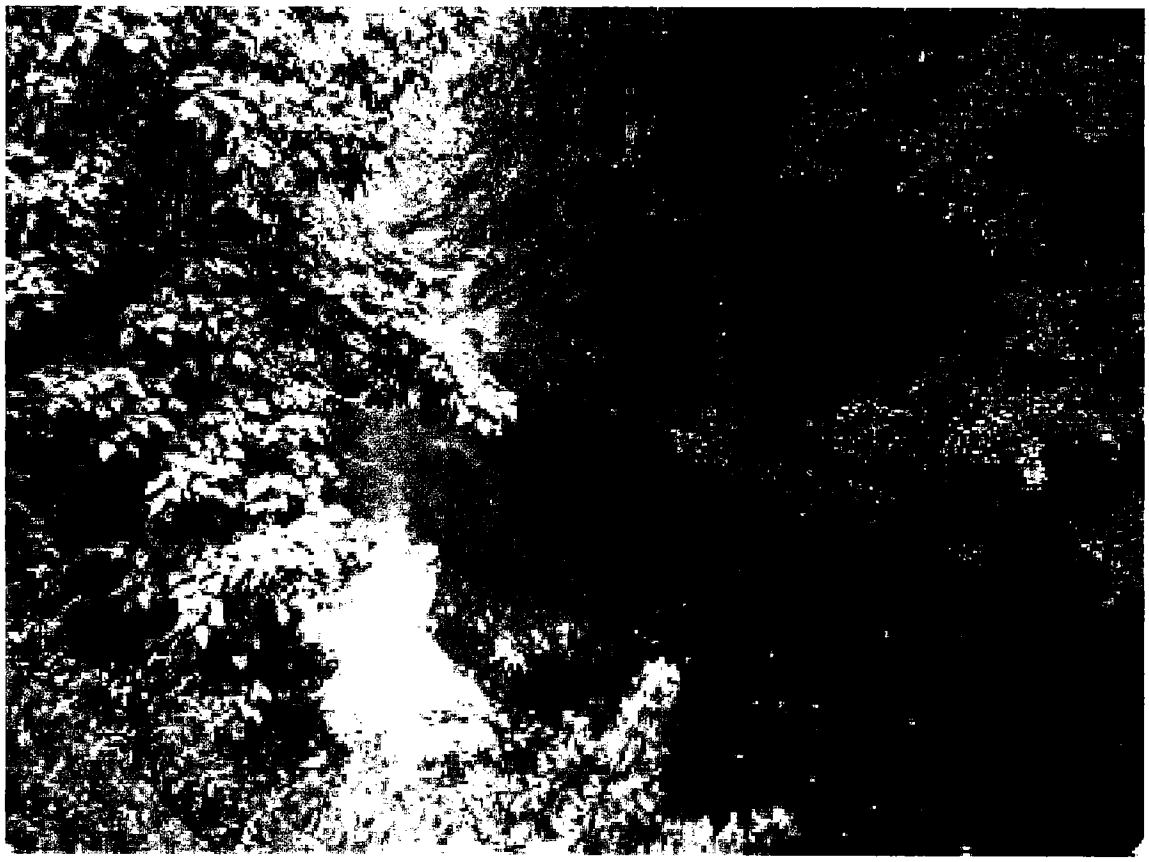
SOURCES:

Pennsylvania Department of Environmental Protection
Pennsylvania Department of Transportation
Susquehanna River Basin Commission

Mackin

Figure 4-2 -- Surface Water Sources & Discharge Points

CHAPTER 5:



BIOLOGICAL RESOURCES

5. BIOLOGICAL RESOURCES

A. Vegetation

1. Native Vegetation

The Swatara Creek watershed has managed to survive the intense commercial, industrial, and transportation development that the eastern portion of Pennsylvania has succumbed to. The majority of the watershed has historically been and still is used primarily for agricultural purposes (Figure 2-1). Indications of the past still remain along the hillsides, in the form of well-preserved farm complexes built by the German and Scots-Irish settlers of the 18th century, who set out to clear the land for farming. Prior to this time, this area of Pennsylvania was located within the original Oak-Chestnut Forest Region (Braun, 1950). Along with the clearing of these lands by settlers, this forest region was virtually eliminated during the destruction of the American chestnut *(Castanea dentata)* by chestnut blight fungus (*Endothia parasitica*) in the early 1900's. Although, some populations of American chestnut have been noted in Lebanon County.

Currently, the old-growth forests in this area are non-existent and forestland is confined to a few extensive, contiguous areas within the more mountainous terrain typical of the northern portion of the watershed. The existing forest is located within the Appalachian Oak Forest Region or Mixed Oak Forest Region (Bailey, 1980) and is dominated by numerous oak species (*Quercus spp.*), along with red maple (*Acer rubrum*), beech (*Fagus grandifolia*), and tulip poplar (*Liriodendron tulipfera*). This forest type occurs on the slopes and tops of mountain ridges as well as in some of the narrower valleys of Dauphin County. Most understory areas are composed of blueberries (*Vaccinium sp.*), huckleberries (*Gaylussacia spp.*), and mountain laurel (*Kalmia latifolia*).

Some areas that have remained undisturbed, particularly those located in the southern portion of Dauphin County, contain native vegetation, including native grasses such as little blue stem (*Schizachyrium scoparium*), big blue stem (*Andropogon spp.*) and Indian grass (*Sorghastrum nutans*), and small trees such as sassafras (*Sassafras albidum*) and red cedar (*Juniperus virginiana*) (Nature Conservancy, 1999). Other native small trees, such as red bud (*Cercis canadensis*) have also been noted within the watershed.

2. Invasive Vegetation

Any plant growing where it is not wanted and having objectionable characteristics, such as aggressive growth or noxious properties that cause allergic reactions or poisoning are considered as invasive vegetation (Haber, 1997). The introduction of these invasive species dates back to the earliest arrivals of explorers and settlers to the region. Their ships were carriers of a wide variety of seeds and invasive animals. Seeds were present in hay bales, natural packing materials, and in food products. Even some of the seeds brought for cooking ended up being invasive weed species. Once established, clearing of these lands for logging and agricultural purposes aided in the spread of these invasive species.

When invasive species become established in forestlands, prairies, and wetlands, they tend to suffocate out the native vegetation. This then leads to the reduction of the biological diversity of the area, decrease in wildlife habitat of the area, and in some situations, the degradation of water quality and reduction of the recreational value of an area. A good example of this situation is the introduction of the chestnut blight fungus (*Endothia parasitica*) that so greatly influenced the health and composition of the forests in the watershed.

Photo 5-1: **Purple loosestrife** *(Lythrum salicaria)*

There is a long list of plants considered invasive within the United States and the Swatara Creek watershed including the Japanese honeysuckle (*Lonicera japonica*), tree-of-heaven (*Ailanthus altissma*), garlic mustard (*Alliaria officinalis*), multiflora rose (*Rosa multiflora*), tall reed (*Phalaris arundicacea*), purple loosestrife (*Lythrum salicaria*), kudzu vine (*Pueraria lobata*), mile-a-minute weed (*Polygonum perfoliatum*), and Japanese knotweed (*Polygonum cuspidatum*). Invasive floating or submerged aquatic vegetation, such as pondweed, (*Potamogeton spp.*) has also become the dominant plant species in some areas of the watershed.

The problem associated with these species is controlling the invasion. This is related to the biology of the species, especially its propagative characteristics. Species that reproduce both sexually by seed and vegetatively by adventitious roots require the traditional mechanical means of controlling such as hand pulling, tilling, cutting, and mowing. Special care needs to be taken with these measures, as there has to be great care in the timing of pulling. This usually works best prior to seed production. It is also important to pull the whole plant including all roots. This can be a very labor-intensive process with large well-established populations. Tilling creates some of the same situations but also ensues the problem of the soil seed bank. Sometimes by tilling the soil, the seeds can be brought to the surface and germinate.

Animals can also be considered as invasive species. In recent years, two invasive mussels, the zebra mussel (*Dreissena polymorpha*) and the Asiatic clam (*Corbicula fluminea*), have created numerous problems in Pennsylvania waterways. These mussels have been introduced through the ballast of ships and have quickly spread. Neither of these species has become established within the watershed; although, the zebra mussel has been identified in the Susquehanna River Drainage. Being rapid reproducers, these animals have the potential to clog water intake pipes and reduce nutrient levels in water bodies that native species need to survive. Suggested methods of control for these species include screening off water pipes and releasing small amounts of chlorine or bromine to kill juvenile individuals.

Chemical means of control bring their own concerns with polluting waterways, killing other desired species, and the potential harm to the user. Biological controls can be used to control the main mass of the population. A biological control works by using the plant's natural enemies against it. Recently, the loosestrife beetle has been released within the Hershey property to try to control purple loosestrife.

Therefore, it has been suggested that the best solution for the control of invasive species is an integrated pest management strategy. This includes a combination of several methods including mechanical, chemical, and

biological controls. Mechanical and chemical efforts should be focused around the edge of the population to prevent further spreading but thorough and extensive care should be taken with these methods.

B. Wildlife

1. Terrestrial

Related to the vegetation of the area, wildlife species present within the watershed are common for the habitats of the area. Oak, maple, and beech all provide food sources for black bears, beavers, foxes, raccoons, squirrels, chipmunks, mice, and white-tailed deer (Martin, Zim, and Nelson, 1951). Numerous birds, both game and non-game species, also utilize these resources. Table 5-1 summarizes wildlife species located within the watershed. A listing of avian species located within the watershed can be located in Appendix F.

Although not conducted directly within the Swatara Creek watershed, the Forest Bioblitz '99 was organized adjacent to the northwest portion of the watershed in a 10 square mile area of State Game Lands 211 in the Stony Creek watershed. A group of individuals including agency personnel recorded 1,250 species of plants and animals within this area. It was estimated that 414 plant species, 146 beetle species, 106 moth species, 90 bird species, 50 moss and liverwort species, and 36 lichen species were identified. Counts for mammals were too large to estimate but did include the sighting of a black bear (*Ursus americanus*) and a pygmy shrew (*Sorex hoyi thompsoni*).

2. Aquatic

Further discussions of fauna and assessments of fish and macroinvertebrate species are presented in the *Water Resources* section of this report. Recently, a new cooperative trout nursery was started within the watershed in Pine Grove Township, Schuylkill County. This was a joint effort by sportsmen's clubs, businesses, and individuals to provide fish for stocking Swatara Creek. Two thousand brook trout (*Salvelinus fontinalis*), 1,300 rainbow trout (*Salmo gairdneri*), and 100 golden rainbow trout (*Salmo gairdneri sp.*) fingerlings were initially released in the hatchery. It is estimated that by stocking time next year these trout should grow to 13 to 14 inches and weigh over a pound. There are also cooperative nurseries on Indiantown Run and Bachman Run in Lebanon County and on Spring Creek in Derry Township. The nursery located on Indiantowm Run raises 4,000 brook trout, 2,000 rainbow trout, and 2,000 brown trout. The facility on Bachman Run raises 4,000 brook trout, 1,000 rainbow trout, and 400 brown trout (*Salmo trutta*) every year. This hatchery also provides 400 brook trout for a children's fishing derby in Derry Township, Dauphin County. The nursery on Spring Creek raises 5,500 brook trout and 500 brown trout for release. All of these fish are released into waters open to the public for fishing.

TABLE 5-1
PARTIAL LIST OF WILDLIFE SPECIES LOCATED WITHIN THE SWATARA CREEK WATERSHED

Species Scientific Name	Species Common Name	Species Scientific Name	Species Common Name
Bufo americanus	American Toad	*Desmognathus fuscus*	Northern Dusky Salamander
Castor canadensis	Beaver	*Rana pipiens*	Northern Leopard Frog
Eptesicus fuscus	Big Brown Bat	*Storeria occipitomaculata*	Northern Red-Bellied Snake
Ursus americanus	Black Bear	*Pseudotriton ruber*	Northern Red Salamander
Elaphe obsoleta	Black Rat Snake	*Hyla crucifer*	Northern Spring Peeper
Felis rufus	Bobcat	*Gyrinophilus porphyriticus*	Northern Spring Salamander
Clemmys muhlenbergi	Bog Turtle	*Eurycea bislineata*	Northern Two-Lined Salamander
Rana catesbeiana	Bullfrog	*Nerodia sipedon*	Northern Water Snake
Thamnophis sirtalis	Common Garter Snake	*Rattus norvegicus*	Norway Rat
Canis latrans	Coyote	*Chryemys picta*	Painted Turtle
Peromyscus maniculatus	Deer Mouse	*Ranan sylvatica*	Pickerel Frog
Terrapene carolina	Eastern Box Turtle	*Erethizon dorsatum*	Porcupine
Tamias striatus	Eastern Chipmunk	*Regina septemvittata*	Queen Snake
Sylvilagus floridanus	Eastern Cottontail	*Procyon lotor*	Raccoon
Lampropeltis triangulum	Eastern Milk Snake	*Plethodon cinereus*	Red-Backed Salamander
Scalopus aquaticus	Eastern Mole	*Notophthalumus viridescens ciridescens*	Red-Spotted Newt
Notophthalmus viridescens	Eastern Newt	*Lasuirus borealis*	Red Bat
Neotoma floridana	Eastern Woodrat	*Vulpes vulpes*	Red Fox
Hemidactyium scutatum	Four-Toed Salamander	*Diadophis punctatus*	Ring-Neck Snake
Urocyon cinereoargenteus	Gray Fox	*Lautra canadensis*	River Otter
Scuirus carolinensis	Gray Squirrel	*Bonasa umbellus*	Ruffed Grouse
Ranan clamitans	Green Frog	*Blarina brevicauda*	Short-Tailed Shrew
Lasiurus cinereus	Hoary Bat	*Plethodon glutuinosus*	Slimy Salamander
Mus muscukus	House Mouse	*Opheodrys vernalis*	Smooth Green Snake
Ambystoma jeffersonianum	Jefferson Salamander	*Lepus americanus*	Snowshoe Hare
Myotis kennii	Keen's Myotis	*Ambystoma maculatum*	Spotted Salamander
Cryptotis parva	Least Shrew	*Clemmys guttata*	Spotted Turtle
Myotis lucifugus	Little Brown Myotis	*Pseudacris crucifer*	Spring Peeper
Eurycea longicauda	Longtail Salamander	*Condylura cristata*	Star-Nosed Mole
Ambystoma opacum	Marbled Salamander	*Sternotherus odoratus*	Stinkpot
Sorex fontinalis	Maryland Shrew	*Mephitis mephitis*	Striped Skunk
Sorex cinereus	Masked Shrew	*Didelphis virginiana*	Virginia Opossum
Zapus hudsonius	Meadow Jumping Mouse	*Peromyscus leucopus*	White-Footed Mouse
Mustela vison	Mink	*Odocoileus viginiana*	White-Tailed Deer
Desmognathus ochrophaeus	Mountain Dusky Salamander	*Rana sykvatica*	Wood Frog
Ondatra zibethicus	Muskrat	*Marmota monax*	Woodchuck
Acris crepitans crepitans	Northern Cricket Frog	*Napaeozapus insignis*	Woodland Jumping Mouse

Source: Environmental Documentation for the Swatara State Park Recreational Improvements Project, 1998

The following waters are stocked with trout by PFBC and/or the local cooperative nerseries: Mill Creek and Little Swatara Creek in Berks County; Manada Creek in Dauphin County; Trout Run, Quittapahilla Creek, Bachman Run, and Snitz Creek in Lebanon County; and Upper Little and Lower Little Swatara Creeks in Schuylkill County. There was also verified trout reproduction in Mill Creek in Schuykill County, Indiantown Run in Lebanon County, and Manada Creek in Dauphin County. In a 1999 survey of Trout Run (in Lebanon County), conducted by the PFBC, an American Eel (*Anguilla rostrata*) was collected from the stream. The last survey of this stream, prior to 1999 was conducted 22 years ago and identified no American Eels. Table 5-2 summarizes the macroinvertebrates historically collected within the Swatara Creek watershed.

Table 5-2
Macroinvertebrates Identified Within The Swatara Creek Watershed

ORDER	FAMILY	GENUS	ORDER	FAMILY	GENUS
Amphipoda	Gammaridae	*Gammarus*		Heptageniidae	*Heptagenia*
Coleoptera	Elmidae	*Macronychus*			*Stenonema*
		Optioservus		Isonychiidae	*Isonychia*
		Ordobrevia		Polymitarcidae	*Ephoron*
		Stenelmis		Tricorythidae	*Tricorythodes*
	Psephenidae	*Ectopria*	Haplotaxida	Lumbriculidae	*Rhynchelmis*
		Psephenus	Isopoda	Asellidae	*Caecidotea*
Diptera	Chironomidae		Megaloptera	Corydalidae	*Corydalus*
	Empididae	*Hemerodromia*	Pelecypoda	Sphaeriidae	*Psidium*
	Simuliidae		Plectoptera	Perlidae	*Acroneuria*
	Tipulidae	*Antocha*			*Neoperla*
		Tipula		Pteronarcyidae	*Pteronarcys*
Ephemeroptera	Baetidae	*Baetis*	Rhynchobdellida	Glossiphoniidae	*Batracobdella*
		Centroptilum			*Ceratopsyche*
		Pseudocloeon			*Cheumatopsyche*
	Caenidae	*Brachycercus*			*Hydropsyche*
	Ephemeridae	*Ephemera*			*Macrostemum*
				Philopotamidae	*Chimarra*

Source: Water Quality and Biological Assessment of the Lower Susquehanna Basin (Publication 190) by C.L. Traver, 1997, Harrisburg, Susquehanna River Basin Commission.

C. Species of Special Concern

Species of Special Concern have become an ever-increasing topic of discussion in the 1990's. The authority for all of Pennsylvania's biological resources lies with four resource agencies. The Pennsylvania Department of Conservation and Natural Resources (DCNR) holds jurisdiction over the management of the plants and general information for the state, while the Pennsylvania Fish and Boat Commission (PFBC) is responsible for the management of the fish, reptiles, amphibians, and aquatic organisms within the state. Management of the state's wild birds and mammals is the responsibility of the Pennsylvania Game Commission (PGC). The U.S. Fish and Wildlife Service (USFWS) is responsible for federally listed, proposed and candidate species under the Federal Endangered Species Act. Responses received from these agencies in regards to Species of Concern in the Swatara Creek watershed are located in Appendix F.

The Pennsylvania Natural Diversity Inventory (PNDI) is a site-specific information system to identify and describe Pennsylvania's rarest and most significant ecological features. DCNR, the Nature Conservancy, and Western Pennsylvania Conservancy maintain PNDI. The system includes data on of plant and animal species of special concern, exemplary natural communities, and unique geologic resources. DCNR stated that there were 52 species of special concern reported to occur in the Swatara Creek watershed (24 plant species, 10 invertebrate species, 5 bird species, 5 insect species, 3 mammal species, 3 geologic features, and 2 species of reptiles).

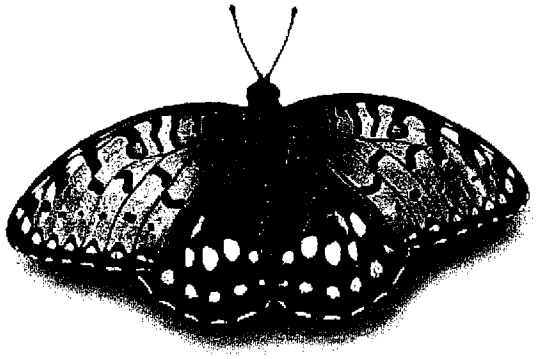


Photo 5-2: **Regal fritillary butterfly (*Speyeria idalia*)**

The response received from USFWS indicated the following federally listed species are or maybe located within the Swatara Creek watershed: the bog turtle *(Clemmys muhlenbergii)* and the regal fritillary butterfly (*Speyeria idalia*). According to this response, the bog turtle, a federally threatened species, has been identified in the four counties that make up the watershed, but not specifically in the Swatara Creek watershed. This species, has had a decrease in its population by approximately 50% over the last 15-20 years. It is suggested that this decline is due to the loss of the turtle's wetland habitats to man made disturbances, fragmentation of existing habitat, and invasive native and exotic plant species. Bog turtles have also been known to be collected for illegal pet trade.

The regal fritillary butterfly is known to occur within the watershed area at Fort Indiantown Gap Military Reservation in portions of Dauphin and Lebanon County. According to studies conducted in the early 1990's by the Nature Conservancy, most of the species' habitat appears to be located between Blue and Second Mountains, but some areas were also located south of Blue Mountain near Memorial Lake State Park. The population at Fort Indiantown Gap Military Reserve is considered the only remaining viable population of this species in the eastern United States, giving this area special ecological significance.

In August 1999, the Pennsylvania National Guard, responsible for administering and care of Fort Indiantown Gap, signed a Memorandum of Understanding with The Nature Conservancy (TNC) to set aside 158 acres of property to protect the species of butterfly. The NTC will maintain and manage the area for the regal

fritillary butterfly. More recently in October 1999, this group and others have begun to investigate expanding the butterflies' habitat, possibly to areas just over the Blue Mountain, near Memorial Lake State Park.

The Pennsylvania Game Commission (PGC) indicated the following species were historically located and may still be present within the watershed.

TABLE 5-3
PGC THREATENED OR ENDANGERED SPECIES

Scientific Name	Common Name	Status	Habitat
Bartramia longicauda	Upland Sandpiper	PT	Fallow fields, pastures, grassy areas
Haliaeetus leucocephalus	Bald Eagle	PE	Riparian (Lakes & Rivers)
Neotoma floridana	Eastern Woodrat	PT	Mountainsides, valley sides, boulder piles
Casmerodius albus egretta	Great Egret	PT	Along streams, rivers, ponds, lakes, marshes, mudflats

The PFBC indicated that the following species were located within the counties of the watershed.

TABLE 5-4
PFBC THREATENED OR ENDANGERED SPECIES

Scientific Name	Common Name	Status	Taxanomic Group
Caecidotea pricei	Price's cave isopod	Rare	Crustacean
Clemmys muhlenbergii	Bog turtle	Endangered	Turtle
Crotalus horridus	Timber Rattlesnake	Candidate	Snake
Lampsilis cariosa	Yellow lampmussel	Rare	Freshwater Mussel
Progomphus obscurus	Obscure clubtail	Rare	Aquatic Insect
Pyganodon cataracta	Eastern Floater	Rare	Freshwater Mussel
Stygobromus allegheniesis	Allegheny Cave Amphipod	Rare	Crustacean
Tachopteryx thoreyi	Thorey's grayback dragonfly	Rare	Aquatic Insect

D. Important Habitats

1. Important Bird Habitats

As defined by the National Audubon Society, an Important Bird Area (IBA) is a site of special significance to breeding or non-breeding birds that, on some basis, can be distinguished from the surrounding area. An IBA should exist as an actual or potential protected area, or it should have the potential to be managed in some way

for the benefit of birds and other wildlife. A site must meet one of the following five criteria to qualify as an IBA:

1) Sites where birds concentrate in significant numbers when breeding, in winter, or during migration
2) Sites for endangered or threatened species
3) Sites for Pennsylvania species of concern
4) Sites containing representative, rare or unique habitats, with characteristic birds
5) Sites for long-term avian research or monitoring.

Within the state, 73 sites have been designated as IBA, with the following 3 areas being located within the Swatara Creek watershed: St. Anthony's wilderness - SGL 211, Hershey special habitat, and Second Mt. Corridor - SGL 211 (Figure 5-1).

St. Anthony's wilderness - SGL 211 is located in Dauphin County and has been recognized within Pennsylvania, as having an exceptional concentration and/or diversity of birdlife, was a site for Pennsylvania species of concern, and was a site with an exceptional representative of a characteristic natural or near-natural habitat within its physiographic province. This site was listed as containing Northern Goshawk (*Accipter gentilis*) and Whip-Poor-Wills (*Caprimulgus vociferus*).

The Hershey special habitat is also located in Dauphin County. This site was a site for Pennsylvania species of special concern and the site contains a habitat type that is rare, threatened, or unusual within the state or region. It was stated to provide for the wintering of the Long Eared Owl (*Asio otus*). This site also shows up as a "Bird Sanctuary" on local mapping.

The Second Mt. Corridor - SGL 211 is located within Lebanon County. This site is a "bottleneck" for at least 10,000 raptors during fall migration and was also a site for long-term avian research or monitoring. Sightings of sharp-shinned hawks (*Accipiter striatus*) and red-tail hawks (*Buteo jamaicensi*) are common. Other species including the Golden Eagle *(Aquila chrysaetos)* have also been recorded.

2. Riparian Buffers

A riparian forest buffer is defined as an area of trees, usually accompanied by a scrub/shrub component and other vegetation that is adjacent to a body of water (Siesholtz, 1997). This buffer maintains the integrity of the stream channels and shorelines; reduces the impact of upland sources of pollution by trapping, filtering, and converting sediments, nutrients, and other chemicals; and supplies food, cover and thermal protection to fish and wildlife. Riparian buffers are extremely beneficial in river conservation. These buffers once protected most rivers and streams in North America; but due to deforestation and development, most of these buffers are gone. The removal of riparian buffers results in adverse effects on water quality, wildlife and aquatic habitat, stream bank stabilization, and aesthetics of the waterway.

Related to the physiographic provinces, land use practices, and water quality trends, it was determined that there appear to be more riparian buffers located in the northern portion of the watershed where forest land, public lands, and less agricultural runoff occurs are more prevalent. As 57 percent of the Swatara Creek study area is agricultural land, these areas tend to have no riparian buffers or minimal riparian buffers.

3. Farm Game & Forest Game Programs

The PGC offers two related programs, the cooperative Farm Game program and the Forest Game Co-op, both are designed to increase recreation opportunities for hunters while promoting management of the state's wildlife resources. A table indicating the state game lands, state forests lands, and state parks within the watershed can be located in the *Cultural Resources* section of this report.

The cooperative Farm Game program represents a statewide network of private landowners who permit the use of their lands for public hunting. To enhance this use, the PGC may provide landowners with seedlings for creating or augmenting wildlife habitat, informational and directional signs, law enforcement patrols, technical assistance from the Commission's natural resource specialists, wildlife seed mixtures, and border cuttings around agricultural fields to provide edge and transitional habitat. The Forest Game Co-op is comprised of forest, coal and gas companies, water authorities, and private individuals. To qualify for this program, a minimum of 1000 acres is required. In return for permitting public access to their properties, cooperators receive the same incentives as participants in the Farm Game program.

The agricultural land use prevalent throughout much of the Swatara Creek watershed makes these programs attractive mechanisms for improving both terrestrial habitats and recreational opportunities. As indicated on Figure 5-1, several hundred acres of Farm Game and Forest Game Co-op lands are concentrated along the rural northern perimeter of the watershed.

4. County Natural Heritage Inventories

County Natural Heritage Inventories typically identify and map the most significant natural areas of the study county. These inventories are lists of existing plant and animal species and natural communities that are unique or uncommon to the county. The inventory holds no legal authority or protection, it's intent is to be used as a planning tool for municipal decision-making, developers, utility companies, and government agencies. Natural Heritage Inventories have been completed on Berks and Dauphin Counties. Lebanon and Schuylkill Counties have not undertaken this type of study.

a) Berks County

The Nature Conservancy completed the Berks County Natural Areas Inventory in 1991. An update to this report was conducted in 1999. According to these reports, Berks County contains 1 natural area of statewide significance and 3 areas of local significance (Figure 5-1).

- Blue Mountain is the only identified natural area within the watershed of statewide significance. This mountain is the boundary between the Appalachian Mountain and Great Valley sections of the Valley and Ridge province. This area represents the largest, continuous tract of forest within Berks County and provides important habitats for numerous animals including some threatened or endangered species and a migration corridor for hawks. This area is also the headwaters for many of the creeks in the area including Little Swatara Creek. State Game Lands and State Forest land provide numerous hunting and fishing opportunities and comprise significant portion of this area and the Appalachian Trail meanders along the

ridge top. For these reasons, Blue Mountain has been designated by the Nature Conservancy as a priority one critical area to be maintained in the state.

The three areas identified for local significance include the Little Swatara Floodplain Forest, the Appalachian Trail, and the Boulder fields.

- The Little Swatara Floodplain Forest is located in Bethel and Tulpehocken Townships and contains a diverse assembly of plants and birds. It has been determined that a mixture of tree species including slippery elm, red maple, white oak, and beech have been located in the area. The herbaceous layer contains wood nettle, spotted touch-me-not, and numerous spring blooming species. A significant number of wetland species have been documented along the creek and floodplain. A number of birds also use the forest area.
- The Appalachian Trail, as mentioned above, runs along the ridge top of Blue Mountain and is an important recreational resource. The trail is mostly protected but some areas are in need of permanent restrictions on development and land use. For this reason, the trail has been ranked high in terms of local significance and protection. Further information regarding this trail is located in the *Cultural Resources* section of this report.
- The Boulder Fields are located in Bethel Township and are of local significance for geologic reasons. They also have historically provided habitat for the state threatened eastern woodrat (*Neotoma floridanus magister*).

b) Dauphin County

The Nature Conservancy completed the Natural Area Inventory for Dauphin County in conjunction with Cumberland and Perry Counties in 1999. There are 9 natural areas of statewide significance and 1 site of local significance located within the Swatara Creek watershed (Figure 5-1).

- Fort Indiantown Gap is not only a site of statewide significance but is also a top priority site for protection. This site is located in Dauphin and Lebanon counties and currently is being used as a military reservation. The area is contained in a valley between Blue and Second Mountains. Populations of two rare animal species inhabit portions of this area in Dauphin County, one of which was previously discussed.
- The Manada Creek Woods are also located in East Hanover Township and portions of these woods extend into the Fort Indiantown Gap site. This area is an upland forest growing red oaks, white oaks, red maples, black gums, hemlocks, witch hazel, serviceberry, highbush blueberry, and mountain laurel. This area also contains a population of a Pennsylvania threatened tree species.
- The Hummelstown Limestone Bluffs is an area of limestone bluffs that supports a population of Pennsylvania threatened plant species that has been known in the area for 60 years. The area surrounding contains diverse flora under sugar maple and hackberry tree canopy.
- Indian Echo Caverns is located in Derry Township and is a commercially operated cave. A globally rare animal has been noted in the cave and is reproducing successfully.
- Swatara Creek at Fiddler's Elbow is an approximately 1 mile section of the creek that includes numerous riffle/run areas. A vulnerable population of mussels was located here in 1997. Threats to these species include thermal and chemical pollution, impoundments, and sedimentation.
- The Iron Run Dam Site is located in Londonderry Township. This site contains a population of a Pennsylvania

rare plant. This species requires disturbed habitats and grows on the shoreline of an artificial lake in the Susan Cole Natural Area. This lake is used as a water source for Middletown Borough.

- The Roundtop Thicket is a site located in Londonderry Township in the Iron Run watershed. The vegetation of the areas consists of a variety of native and exotic herbaceous and woody species. It also supports a small population of a species of special concern plant.
- The Swatara Creek Woods is a forested site along the creek that provides a habitat that supports a diversity of species including two Pennsylvania threatened plant species.
- Swatara Creek at Royalton is located in the lower reaches of the creek just before the creek's confluence with the Susquehanna River. It contains two species of special concern. It also contains populations of Asiatic clams that, as described above, are an invasive species and potentially could damage the ecosystem of the creek.
- The Fiddler's Elbow Bluff is the only locally significant site in the Dauphin County portion of the watershed located near the Swatara Creek Woods along the creek. This is an area of limestone cliffs and ledges containing diverse native flora including round-leaved hare's bells, bloodroot, hepatica, ragwort, and columbine.

Figure 5-1

SWATARA CREEK

River Conservation Plan

prepared for the

Swatara Creek Watershed Association

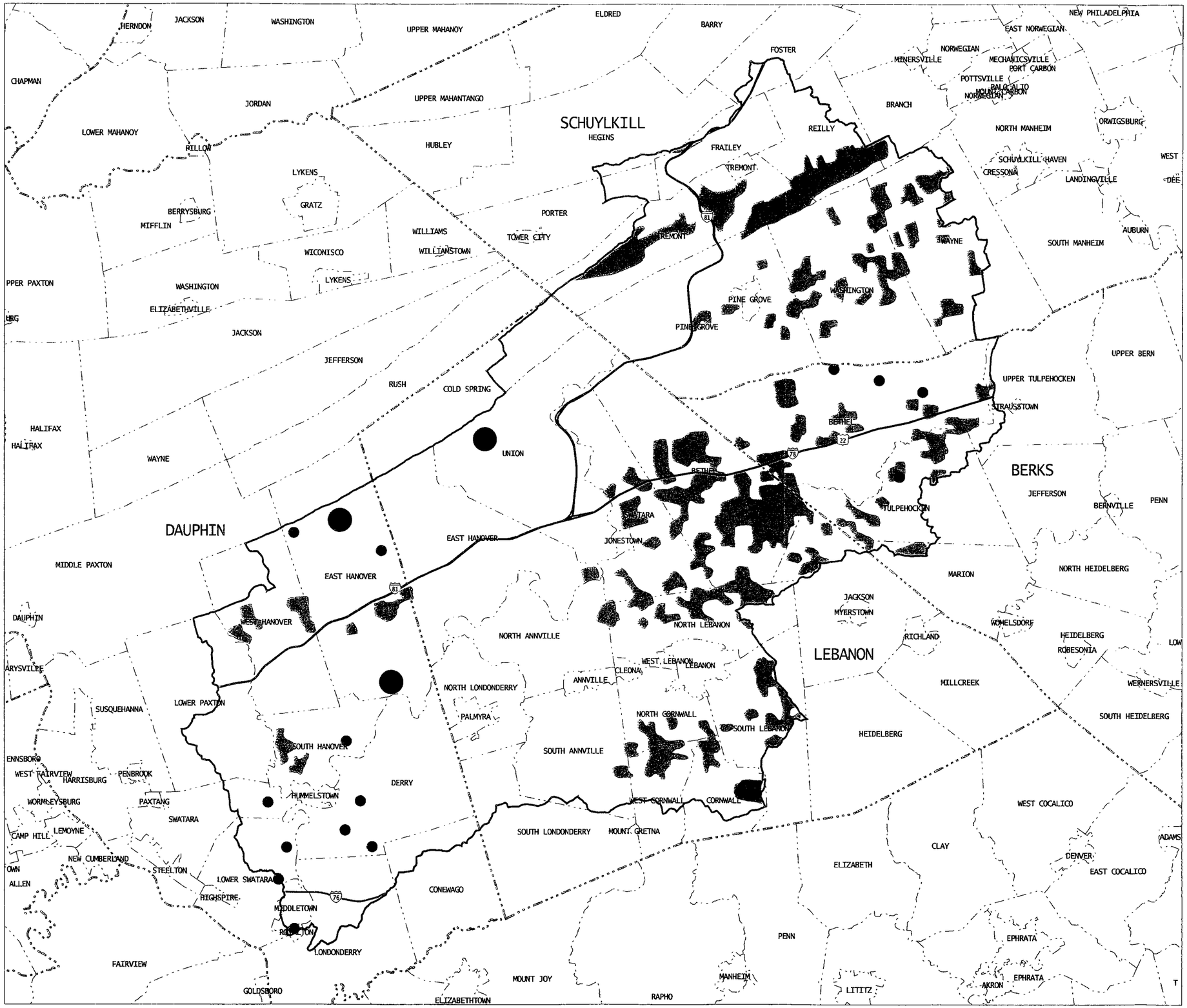
September, 2000

Biological Features

- PA Game Commission Forest Cooperative Area
- PA Game Commission Farm Cooperative Area
- Natural Heritage Inventory Area
- Important Bird Area

Other Features

- Swatara Creek Watershed
- Interstate Highway
- Municipal Boundary
- County Boundary



4 3 2 1 0 2 4 6 8

Scale in Miles

Scale = 1 : 253,440

1 Inch = 4 Miles (approx.)

SOURCES:

National Audobon Society
Pennsylvania Game Commission
Pennsylvania Department of Transportation
Susquehanna River Basin Commission
Berks County Natural Heritage Inventory
Dauphin County Natural Heritage Inventory

Mackin

CHAPTER 6:

CULTURAL RESOURCES

6. Cultural Resources

A. Recreation

The Swatara Creek watershed has been a source of recreation since the time of the first settlers in the area.

1. Use

Areas utilized for recreational use are situated throughout the Swatara Creek watershed. Fishing, hunting, hiking, camping, canoeing, swimming, etc. areas are common and are well utilized by the residents of, and visitors to the area.

Although many of the streams within the Swatara Creek watershed are or have been impaired by pollution, fishing is still an important recreational activity. The Pennsylvania Fish and Boat Commission (PFBC) lists several species of game fish as being present within the watershed. These species include Large and Smallmouth Bass; Brook, Brown, and Rainbow Trout; Chain Pickerel; Yellow Perch, and Muskellunge.

Because of the inherent differences in the waters within the watershed, determining the quality and quantity of fishing associated with each is not possible. However, streams or ponds and lakes receiving special management or designation by the PFBC are presented in Table 6-1.

Table 6-1
Special Management Waters Located Within the Swatara Creek Watershed

County	Water	Limits	
Selected Trout Stocked Lake			
Lebanon	Stoevers Dam	NA	
Delayed Harvest Artificial Lures Only Waters			
Dauphin	Manada Creek	1.8 Miles	Between Briarcrest and Furnace Roads
Lebanon	Quittapahilla Creek	0.9 Miles	Between Spruce Street Bridge and Quittie Creek Nature Park
Big Bass Lakes			
Lebanon	Memorial Lake	NA	

Canoeing has become an increasingly popular recreational activity on Swatara Creek and some of its major tributaries. Swatara Creek has been listed as a navigable waterway (Public Highway Declaration Act) since 1811 from its mouth at the Susquehanna River (Dauphin County) upstream to where Good Spring Creek enters Swatara. Lower Little Swatara Creek in Schuylkill County is also listed as a navigable waterway. Canoe and boat launch/take out points have been established at several areas along Swatara Creek and in other local waterways in the watershed. In addition, a water trail has been established by SCWA and the PFBC for the lower section of Swatara Creek.

Hunting has been and continues to be a tradition within the Swatara Creek watershed. Numerous public lands open for hunting are located within the watershed; these include State Gamelands, State Parks, State Forests, and Fort Indiantown Gap property. The majority of this land is located in the forested northern portion of the watershed. The majority of the southern portion of the watershed is privately owned farmland with limited access. However, in some cases to reduce crop damage, permission can be obtained to hunt on these private lands. Table 6-2 lists the available public hunting lands in the Swatara Creek watershed.

Table 6-2
Public Hunting Areas Located in the Swatara Creek Watershed

Facility	County	Acreage
State Gameland 246	Dauphin	424 Acres
Ft. Indiantown Gap Military Reservation (Permit Required)	Dauphin, Lebanon	18,506 Acres (Not all available for hunting)
State Gameland 211	Dauphin, Lebanon	12,294 Acres
Swatara State Park	Lebanon, Schuylkill	3,515 Acres
State Gameland 229	Schuylkill	2,891 Acres
State Game Land 160	Schuylkill	245 Acres
State Game Land 80	Berks, Schuylkill, Lebanon	8,507 Acres
Weiser State Forest	Schuylkill	2,073 Acres

Camping, hiking, biking, and walking have become increasingly popular throughout the country as well as in the Swatara Creek watershed. Numerous public and private camping areas are available. In addition several trails and routes are currently available for use or are proposed for the future. In many instances, the hiking trails are located adjacent or in close proximity to the campgrounds and other public facilities.

2. Facilities

Mackin Engineering identified 185 recreational facilities during the field view and background information review of the watershed. The information is broken down by county, municipality, and sub-watershed where appropriate. It is detailed under the following subject headings.

a. Public Parks

A total of 112 public parks were identified within the watershed.

STATE PARKS: Two (2) state parks (Memorial Lake and Swatara) are located in the Swatara Creek watershed. These parks are located in Lebanon and Schuylkill counties and are described in the following paragraphs.

Memorial Lake State Park

The centerpiece of the 230-acre Memorial Lake State Park is the 85-acre Memorial Lake. The park offers boating (non-motorized), fishing, ice-skating, cross-country skiing, and picnicking as its primary sources of recreation.

Swatara State Park

The 3,515-acre Swatara State Park is currently undeveloped. It offers only fishing, hunting, and hiking opportunities. Plans for the future development of the park are pending the outcome of a proposal to construct a 753-acre lake and dam on Swatara Creek within the park. Chapter 7 of this document presents and expanded discussion of the Park, its history, and its future development.

COUNTY PARKS: The only identified County Parks in the watershed were found in Lebanon County. These parks include The Union Canal Tunnel Park and Monument Park in the City of Lebanon. No county parks were located within the Berks, Dauphin, and Schuylkill County sections of the watershed. Although the Sweet Arrow Lake recreation area is currently controlled by Pine Grove Borough, it may soon come under the jurisdiction of Schuylkill County.

The Swatara Creek Greenway (detailed in Chapter 8), located within Dauphin County will also be associated with the Dauphin County Parks as it develops.

MUNICIPAL PARKS: 109 municipal parks were identified within the Swatara Creek watershed. Tables 6-3a, 6-3b, and 6-3c summarize the parks and features for each of the counties in the watershed. No parks or public playground areas were located in the municipalities of Upper Tulpehocken Twp. in Berks County; North Londonderry, Union, South Annville, and North Annville Townships in Lebanon County; Branch, Porter, and Tremont Township in Schuylkill County; and Londonderry Township Dauphin County.

Table 6-3a

Summary of Municipal Parks Located within Berks and Schuylkill Counties in the Swatara Creek Watershed

Name	Municipality	County	Type
Rehersburg Lions Field	Tulpehocken Twp.	Berks	Lions Club
Mt. Aetna Lions Field	Tulpehocken Twp.	Berks	Lions Club
Frystown Playground	Bethel Twp.	Berks	Playground
Veterans Park	Pine Grove Borough	Schuylkill	Passive/Playground
Sweet Arrow Lake	Pine Grove Borough	Schuylkill	Passive
Pine Grove Twp. Recreation Area	Pine Grove Twp.	Schuylkill	Playground
Mt. Pleasant Hose Company Playground	Foster Twp.	Schuylkill	Playground
Municipal Playground	Frailey Twp.	Schuylkill	Playground
Twp. Playground	Reilly Twp.	Schuylkill	Playground
Frog Hollow Environmental Center	Wayne Twp.	Schuylkill	Nature Center (privately operated)
Tremont Borough Swimming Pool	Tremont Borough	Schuylkill	Swimming Pool
Borough Playground on Poplar St.	Tremont Borough	Schuylkill	Playground
Municipal Playground	Washington Twp.	Schuylkill	PlaygroundAthletic

Table 6-3b
Summary of Municipal Parks Located within the Dauphin County Portion of the Swatara Creek Watershed

Name	Municipality	County	Type
Brookside Park	Derry Twp.	Dauphin	Athletic/Playground
Memorial Field	Derry Twp.	Dauphin	Multi Use
Palmdale Park	Derry Twp.	Dauphin	Athletic/Picnic
Shank Park	Derry Twp.	Dauphin	Multi Use
Koons Park (Lions Club Field)	Derry Twp.	Dauphin	Athletic/Picnic
Hershey Recreation Center	Derry Twp.	Dauphin	Multi Use
Chocolatetown Square	Derry Twp.	Dauphin	Passive
Boathouse Park	Derry Twp.	Dauphin	Passive
Bullfrog Valley Pond	Derry Twp.	Dauphin	Passive
Shaffner Park	Hummelstown Borough	Dauphin	Multi Use
Mahaffey Park	Hummelstown Borough	Dauphin	Multi Use
Shopes Field	Hummelstown Borough	Dauphin	Athletic
Nature Trail	Hummelstown Borough	Dauphin	Multi Use
Graystone Park	Hummelstown Borough	Dauphin	Under Construction
Koons Park	Lower Paxton Twp.	Dauphin	Multi Use
Brightbill Park	Lower Paxton Twp.	Dauphin	Multi Use/Comm. Ctr.
Buchannan Tract	Lower Paxton Twp.	Dauphin	Passive/Undeveloped
Hodges Heights Park	Lower Paxton Twp.	Dauphin	Multi Use
Kings Crossing Park	Lower Paxton Twp.	Dauphin	Playground/Athletic
Lamplight Park	Lower Paxton Twp.	Dauphin	Multi Use
Meadow Brook Park	Lower Paxton Twp.	Dauphin	Multi Use
George Memorial Park	Lower Paxton	Dauphin	Multi Use
Old Reliance Park	Lower Swatara Twp.	Dauphin	Multi Use
Park at Middletown High School	Lower Swatara	Dauphin	Multi Use
East Hanover Park	East Hanover Twp.	Dauphin	Multi Use
Conewago Twp. Play Area	Conewago Twp.	Dauphin	Playground
Earl R. Long Memorial Park	Swatara Twp.	Dauphin	Playground/Athletic
Chambers Hills Park	Swatara Twp.	Dauphin	Playgrounds/Athletic
Howard "Bumps" Randolph Memorial Park	Swatara Twp.	Dauphin	Playground/Athletic
Manor Park	West Hanover Twp.	Dauphin	Multi Use
Fairville Park	West Hanover Twp.	Dauphin	Multi Use
Houck Memorial Field	West Hanover Twp.	Dauphin	Athletic
Houck Manor Field	West Hanover Twp.	Dauphin	Athletic
West Hanover Municipal Park	West Hanover Twp.	Dauphin	Undeveloped
Lawrence Park	West Hanover Twp.	Dauphin	Undeveloped
Mount Laurel Park	West Hanover Twp.	Dauphin	Wooded/Passive
2 Elementary School Playground	West Hanover Twp.	Dauphin	Playground/Athletic
Stone Mill Rd. Ballfield	S. Hanover Twp.	Dauphin	Athletic
Swatara Park	S. Hanover Twp.	Dauphin	Multi Use
Greenbriar Field	S. Hanover Twp.	Dauphin	Athletic
Kiwanas Park	Royalton Borough	Dauphin	Multi Use
Market Street Playground	Royalton Borough	Dauphin	Playground
Tot Lot	Royalton Borough	Dauphin	Tot Lot
Hoffer Park	Middletown Borough	Dauphin	Multi Use
Oak Hills Park	Middletown Borough	Dauphin	Multi Use
Frey Manor Park	Middletown Borough	Dauphin	Multi Use
Etnoyer Park	Middletown Borough	Dauphin	Multi Use
Colston Park	Middletown Borough	Dauphin	Multi Use
Municipal Park	Middletown Borough	Dauphin	Playground
Swatara Boat Launch	Middletown Borough	Dauphin	Boat Launch

Table 6-3c

Summary of Municipal Parks Located within Lebanon County of the Swatara Creek Watershed

Name	Municipality	County	Type
West Lebanon Recreation Area	W. Lebanon Twp.	Lebanon	Multi Use
W. Lebanon Playground	W. Lebanon Twp.	Lebanon	Playground
Quittie Creek Nature Park	Annville Twp.	Lebanon	Passive/Nature
Maple St. Park	Annville Twp.	Lebanon	Athletic (Privately maintained)
Coleman Memorial Park	City of Lebanon	Lebanon	Multi Use
Northeast Park	City of Lebanon	Lebanon	Multi Use
4 Association Owned Playgrounds	City of Lebanon	Lebanon	Playgrounds
Southeast Playground @ Hanover and Walnut Streets	City of Lebanon	Lebanon	Playground
East End Playground @ 5th and Lehman	City of Lebanon	Lebanon	Playground
Beautex Park	City of Lebanon	Lebanon	Playground
Southwest Park	City of Lebanon	Lebanon	Multi Use
Meadowbanks Park	City of Lebanon	Lebanon	Passive/Trail
Stoever's Dam	City of Lebanon	Lebanon	Multi Use
2 Tiny Tot Lots	City of Lebanon	Lebanon	Tot Lot
Fishers Park	City of Lebanon	Lebanon	Passive
Lebanon Park at 6th St. and Poplar St.	City of Lebanon	Lebanon	Greenspace
Athletic Field at 15th and Cedar Crest Dr.	North Lebanon	Lebanon	Athletic
North Lebanon Park along Rt. 72	North Lebanon	Lebanon	Multi Use
North Lebanon Lions Lake Park	North Lebanon	Lebanon	Walking Paths
North Lebanon Township Park	North Lebanon	Lebanon	Multi Use
Avon Playground	South Lebanon	Lebanon	Playground
South Hills Park	South Lebanon	Lebanon	Multi Use
Cornwall Park at Sand St.	Cornwall	Lebanon	Playground
Athletic Field near Gold Rd.	Cornwall	Lebanon	Athletic
Athletic Field at Snitz	Cornwall	Lebanon	Athletic
Cornwall Park at George St.	Cornwall	Lebanon	Playground
Cornwall Park at Broad St.	West Cornwall	Lebanon	Playground
Community Playground @ Center St.	North Cornwall	Lebanon	Playground
Broad St. Park	West Cornwall	Lebanon	Playground
W. Cornwall Tiny Tot Lot	West Cornwall	Lebanon	Tot Lot
Heritage Park	Palmyra	Lebanon	Multi Use
Firemans Park	Palmyra	Lebanon	Playground
South East Park	Palmyra	Lebanon	Athletic
Garfield St. Park	Cleona	Lebanon	Multi Use
Jonestown Borough Playground	Jonestown	Lebanon	Multi Use
Levitz Park	East Hanover	Lebanon	Multi Use (Under Construction)
Fire Company Park @ Grebel Rd.	Bethel	Lebanon	Athletic/Passive
Lions Park	Bethel	Lebanon	Athletic/Playground
Jackson Meadows	Jackson	Lebanon	Athletic
Kutztown Field	Jackson	Lebanon	Athletic
Jackson Elementary School	Jackson	Lebanon	Playground
H.I. Grubine Field	Jackson	Lebanon	Athletic
Cambletown Playground	South Londonderry	Lebanon	Playground
Tot Lot	South Londonderry	Lebanon	Tot Lot

The following paragraphs give a brief synopsis of the seven (7) parks located adjacent to the streams in the watershed:

Hoffer Park is a six (6) acre facility located on Swatara Creek in the Borough of Middletown. This park is a multi use park that is used for numerous recreational and community activities. It contains several basketball and tennis courts, one beach volleyball court, two picnic pavilions and a playground. The park also offers access to Swatara Creek for fishing.

Swatara Creek Park is a 15acre (approx.) recreational area located adjacent to Swatara Creek in South Hanover Township. This park is a multi use facility with baseball/soccer fields, a playground, and a picnic pavilion with grilling facilities. The park also provides fishing access to Swatara Creek and contains a section of the Union Canal and Tow Path. A portion of the park is an undeveloped wetland area.

Quittie Creek Nature Park is an approximately 23 acre park located along the northern bank of Quittapahilla Creek in Annville Township. The property was obtained by Annville Township in 1967 from the Bethlehem Mines. From approximately 1903 through 1952 the site was used as a limestone quarry and kiln, the remnants of which can still be observed in the park. Quittie Creek Nature Park is currently used for passive recreational pursuits as well as fishing and canoeing access. The park also contains an interpretive nature trail. The Friends of Old Annville have proposed several improvements to the park; these are presented in the *Management Options* section of this document (Chapter 10).

Cleona Elementary School Park is 13.4 ac. facility located on the north bank of Quittapahilla Creek in the Borough of Cleona. The park is essentially an extension of the playground at the Cleona Elementary School. The facility allows for passive recreation along the stream.

Levitz Park is a 105 ac. facility located in East Hanover Township, Lebanon County. This park contains an unnamed tributary to Swatara Creek flowing through the western edge of the park. The park is currently being developed; but contains athletic fields, courts, and rinks. The facility also contains picnic areas, restrooms, and trails.

Veterans Park is an approximately 8-acre facility located along the former Union Canal in the Borough of Pine Grove. The park reestablished the canal in its historic location as well as re-vegetated the area of the park. The Pine Grove Area Bicentennial Committee established the park in 1996. The Park is used for numerous activities, including ice-skating during the winter months; but it is primarily used for passive recreation.

The Sweet Arrow Lake Recreation Area is located adjacent to the Pennsylvania Fish and Boat Commission Access area on Sweet Arrow Lake. The Borough of Pine Grove controls the area. It is used for passive recreation, picnicking, fishing, and boating. Ownership for the area may change in the future due to concerns about the condition of the dam and potential liabilities involved.

Photo 6-1: View of Sweet Arrow Lake Recreation Area.

b. Public Forests/Gamelands

Seven (7) Public Forests/Game Lands located all or partially within the watershed were identified. These lands total 29,949 acres (approx. 8.2% of the watershed). Table 6-2 presents these areas.

c. Boat Launches

As stated previously, canoeing and boating have become increasingly popular on Swatara Creek and some of its tributaries. In addition, boating opportunities are also available on several of the lakes in the watershed. No boating or canoeing facilities are available in the Berks County Section of the Watershed. Table 6-4 presents the boat launching areas in the watershed.

Photo 6-2: Boat docking area at Memorial Lake State Park.

Table 6-4
Summary of Boat Launches and Access Points Located within the Swatara Creek Watershed

Name	County	Type	Public/Private
Sweet Arrow Lake	Schuylkill	Canoe/Boat	Public
Intersection of Appalachian Trail and Swatara Creek	Lebanon	Proposed Canoe	Public
Swatara Creek @ Scotto's Italian Restaurant in Jonestown	Lebanon	Canoe	Private/Public
Swatara Creek @ Waterworks	Lebanon	Canoe	Public
Swatara Creek @ Union Canal Canoe Rentals in East Hanover Twp.	Lebanon	Canoe	Private/Public
Lebanon Water Authority at Route 22 Crossing	Lebanon	Proposed Canoe	Private/Public
Memorial Lake	Lebanon	Canoe/Boat	Public
Lake Weiss	Lebanon	Canoe/Boat	Private
Lake Strause	Lebanon	Canoe/Boat	Private
Lions Lake/Ebenezer Dam	Lebanon	Canoe/Boat	Public
Stoevers Dam	Lebanon	Canoe/Boat	Public
Marquette Lake	Lebanon	Canoe/Boat	Public
Swatara Creek @ Boat House Road Park, Derry Twp.	Dauphin	Canoe	Public
Swatara Park @ Hummelstown Borough	Dauphin	Canoe	Public
Clifton Covered Bridge @ Fulling Mill Rd.	Dauphin	Canoe	Public
Swatara Creek/Susquehanna River	Dauphin	Boat	Public

d. Trails

There are numerous trails available for hiking, horseback riding, snowmobiling, etc. in the Swatara Creek watershed. Table 6-5 presents a summary of these identified trails.

Table 6-5
Summary of Major Trails Located Within the Swatara Creek Watershed

Name	County	Status
Appalachian	Schuylkill, Lebanon, Berks	Active
Horse-Shoe	Lebanon	Active
Lebanon County Rail-Trail	Lebanon	Under Construction
Swatara Creek/Union Canal and Tow Path	Dauphin, Lebanon	Planned
Walking Path Along Quittapahilla	Lebanon	Active
Swatara Water	Dauphin, Lebanon	Active
Hotel Road Trail	Lebanon	Active

Numerous other unnamed trails and paths exist within the watershed on the publicly held properties. The following paragraphs provide information on the major trails identified in the watershed.

Appalachian Trail

The Appalachian Trail is a 2,160 ± mile footpath that stretches from Maine to Georgia. Approximately 230 miles of the total trail are located within Pennsylvania. Approximately 20 miles of trail is located within the watershed. Three local trail groups, the Susquehanna Appalachian Trail Club, Lebanon Valley Hiking Club, and York Hiking Club have taken on the responsibility of maintenance and upkeep of the trail within the watershed.

Photo 6-3: View of Appalachian Trail crossing at PA Route 443 Near Swatara State Park

Horse-Shoe Trail

The Horse-Shoe trail is a 137 ± mile equestrian/foot path that was developed in 1935 to provide a link to the Appalachian Trail from Philadelphia. The trail is not publicly owned, and periodically changes as a result development and changing landowners. Approximately 10 miles of the Horse-Shoe Trail is located in the Swatara Creek watershed. The Lebanon Valley Hiking Club has taken the responsibility for maintaining the trail within the watershed. In addition the Horse-Shoe Trail Club based in Birchrunville, PA also completes work on the trail.

The Lebanon Valley Rail-Trail

The Lebanon Valley Rail Trail is a proposed 15 ± mile bike/hiking trail that extends from the existing Conewago Trail (Lancaster County Line) into the City of Lebanon along the abandoned Pennsylvania Cornwall Railroad Line (RBA Group, 1998). The Lebanon Valley Rails to Trails (LVRT) group proposes to complete this trail. Approximately seven miles of this trail is located within the Swatara Creek watershed. Conversation with Mr. John Wengert, president of LVRT identified that the property for the southern 5 miles of trail was purchased in December 1999. The remaining trail length will be purchased and constructed in subsequent years.

e. Campgrounds

Numerous campgrounds exist within the Swatara Creek watershed. The majority of these are facilities open to the pubic for use. Table 6-6 lists these facilities as well as any relevant features.

Table 6-6
Campgrounds Identified Within the Swatara Creek Watershed

Name	County	Type
Hershey High Meadows Campground	Dauphin	Family
Hershey KOA Campground	Dauphin	Family
Lickdale Campground	Lebanon	Family
Gretna Glen Camp	Lebanon	Church
Camp Arewa	Lebanon	Private
Camp Carson	Lebanon	Private
Camp Strause	Lebanon	Private
Mt. Lebanon Grove Church Camp	Lebanon	Church
Bashore Boy Scout Camp	Lebanon	Scout
Thousand Trails Campground	Lebanon	
Great Valley Girl Scout Camp	Lebanon	Scout
Jonestown KOA Campground	Lebanon	Family
Camp Swatara Family Camping	Lebanon	Family
Twin Grove Park Campgrounds	Schuylkill	Family
Echo Valley Park Campground	Schuylkill	Family
Camp-A-While	Schuylkill	Family

f Golf Courses

A total of 16 public and private golf courses were identified in the watershed. They provided thousands of hours of recreational opportunities in 1999. Table 6-7 lists the golf courses identified.

Table 6-7
Golf Courses Identified Within the Swatara Creek Watershed

Name	Municipality	County
Lebanon Country Club	North Cornwall	Lebanon
Royal Oaks Golf Course	North Cornwall	Lebanon
Fairview Golf Course	West Cornwall	Lebanon
Course Along Trib. to Snitz Creek	Cornwall	Lebanon
V.A. South Hills Golf Course	South Lebanon	Lebanon
Monroe Valley Golf Course	Swatara	Lebanon
Blue Mountain View Country Club	Bethel	Lebanon
Freeport Mills Golf Course	Bethel	Lebanon
Pine Meadows Golf Course	Bethel	Lebanon
Lebanon Valley Golf Course	Jackson	Lebanon
Beaver Bend Chip and Putt Golf Course	South Hanover	Dauphin
Hershey Hotel Golf Course	Derry	Dauphin
Hershey Country Club and Golf Course	Derry	Dauphin
Hershey Parkview Golf Course	Derry	Dauphin
Spring Creek Golf Course	Derry	Dauphin
Manada Golf Course	East Hanover	Dauphin
Hidden Valley Golf Course	Washington	Schuylkill

g. Amusement Parks

Hersheypark, located in Hershey PA is the lone Amusement Park in the watershed. The amusement park was built in 1909 for employees of the Hershey Chocolate Company and students from the Hershey School. The park was later opened to the public and currently has over 2,000,000 visitors annually.

Other sites associated with Hershey Park include Hershey's ZooAmerica, the Hershey Museum, and Hershey's Botanical Gardens. The Hershey Arena, Theater, and Symphony are also attractions located in close proximity to the amusement park.

h. Other

In addition to the previously presented recreational facilities; the Penn National Race Course is located within the watershed, just off of PA Route 443 off of exit 28 of Interstate 81. This facility showcases thoroughbred horse racing.

The Middletown and Hummelstown (M+H) railroad is also a popular attraction within the watershed. This historic train line provides numerous passenger tours along Swatara Creek and the former Union Canal throughout the year.

A popular destination along the M+H rail line is Indian Echo Caverns, a natural limestone cavern formation. Numerous other limestone caverns exist in the southern portion of the watershed; how ever, Indian Echo Caverns is the only one developed for the public.

B. Archaeological and Historical

There is a diverse and unique history associated with the Swatara Creek watershed. The history of the area varies due to the unique physical, geological and cultural regions found throughout the watershed. The information in this section is presented within six (6) specific eras:

1) Prehistory (<1600)
2) Early Colonial Settlement (1600 ~ 1750)
3) Community and Commercial Development (1750 ~ 1850)
4) Industrial Development (1850 ~ 1950)
5) Post Industrial (1950 ~ Present)

1. Prehistory

Archaeological findings in the region indicate that the Swatara Watershed has been inhabited for over 11,000 years. Three periods of prehistory are discussed in this section; the Paleo Indian period, the Archaic period, and the Woodland period.

The Paleo Indian period according to Mayer-Oaks (1955) extends from before 8,000 BC to 3,000 BC. This period covers the earliest inhabitants of the North American continent. These were generally nomadic hunters of now extinct big game.

In the Susquehanna River Valley, the Archaic period lasted between approx. 7000 BC and the time of Christ. It involved the evolution of the Paleo Indians; the first inhabitants of the North American continent. This group of Native Americans gradually evolved from the early Paleo Indians as the gradual changes in climate brought the Susquehanna River Valley climate into the conditions that we see today (Kent, 1984).

The Archaic period eventually evolved into the Woodland period. Within the Susquehanna River Valley, the period began around the time of Christ and lasted until approximately 1600 AD when the first European explorers and settlers began to move into the area. The Early Woodland period is identified by the use of pottery vessels in the cooking and storage of food for the first time. (Kent, 1984) As the Woodland period progressed, distinct changes in the culture of the Native Americans took place. This was facilitated by the introduction of horticulture to the native groups. The long-term results of the development of horticulture included the development of larger and more permanent villages. Eventually these tribes began to develop a unique or tribal identity; which eventually led to increased competition and conflict among the individual communities or tribes. Hundreds of sites associated with the Woodland Area have been identified within the Swatara Creek watershed.

The dominant tribe in the Swatara Watershed as well as the entire Susquehanna River valley, at the time the first settlers arrived, were the Susquehannock Indians.

The Susquehannock Indians were closely related to the Iroquois Tribes. However, the two cultures split circa 1450 AD (Kent, 1984). Following the split, the Susquehannocks occupied the lands between the Susquehanna and the Delaware Rivers. It is believed that the Susquehannocks defeated many of the other tribes that inhabited this area including the Shenks Ferry People. However, the Susquehannock Nation was eliminated as a tribe by 1675 as a result of disease and a prolonged war with the Iroquois Nation.

During this prehistoric period, a precursor to today's transportation system developed. The Allegheny Path, an Indian trail that extended from the Delaware River to the Susquehanna River was the major east-west route through the state (Wallace, 1998). The portion of the trail that extended through the Swatara Creek watershed from Myerstown to Harrisburg is today the site of Route 422.

Review of Pennsylvania Historical Museum Commission (PHMC) files and discussion with PHMC personnel revealed 401 prehistoric sites located in the Swatara Creek watershed, with 202 of these sites assignable to one of the above mentioned time periods. Information as to which time period each site is associated with is not currently available; however it should be accessible in the near future (Funk personal communication, 2000).

2. Early Colonial Settlement (1600-1750)

Prior to 1729, the area contained within the Swatara Creek watershed was not located within a delineated Pennsylvania county. After 1729 the watershed was considered part of Lancaster County; although the northern portion of the watershed was on the very outskirts of the established county boundary. It was not until 1732 that title to the lands south of the Blue Mountains, between the Delaware and Susquehanna Rivers, not previously purchased were deeded to the Pennsylvania colonists by the Delaware Indian Tribe. (Miller et al, 1940)

Although the watershed was not officially within the "settled" section of Pennsylvania; it was far from uninhabited. Scots-Irish immigrants were likely settling within the watershed prior to 1720. German, Swiss, and French Settlers officially began settling within the watershed around 1723. (Miller et al, 1940). The majority of these later settlers were of German descent. Because of their strong work ethic and thriftiness these settlers were in developing the region. Even today Germanic customs and characteristics are prevalent throughout the watershed.

Although there were various peace treaties, and the land within the watershed was deeded to the colonists, Indian raids and kidnappings occurred in the region up through 1760. This situation was compounded by the continued influx of new settlers into lands outside of the areas that was titled to the colony and later by the French and Indian War.

As a result of the raiding and in order to block the main Indian routes over Blue Mountain and as a defense during the French and Indian War, a string of eleven provincial forts were erected (or commandeered in some instances) between the Susquehanna and Delaware Rivers along Blue Mountain from approximately 1754 through 1760. These forts served as the dividing line between the settled and unsettled parts of the state. Within the Swatara Creek watershed there were 3 provincial installations Fort Henry, Fort Swatara (originally Heydrick's fortified property), and Fort Manada. Other private fortified properties and/or places of refuge included Brown's Fort (located between Ft. Swatara and Ft. Manada), Glunninger Fort (now Pleasant Hill area) as well as the fortified properties of Adam Reed, Joeseph Barnett, Philip Johnson, Weidmans Mansion, Hess Blockhouse, Gibber Blockhouse, Bethel Moravian Church, Harpers Tavern, the Ulrich house, and the John Light property. The French and Indian War in Pennsylvania 1753-1763 (PHMC, 1996)also states that there were the private forts of Dietrich Six, Samuel Robinson, Phillip Robinson, as well as forts referred to as McClures's, McFarlands, Pattons, and an unnamed fort in Indiantown Gap.

The primary industry during this time period within the watershed as well as the remainder of the frontier was agriculture. The most successful of the early settlers were the German farmers with their exceptional work ethic and understanding of some important farming concepts including fertilization and crop rotation. The abundant water supplies in the streams of the area provided the necessary energy to run gristmills. Several of these operations sprang up within the watershed during this time period. Most other industries at this time were offshoots of the farming operations, and many were located outside of the watershed in the larger settlements towards Philadelphia or Lancaster.

In 1742, Peter Grubb constructed the Cornwall Iron Mine and Furnace (Miller et al, 1940) located

near the southern boundary of the watershed, following discovery of the Cornwall iron ore deposit. The Cornwall ore was rich and abundant (>40 feet deep). The furnace produced "Pig Iron" which was shipped downstream to the Susquehanna River and further on downstream to Baltimore. From Baltimore it was sent on to England. An offshoot of the iron furnace was the development of the charcoal industry. Burning, in the absence of oxygen, the abundant hardwoods in the area produced charcoal. This fuel, which burned hotter than regular wood, was then used in the furnace as part of the English (cold) method of producing iron. (Miller et al, 1940)

3. Community and Commercial Development (1750 to 1850)

The period between 1750 and 1850 brought about monumental changes in the Swatara Creek watershed. Berks County was formed from Chester, Lancaster, and Philadelphia Counties in 1752. In 1785 Dauphin County was formed from Lancaster County. In 1811 Schuylkill County was formed from Berks and Northhampton Counties. Finally in 1813 Lebanon County was formed from Berks and Dauphin Counties. These changes resulted in the Swatara Creek watershed today being located in Berks, Dauphin, Lebanon, and Schuylkill Counties. Although still not domesticated, (Indian raids and deaths were recorded in the watershed as late as 1760) the colonial frontier now extended into western Pennsylvania. Roads were being established between the major cities in the region and small communities and towns were springing up rapidly along these roadways (Lebanon (1756), Campbelltown (1760), Jonestown (1761), Fredericksburg (1761), Annville (1762), and Palmyra (1776)).

The most significant event from this period would be the Revolutionary War (1775 through 1783). Residents of the Swatara Creek watershed as well as the other frontier communities were significant supporters and contributors to the Revolutionary War effort. This support began prior to the actual onset of the war. Residents of the Lebanon Valley were quick to support the citizens of Boston following the English closure of the Boston Harbor following the "Boston Tea Party" (Miller et al, 1940). There are several possible reasons for the support and involvement in the move for independence from England, and eventually the Revolutionary War. Dunaway (1927) discusses that the diversity and adversity faced by the frontier colonists made them more warlike. In addition, unlike many in Philadelphia, they had no ties to England; nor felt any need to show a profit for the colonial sponsors. This led to a less pacifistic attitude toward English rule and culminated in the "overthrow" of the provincial government in 1776. Numerous regiments of soldiers were organized all or partially from within the Swatara Creek watershed (Miller, et al, 1940).

Following the revolutionary war, a period of significant growth and prosperity in the watershed and surrounding areas ensued. The discovery of anthracite coal in the northeastern Pennsylvania counties was another major event during this time period. The northern end of the Swatara Creek watershed originates in the southern end of southern anthracite coalfields (Edmunds, Skema, and Flint, 1999). The discovery and subsequent mining of this resource had a huge impact on the environment of the Swatara as well as its development.

Transportation played a great role in the changing landscape of the Swatara Creek watershed.

Construction began on a road between Lebanon and Lancaster via Cornwall in 1750. The roadway allowed for the movement of supplies to Cornwall and Lebanon and shipment of iron from Cornwall to Lancaster. This road later became known as the Cornwall Turnpike following the replacement of its roadway planks with "piking". Two other roadways The Horseshoe Pike and the Berks and Dauphin County Turnpike were also completed during this time period (1819 and 1817 respectively). Travel on these turnpikes led to the development of small communities along the highway; watering areas approximately every 5 miles and overnight accommodations approximately every 25 miles. (Miller et al, 1940)

One of the major transportation features associated with Swatara Creek, the Union Canal, was built during this time period. As early as 1690, William Penn recommended a canal be built to connect the Susquehanna and Schuylkill Rivers via Swatara and Tulpehocken Creeks.

Initially the project was chartered as the Schuylkill and Susquehanna Canal Co. Construction of the canal was initiated in 1792 and several miles of canal were completed between Lebanon and Myerstown before construction was halted due to a lack of funding. In 1795 a lottery was approved by the state legislature to provide up to $400,000 to fund construction of the canal. However, over the next 20 years only $270,000 reached the canal company for use on the canal.

In 1811 there was a reorganization of the company and the Union Canal Company of Pennsylvania resulted. Work on completing the canal commenced in 1821 and was completed in 1828. A canal branch, to access the southern anthracite coalfields and provide additional water to the canal, was completed between Waterworks and Pine Grove in 1832. Total construction cost for the canal was >$6,000,000.

The canal locks constructed as part of the Union Canal were too small for the larger boats coming from the Pennsylvania Canal and Schuylkill Canal. Enlargement of the locks began circa 1850 and was completed throughout that decade. However an 1862 flood severely damaged the canal. Costly repairs and problems supplying water for the canal coupled with the loss of revenues caused by completion of the Lebanon Valley Railroad in 1857 eventually led to the closing of the canal in 1884. The Union Canal closed having only paid dividends to its stockholders twice over entire life of its existence. (Libbey personal communication, 1999)

One additional feature of note associated with the Union Canal is the Union Canal Tunnel. This tunnel is a significant feature in the section of the Union Canal connecting Clarks Run and the headwaters of Quittapahilla Creek. It was constructed between 1825 and 1827. The tunnel was initially 729 feet long; but was shortened to 600 feet when the tunnel was enlarged in 1858. The tunnel is currently the oldest existing transportation tunnel in the United States and may have been the first transportation tunnel constructed in the United States.

(Information for the previous paragraphs was a conglomeration of data presented in (Aungst, 1968), (Pawling, 1981), and LCHS Webpage)).

The final transportation feature affecting the watershed was the Railroads. Although the Railroad gained much greater prominence after 1850, rail lines were found within the watershed prior to this time period. The earliest recorded rail line in the watershed was the Lorberry Creek Railroad in 1831. This rail line used wood strap and horses. The first locomotive lines in the watershed appeared in the 1840's. By 1850 the railroad tracks had been switched from straps to T rails, and horses were no longer used to move the rail cars.

The development of the railroad in the watershed along with other factors led to the demise of the Union Canal.

In addition to changes in the modes of transportation, there were additional changes in the industries located within the Swatara Creek watershed during this time period.

Agriculture was still the dominant industry in the watershed. However, changes in farming practices were occurring during this time period. Much of the southern and eastern watershed is rich in limestone deposits. Burning this limestone results in the formation of slaked lime, a soil additive that was beneficial to the production of the planted crops. Many of the local residents utilized this process to increase their crop production.

Numerous mills (grist and saw) sprang up along the waterways of the Swatara Creek watershed in the early 1800's. The gristmills, in conjunction with the improved transportation system of the area allowed farmers to ship greater quantities of grist or flour and lumber to market; however, most of the flour and lumber was used and/or sold locally. Numerous mills were documented along Quittapahilla Creek (Heilman, 1903). Only two of these mills were present prior to 1750. However, numerous dams for mills are referenced in the History of Pine Grove, Pennsylvania (Haas, 1935). A total of 81 mills were identified and documented by SCWA along Swatara Creek and the remainder of the tributaries in the watershed

The Cornwall Iron furnace and ore mine that originated in 1742 was in continued operation throughout this time period. In addition to its original operation of producing "Pig Iron", the furnace also cast cannon barrels for the colonists during the revolutionary war.

With the discovery of anthracite coal the first significant changes to the iron making process occurred. Anthracite coal replaced the traditional charcoal in the iron making process. The Cornwall furnace was not equipped to convert to anthracite; therefore, the owners built other furnaces, equipped to utilize coal, in the vicinity of the ore mines. Additional iron furnaces sprang up in the vicinity of Cornwall and throughout the watershed; however, all/most of the ore for these operations was still provided by the Cornwall mine.

The coal mining coupled with the absence of any effective environmental regulation resulted in the serious degradation to Swatara Creek. Haas (1935) writes in the History of Pine Grove, Pennsylvania "...when the obstructions (dams on the creek) were washed away it was too late. The water had

already become polluted with the flow of culm from the mines, and the main stream of the Swatara between Jonestown and the headwaters became barren of fish". A 22-mile Branch Feeder to the Union Canal was completed between 1828 and 1830 to access the anthracite coal for transport. (Pawling, 1983) In addition, railroad lines (originally mule drawn and later steam and diesel were constructed from the northern terminus of the Union Canal to the coal collieries in the anthracite fields.

Photo 6-4: Forge located near Lebanon reservoir

4. Industrial Development (1850 to ~1950)

Again significant changes affected the Swatara Creek watershed between 1850 and 1950. Early in this period the Civil war had a significant effect on the development of this nation. Later, the advent of the industrial age brought about a marked change in the lives and lifestyles of the residents of the region and watershed. Finally, World War 1 and 2 sandwiched around the great depression provided the final changes to the watershed and its inhabitants during this time period.

Residents of the Swatara Creek watershed were involved in each of these events. However, none of these events actually originated in the watershed; and except for the Great Depression and the industrial age, none of the events took place in the watershed. The iron and steel industries in the watershed were among the first to become mechanized during the industrial age. These industries are still present in the watershed today, albeit to a lesser extent.

The changes to the transportation system within the watershed are similar to the changes that occurred throughout the country during this time period. The canals although still in use at the beginning of this time period were becoming extinct. Cheaper more efficient transportation was being provided by railroads. The Union Canal located within the watershed ceased operations in 1884 after its assets were sold at sheriff's sale. The demise of the canal resulted from the general deficiency of the canal caused by a lack of knowledge of the geology of the area; but it was also caused by the development of the Philadelphia and Columbia Railroad (~1834), the Tidewater Canal (1840), and the Lebanon Valley Railroad (1857).

Overland highways were seeing continual improvements and the "pikes" from earlier years were becoming the major travel routes for many of the local residents especially after automobiles became the primary mode of transportation. Paved roads were located within the watershed by 1940.

From the mid 1800's through the early 1900's railroads were the primary method for delivering goods and services within the watershed. The majority of these rail lines were controlled by the Reading Railroad or its precursor the Philadelphia and Reading Railroad. Some of the early rail lines eventually bought out by or merged with the Philadelphia and Reading Railroad Company include:

Schuylkill and Susquehanna RR
Good Spring RR
Lebanon and Pine Grove RR
Lebanon and Tremont RR
Lebanon Valley RR
Lorberry Creek RR
Middletown and Hummelstown RR
Mount Eagle and Tremont RR
Swatara RR
South Mountain RR
Swatara & Good Spring RR

The railroads were especially useful in transporting the vast quantities of anthracite coal being mined in the northern end of the watershed. Rail transportation of agricultural products and iron and charcoal from the remainder of the watershed was also more efficient than earlier methods.

The advent of the Model T automobile in 1908 and associated improvements in roadways began the decline of the railroading industry in the region. The majority of the previously listed rail lines were abandoned by the 1970's. Today many of these abandoned rail lines are seeing a rebirth as rail trails.

Following World War II airplane travel also became popular in the region as well as throughout the country when numerous servicemen trained in the military to fly returned from the war. These men enjoyed flying and planned to continue the "hobby" in civilian life. This led to numerous small airports being located through the region and watershed.

Agriculture was still the dominant industry in the watershed during this time period. However by 1870, for the first time, less than half of the workforce in Lebanon County (Carmean (ed.), 1976), and likely the entire watershed, were working on farms. Innovations and modernization led to increased harvests and greater amounts of land being cultivated in the watershed using less manpower.

Coal and iron were other major industries in the watershed and region. Complementary industries developed during this time period as a result of an increasing population and more limited amount of land available for farming. These businesses included steel foundries, machine shops, lumber mills, etc. Steel production developed as an offshoot of the iron industry and became a major influence in the City of Lebanon.

A major change that was taking place in the industries during this time period was the influx of different nationalities into the workforce. This was primarily occurring in the coalfields where more

of the Slavic nationalities (Polish, Hungarian, Slovak, etc.) were working the mines that used to be almost exclusively the domain of Irish and English miners.

During the early 1900's the union movement began in anthracite coalfields. A major strike in 1902 led to pay increases and improved working conditions for miners. This strike also led to the recognition of the United Mine Workers Union.

Limestone and dolomite had been important minerals in the Lebanon Valley from the time the first settlements were established in the area. Burnt limestone was utilized as a soil additive for enhanced crop production. However, its value as a building material and "flux" in the iron making process in addition to its agricultural properties led to it being mined extensively in the southern end of the watershed. The Annville Stone Company began the first commercial limestone mining operations in early/mid 1800s. The Annville limestone of the watershed was and is highly valued because of its high calcium carbonate content. Today abandoned quarries are located throughout the Lebanon and Dauphin County portions of the watershed. Pennsy Supply and Handwerk Inc. in Dauphin County and Pennsylvania Lime Inc. in Lebanon County are running active quarry operations.

In addition to limestone and dolomite, a sandstone known locally as brownstone was quarried in the watershed. This material was used extensively as a building material in the Hummelstown area in the mid 1800s. From 1853 through 1858 the stone was used to construct enlarged locks on the Union Canal. This brought national attention to the brownstone as a building material. The brownstone was used in hundreds of buildings and structures in at least 13 states. These include the Standard Oil Company Building in New York City and the Academy of Fine Arts and the Academy of Natural Sciences in Philadelphia. The Pennsylvania Brown Freestone Company (1867-1891) and the Hummelstown Brownstone Company (1891-1929) were the primary companies that quarried the brownstone. The quarried brownstone was also manufactured into brownstone bricks. However the advent of the clay brick manufacturing process, which was cheaper and had a variety of colors led to the demise of the brownstone industry circa 1927 (Olena, 1965)

In 1903 a new industry was developed in the watershed - Chocolate. Milton S. Hershey, following the sale of his Lancaster caramel business, began construction on a new factory to produce chocolate in the farmland of Derry Township. Around this factory the town of Hershey was born. Mr. Hershey developed a recipe for milk chocolate that became world famous and made Hershey a synonym for chocolate.

Mr. Hershey had a deep and abiding sense of duty to his community and workers. As a result he spent large amounts of his personal wealth on the welfare of others. In 1909 he established the Hershey School for orphaned boys. The school took orphaned boys and raised and educated them. Upon his death in 1948 Milton Hershey left his estate to the school. The Hershey Trust continues to be managed for the good and welfare of the residents of the Hershey School.

In addition to the Hershey School, Milton Hershey also constructed the Hershey Hotel, Hershey Park, and Hershey Arena. Many of these projects were undertaken in the 1930's during the great

depression. During this time period Hershey was one of the few towns that grew. Mr. Hershey was proud to say that no employee was laid off during the depression (Hershey Foods, 1999).

5. Post Industrial (1950 to Present)

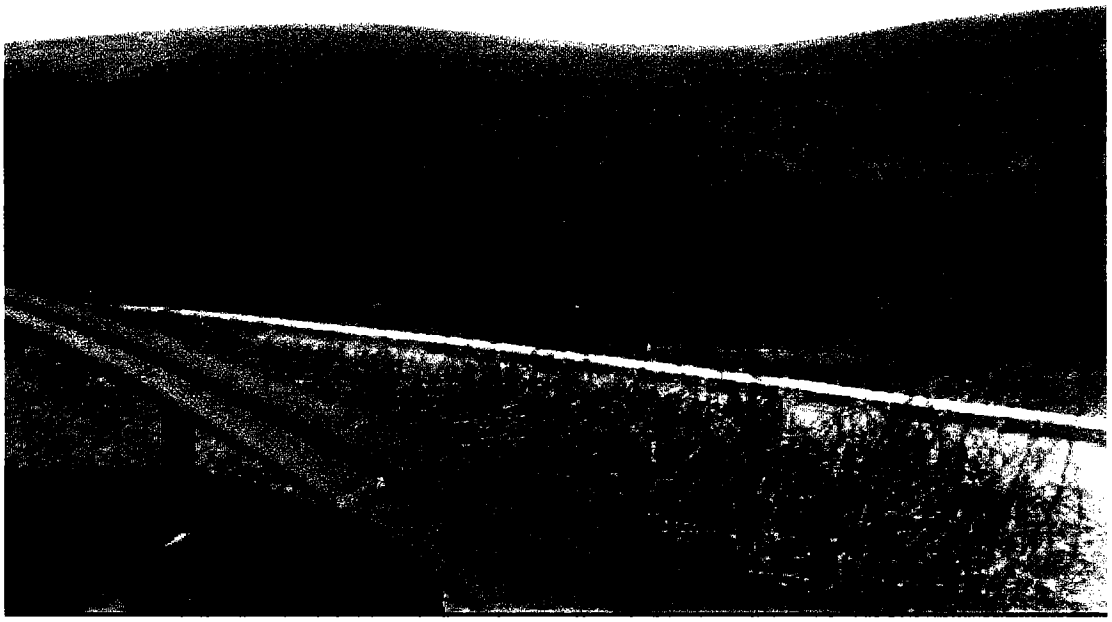
The last fifty years have again produced major changes in the watershed. The automobile has ascended to be the primary method of travel for both people and goods. Interstate Highways (I-81, 76 and 78) have been constructed through the watershed. Other state and local roadways have been constructed throughout the watershed. Following the decline of the railroad as a source of transportation, mass transit vehicles were introduced to the watershed. Currently two bus service lines provide for local transportation needs in the watershed. They are the Capital Area Transit (CAT) that provides service to Middletown, and portions of Dauphin County in the watershed and County of Lebanon Transit Authority (COLT), which provides service to Lebanon County residents.

As stated previously, the advance of the automobile spelled the doom of the railroad. Within the Swatara Creek watershed there are currently only four (4) railroad lines that are active. Amtrak operates a passenger service line that runs through Middletown. Conrail (soon to be Norfolk Southern) operates a line that passes through the City of Lebanon (East to West), The Blue Mountain and Reading Railroad and the Middletown to Hummelstown (M+H) Railroad. The Blue Mountain and Reading and M+H railroads are primarily sight seeing rail lines today.

Although no major commercial airports are located within the watershed, the numerous small airfields located are an indication of the popularity of this source of recreation and travel. In addition, Harrisburg International Airport is located adjacent to the watershed in Middletown. Fort Indiantown Gap's Muir Airfield, a major military training facility, is located within the watershed. A complete description of the transportation features in the watershed is presented in Chapter 2- Project Area Characteristics of this document.

The industrial make up of the watershed has also changed over the last fifty years. Though agricultural production is at an all time high, less than 5% of the population now farms (Carmean (ed), 1976). The coal industry in the northern portion of the watershed is working at only a fraction of historic levels. Limestone in the watershed is being quarried with fewer employees than the past. The percentage of manufacturing and industrial jobs has also declined throughout the watershed. In recent years the greatest increase in the workforce has occurred in the service industries. This trend is expected to continue in the coming years. In addition, the tourism industry in association with the Hershey Park attractions, campgrounds, outdoor, and sightseeing has also become important to the economy of the watershed. This trend is only expected to increase in the future.

CHAPTER 7:



SWATARA STATE PARK

7. Swatara State Park

A. Project Background and History

The Swatara State Park is located along Swatara Creek in both Lebanon and Schuylkill Counties. The park is 3,516 acres in size and encompasses approximately eight miles of Swatara Creek within its boundaries. The origin of the park dates back to the early 1960's. Circa 1962, the Lebanon County Water Authority and Lebanon County Planning Department proposed acquisition of the property along Swatara Creek to support an approximately 775 ac. reservoir for recreational use and supplementary water supply for the city of Lebanon. The state declined supporting the project at that time due to water quality issues.

In 1964, Project 70 was enacted. This legislation authorized $41,000,000 for the development of 22 state parks throughout the Commonwealth. The idea for a state park along Swatara Creek was reintroduced at this time. In 1969, it was concluded that the water quality issues that had defeated earlier plans for the park could be addressed and the plan for Swatara State Park was presented to the public in August of that year. The project was approved by the State in December 1969, the governor gave final approval in March 1970, and land acquisition began in 1971. Land acquisition for the park was completed and Routes 443 and 72 were relocated by 1980. Swatara State Park is the last park proposed in Project 70 that remains undeveloped.

Photo 7-1: *View of relocated Route 72, abandoned roadway on right being used as a trail.*

Prior to any improvements being constructed, most notably the dam and reservoir, a stipulation was included in the project approval that water quality issues would need to be improved to the point that a productive fishery could be maintained in the reservoir and an adequate quality water would be discharged for downstream use.

Throughout the 1970's, Operation Scarlift spent over $3,000,000 to address abandoned mine drainage (AMD) and associated water quality problems in the watershed upstream from the park. In addition, over 800,000 tons of coal refuse was removed from within the park boundary. Water quality assessments completed in the 1980's indicated water quality was improving; however, it was still insufficient to allow construction of the dam and reservoir.

In addition, since the early 1990's numerous other mine drainage abatement and water quality improvement projects have been implemented in the Swatara Creek Watershed upstream from the State Park by the Northern Swatara Watershed Association, the Schuylkill County Conservation District, and the Pennsylvania Department of Environmental Protection (Pottsville District Mining Office). These projects included the Rausch Creek relocation, Stumps Run reclamation projects (1 through 3), diversion wells on Swatara Creek and Martin Run, limestone channels and drains on Swatara Creek, and constructed treatment wetlands on Lower Rauch Creek. As a result of these and the previously mentioned projects, water quality in Swatara Creek improved to the point that construction of the dam and associated reservoir at Swatara State Park was reconsidered.

Although the project continued through the 80's, activity was limited. In 1981, the Commonwealth completed a cultural resources inventory of the park property that detailed both prehistoric and historic features located there.

An Expanded Environmental Assessment was submitted to state and federal regulatory agencies as part of the Section 404/Chapter 105-water obstruction permit application process in 1990. However, it was rejected because of deficiencies concerning the wetlands, water quality, and environmental impacts. A meeting among the US Army Corps of Engineers (USACOE), US Environmental Protection Agency (EPA), and the Commonwealth of Pennsylvania resulted in the development of specific strategies to improve water quality and a commitment from the Commonwealth to implement them. These strategies were implemented between 1991 and 1993. In addition, studies to catalog the wetland systems in the park were completed between 1991 and 1995. A jurisdictional determination confirming the boundaries and locations for the project area wetlands was received from the USACOE in 1996.

An Environmental Impact Statement (EIS) for the proposed improvements was originally requested by the regulatory agencies. This request resulted in a series of scoping meetings being held between the agencies and Commonwealth in 1996. Following these meetings, the USACOE agreed to evaluate a permit application in lieu of an EIS with the stipulation that a decision based upon an evaluation of the application and public comment could be to: 1) issue the permit, 2) deny the permit, or 3) require that an EIS be prepared.

In January 1997, studies to support the preparation of the Section 404 and Chapter 105 permits were undertaken by the project consultants (McCormick, Taylor & Associates, Inc. and A.D. Marble & Associates Inc. as sub-consultants to Acer Engineers). Upon completion of the studies, including amphibian sampling of the project area, it was determined that the preferred alternative was the construction of a dam and reservoir at the

elevation of 473 feet above sea level. This alternative would result in a 753-acre lake with 685 boatable acres (> 2' in depth).

A permit application was completed and submitted to the USACOE in April, 1998. Public comment concerning the permit application was collected from July 15 through August 31, 1998. An estimated 80% of the comments received were in support of the proposed dam and associated reservoir. However, negative comments were received from the US Fish and Wildlife Service (USFWS), EPA, Sierra Club, Appalachian Audubon Society, and The Chesapeake Bay Foundation. The majority of these comments were regarding impacts to wetlands, vernal pools, and old growth forests that would result from the construction of a dam on the stream and resulting inundation of the reservoir.

In January 1999, prior to a decision being made by the USACOE, the Commonwealth withdrew its permit application.

In April 2000, the Pennsylvania Department of Conservation and Natural Resources (DCNR) announced that plans for the development of the reservoir in the near future were being halted. Amenities and improvements to the park that would complement the stream corridor without hindering possible future development of the dam and lake are now being prepared for implementation.

B. Description of Park and Proposed Park Improvements

As stated previously, Swatara State Park is located along Swatara Creek in Schuylkill and Lebanon Counties. Currently the park contains only minimal improvements, including removal of the abandoned buildings on the park property, removal of "culm" piles for water quality improvements, relocation of PA Routes 72 and 443 to accommodate the lake behind the proposed dam on Swatara Creek, and minor improvements to the abandoned Lebanon and Tremont railroad line for use as a bike/hike trail. In addition, a Lenticular Truss bridge from Lycoming County was relocated over Swatara Creek for hikers on the Appalachian Trail and other non-motorized vehicle access into and through the park. A variety of land use types are present throughout the park. These land uses range from disturbed mine areas to mature hardwood and evergreen forests to wetlands and ponds.

Swatara State Park also has a variety of cultural features within its boundaries. Prehistoric fossils can be found in the sedimentary rock of the Upper Mahantango Formation located south of Old State Road near the Schuylkill County line. In addition, Swatara Creek State Park is located near the Tulpehocken Trail, a major historic Indian trail. Areas along Swatara Creek within the park boundaries have a high probability for containing prehistoric artifacts associated with the Indian cultures that formerly resided along the stream. Several sections of the Union Canal, its locks, and associated dam can also be found within the park boundaries. Finally, a substantial section of the Lebanon and Tremont rail line runs through the park. The Lebanon and Tremont Railroad was a line purchased by the Reading and Philadelphia railroad following the demise of the Union Canal.

Photo 7-2: *Relocated lenticular truss bridge carrying the Appalachian Trail over Swatara Creek.*

The improvement plans proposed for the park could be divided into 1) construction of a dam and associated reservoir formation and 2) development of park amenities. The proposed dam would have inundate the park along the Swatara Creek to an elevation 473 feet above sea level. The "Big Dam" located at Inwood previously inundated much of the area proposed as reservoir in the park. This dam helped to supply water to the Union Canal until a massive flood in 1862 washed out the dam.

The proposed reservoir would provide "flatwater" recreation within the park including fishing, boating, sailing, etc. In addition, the reservoir might also be used as a supplemental source of drinking water for the City of Lebanon.

The park amenities would include day use areas including boat access points, trail access points, rest rooms, picnic areas, playgrounds, interpretive sites (historic and environmental), and scenic overlooks/views. Other amenities would include tent and modern cabin camping areas, an administration building, and a multi-use trail.

Additional management options for the development or expansion of the park may be developed as a result of the Swatara Creek Watershed River Conservation Plan.

CHAPTER 8:

SWATARA GREENWAY

8. Swatara Creek Greenway

Prior to the Swatara Creek Watershed Rivers Conservation Plan project being developed, the Dauphin County Department of Parks and Recreation had initiated work on a greenways project along Swatara Creek within Dauphin County. Concurrent with the county project, the Hershey Trust also initiated a study to develop a greenway along Swatara Creek for the property managed by the Hershey Trust. Both of these studies have since been completed and will be implemented in a manner consistent with the principles and goals of each lead organization. The plans have been approved for listing on the Pennsylvania Rivers Registry. As part of the River Conservation Plan for the Swatara Creek watershed, it was determined that the information concerning the Swatara Creek Greenway plans as well as their management options would be incorporated into the plan document.

Project Background and History

The Greenway plan prepared for the Hershey Trust on the northern Dauphin County section of Swatara Creek, served as the impetus for the County's plan on the lower Swatara Creek stream corridor. In October 1994, the first public informational meeting was held to inform interested persons of the proposed greenway projects.

Following this meeting, data collection for the project was undertaken by the plan preparers, Natural Lands Trust and Melham Associates. The preliminary findings from this data collection were presented at the first official public hearing for the project in January 1995. This meeting was utilized to solicit input from the interested public about the project area as well as inform them about the about the planning process for the River Conservation Plan.

Two additional public meetings were held in late January and early February to solicit input from the public about their hopes and desires for the Swatara Creek watershed, as well as any other thoughts or concerns regarding the watershed. Surveys were distributed at these public workshops to discern the opinions of the attendees as well as other individuals located in and around the project corridor. Personal interviews were also conducted with individuals identified by the project steering committee as being "Key Persons". These people would have opinions and insight to the project corridor that would be valuable to the development and completion of the Greenway/Rivers Conservation Plan.

In June 1995 the "Draft" Greenway/Rivers Conservation Plan was presented to the public. The public meeting presented the three-phase approach for protecting the lands adjacent to this section of Swatara Creek as recommended by the consultant and the Dauphin County Parks and Recreation staff. A period of public comment was also opened at this time to receive feedback on the proposed management options. After the close of the comment period the consultants and the Dauphin County Department of Parks and Recreation addressed and incorporated the public comments into the "Revised" Greenway/Rivers Conservation Plan.

The "Final" Greenway/Rivers Conservation Plan was presented at a public meeting held in April 1996. At this meeting the final management recommendations for the Swatara Creek project corridor were presented as well as a tentative timetable for their implementation.

The "Final" Greenway/Rivers Conservation Plan was circulated to the local municipalities for formal acceptance in May, 1997. A petition for formal inclusion of the plan on the Pennsylvania Rivers Registry was submitted to the state in September 1999. Final approval for the plan is scheduled for September, 2000. Copies of the Greenway Plan can be reviewed at the Dauphin County Parks Department (717) 599-5188.

DAUPHIN COUNTY GREENWAY PLAN

The management options in the Dauphin County Greenway Plan were divided into three phases. In general, these phases present increasingly challenging efforts for developing the Greenway.

Phase 1: The first phase of the management plan is meant to be a starting point where the most easily achieved actions are initiated. The primary focus of Phase 1 is enacting municipal measures for the protection of the Swatara Creek project corridor. These measures would include enacting a stronger floodplain ordinance and use of conservation zoning along Swatara Creek. In addition, Phase 1 includes acquisition of four canoe access points, the marking of bike and hiking trails within the corridor on public property. The final management option in Phase 1 would be the reconstruction of the covered bridge at Clifton. Details of these plans can be found in the Swatara Creek Greenway & River Conservation Plan (Natural Lands Trust, 1997).

Phase 2: The second phase of the project encompasses Phase 1 actions and proposes additional protections and enhancements for the project corridor. These include development of individual municipality protections for tributaries and natural features located outside of the narrow Swatara Creek corridor. Acquisition of natural features of unique or exceptional nature for use as municipal park sites and continued acquisition of agricultural easements through the area is expressed in this phase. Phase 2 also proposes to expand the trail network initiated in Phase 1. This expansion is to include a hiking trail along the former Union Canal Tow Path wherever possible. Restoration of a former Union Canal Lock Structure and stream bank along the greenway is also proposed. Finally, the largest proposed management option for Phase 2 would be the acquisition of a regional park in and around the Swatara Creek Greenway. The Swatara Creek Greenway & River Conservation Plan (Natural Lands Trust, 1997) details the need and advantages of these options.

Phase 3: The final phase of the project is meant to build upon the successes of Phase 2 as well as implement any other uncompleted facets of Phase 2, whenever opportunities become available. Phase 3 expands upon the development of the voluntary easement program, for the protection of agricultural lands, detailed in Phase 2. During this phase, expansion outside of the stream corridor to include all of the large agricultural areas in the vicinity that may be interested in the program is anticipated. Likewise, the expansion of the conservation of natural areas in the study area via conservation easements is also seen as an important management item in Phase 3.

Biking and hiking trails developed in both Phases 1 and 2 will also be expanded as part of Phase 3 of the management plan. The extensions propose to connect the trails to features located outside of the stream corridor. Examples listed in the Swatara Creek Greenway & River Conservation Plan (Natural Lands Trust, 1997) include the Middletown Reservoir, Middletown High School, and the Old Reliance Farm located in Lower Swatara Township. Connectors to these areas are to be obtained through voluntary donations or subdivision negotiations.

Phase 3 also recommends improvements and possible restoration of the Union Canal and towpath, possibly leading to the restoration of a small segment of the canal. As stated in the greenways document, this is a very long-term endeavor. A final additional long-term endeavor included in the management options of Phase 3 includes restoration of the quarries in the project area. Although the greenways document stresses that the quarries may be viable for decades, it also recommends that efforts be made to allow utilization of the lands following the closure and restoration of them. Finally, the document recommends continued stream bank and riparian forest restoration.

CHAPTER 9:

PROJECT ISSUES, CONCERNS, CONSTRAINTS AND OPPORTUNITIES

9. Issues Concerns Constraints and Opportunities

A. Project Area Characteristics

ISSUES AND CONCERNS

The rapid population growth occurring within the watershed, especially in Berks, Dauphin, and Lebanon Counties is the most important issue associated with the Project Area Characteristics. As presented in the population write-up, the watershed has seen a population increase of 40.5% from 1960 through 1990. Some municipalities within the watershed experienced nearly 200% growth in the thirty years between 1960 and 1990. All indications suggest that this growth trend will continue through the year 2000 census and beyond. This population growth is occurring in locations that were traditionally in agricultural or forested land use, away from the traditional urban population centers, which are actually losing residents.

This increasing population requires housing, transportation, water, sewage, and other amenities associated with residential development. Development of traditional rural/agricultural areas to accommodate the emigration from the urban areas threatens the aesthetics and quality of life that made these areas so appealing to live in. Increased development in close proximity to Swatara Creek and its tributaries will continue to erode the aesthetics of the stream corridor in the watershed.

Increasing population further away from the urban population centers is also resulting in longer commutes and increased congestion on roadways in the watershed. Large-scale roadway upgrades to address congestion convert farmland, encourage further emigration, and contribute to the rapid expansion of highway related commercial areas throughout the watershed. The expansion of the highway related commercial areas again results in congestion and traffic delays.

The population growth and associated development has had a major, permanent effect on the long-term land use patterns in the watershed, especially Berks, Dauphin, and Lebanon Counties. Along with residential and transportation development, industrial development has also emigrated from the urban centers into the rural landscape. Located primarily along the major transportation corridors in the watershed, this is primarily light industry and trucking which have gradually replaced the heavy industry (steel, coal, manufacturing, etc.) that was traditionally found in the watershed.

Other land use issues of concern are the conversion of family farms to industrial farming operations as a way to remain profitable in the face of tighter profit margins in agriculture. Although these operations prevent the conversion of farmland there are issues concerning manure management, discharges, odors, and traffic that are significant and controversial.

An uneven distribution of wealth between the counties and communities of the watershed, caused by population loss and higher levels of unemployment and underemployment, may result in the uneven implementation of the management options proposed in this plan.

OPPORTUNITIES

This project offers a unique opportunity for municipalities of the watershed to work together to look at the region on a watershed basis. By doing this, land use plans can be developed on a watershed scale rather than a municipal scale. This would result in better allocation of the limited available land resources for the development necessary to continue economic growth in the region as well as protect the resources and aesthetics that make the area a unique and desirable place to live.

B. Land Resources

ISSUES AND CONCERNS

The loss of farmland and farmland soils is a primary concern with regard to land resources. The same features that contribute to land being well suited for agricultural production (slope, drainage, stability) also make these areas attractive for development. The increasing population, as discussed in the Project Area Characteristics, is settling in areas that were traditionally farmed. High land prices and reduced profits in agriculture are making it difficult for farmers to continue in the business. Programs in place to protect farmland have been successful in some instances; but in others, property values assigned under old tax assessments make it economically unfeasible to establish Agricultural Security Areas and Agricultural Conservation Easements.

The shifting industrial base of the watershed out of the traditional population centers is leaving abandoned commercial/industrial "Brownfield" sites in these communities. These sites may have environmental cleanup concerns associated with them.

Abandoned and active mine and quarry properties are also an area of concern. These sites are potentially dangerous and can be a source of degradation in the watershed, especially the abandoned facilities. In addition, the abandoned quarries are often filled with groundwater. Because of this, these areas could be a direct source of contamination entering the groundwater in the area.

Expansion of the existing landfills in the watershed or the development of new landfills is a concern as the population of the region increases and the level of refuse imported from out of state also rises.

Finally, sinkhole development has always been a concern in the karst limestone formations of the watershed. However, since the majority of the area was in agricultural production, the impacts of sinkhole development were minimal. With increased development in the Karst areas, sinkhole development is becoming a greater potential safety and economic hazard. In addition, the increased runoff associated with development is leading to more frequent sinkhole formation in and around these areas.

OPPORTUNITIES

The abandoned mines, quarries, and commercial/industrial buildings or "Brownfields" in the watershed offer a great opportunity for redevelopment. Utilizing PA Act 2 funding from the state, these areas can be assessed, remediated, and be put back into productive use. Often, these areas already have the necessary infrastructure

for industry and are located near other industrial and commercial support enterprises. Reutilization of these sites would help to reduce some of the pressure to develop existing farmland and reduce urban sprawl.

Developing a partnership with Ft. Indiantown Gap (FIG) offers an opportunity to obtain environmental improvement on the largest land holding in the watershed. A mutually beneficial relationship would allow FIG to continue training exercises and activities, while protecting and enhancing the important flora and fauna located on site is a great opportunity for the watershed.

C. Water Resources

ISSUES AND CONCERNS

Impacts to water quality are the predominant concern in the entire watershed. Decades of abuse and degradation have given way to improvements in the quality of water in the streams of the watershed. However, most of the watershed remains impaired to some degree. Today, most of the impairment to the waters of the watershed is a result of non point source pollution (NPS). Abandoned Mine Drainage (AMD), a result of coal mining in the northern portion of the watershed, is a primary cause of water quality impairment in the Schuylkill County portion of the watershed. Agricultural and nutrient runoff is a primary cause of impairment to the streams in the agricultural areas of the southern Schuylkill, Berks, Dauphin and Lebanon County sections of the watershed. Urban runoff from the rapidly developing areas of Dauphin and Lebanon Counties is a final major NPS cause of stream impairment in the watershed.

Public water supply reservoirs, municipal well, and private wells currently supply the need of the region. Increased population and development in the watershed has resulted and will continue to result in a higher demand for water. Increased surface water and groundwater withdrawals to meet this demand may result in lower base flows and higher summer and lower winter temperatures in streams in the watershed. This could be very important in the coldwater and trout stocked streams of the project area.

Increased development is reducing the amount of riparian buffers along the stream corridors in the watershed. This results in increased runoff, erosion and sedimentation, thermal increases, and loss of aesthetics along these streams. In the areas of the watershed that are experiencing increased development, the resulting increase in impervious surface is increasing runoff into the streams and raising peak runoff volumes in the streams. This same development is reducing the infiltration of precipitation for groundwater recharge.

Industrial farming operations (concentrated animal operations (CAO's) and concentrated animal feeding operations (CAFO's)) are becoming more prevalent in the watershed. CAO and CAFO practices, especially those associated with disposal of waste products are potentially a source of serious degradation to the streams and groundwater in the watershed.

Water filled quarry pits and mines, especially those in the karst topography of the southern portion of the watershed, directly expose groundwater to potential contamination. Application of pesticides and fertilizer as part of farming operations can also result in contamination of groundwater supplies and is a concern.

The loss of beneficial floodplain values is a concern in the watershed. Development in and around the floodplains of the streams in the watershed can cause increased flooding problems downstream as well as reduce infiltration and groundwater recharge from rain/storm events.

Finally, the structural integrity of the dams and condition of some of the lakes (most notably Stoevers Dam and Sweet Arrow Lake) in the watershed are deteriorating. Failure to address these situations will, at a minimum, result in the loss of recreational opportunities and could compromise public safety.

OPPORTUNITIES

This project offers the opportunity to develop and coordinate a comprehensive watershed- wide assessment of the streams within the watershed. Utilizing a group of trained volunteers to monitor and sample the waters, management decisions can be made regarding which streams need to have restoration/rehabilitation projects completed on them. The success and progress of implemented projects can be monitored and assessed in the same manner.

The water filled quarries in the southern portion of the watershed offer the potential for use as a supplemental water source for the region, if potential contamination issues and ownership can be addressed.

D. Biological Resources

ISSUES AND CONCERNS

Invasive species are the greatest concern with regard to biological resources in the watershed. These plant and animal species (especially purple loostrife (*Lythrum salicaria),* tall reed (*Phragmites communis),* multiflora rose (*Rosa multiflora),* and zebra mussel (*Dreissensia polymorpha))* reduce ecological diversity and habitat and can cause significant economic damage.

The loss of forested areas, wetlands, and riparian buffers in the watershed, as a result of increased development, eliminates habitat for sensitive species (neotropical migrant birds, wetland species, and forest interior species) and reduces the availability of travel corridors for movement of wildlife through the watershed.

No old growth forest component exists within the watershed.

Expansion of the FIG training facility could have adverse impacts on wildlife, habitat, and species of special concern that inhabit the property.

OPPORTUNITIES

The project offers the opportunity to develop a natural heritage inventory for species and habitats of special interest in the two counties in the watershed that do not currently have one (Lebanon and Schuylkill).

The proposed development and expansion of the FIG training facility offers the opportunity for a partnership to

be forged with the facility to protect and enhance important habitats, while allowing for continued use of the lands on the facility for military training.

E. Cultural Resources

ISSUES AND CONCERNS

Continued growth of the population in the watershed will stretch the capacity of local parks and recreation facilities to provide for recreational needs.

Continued development in the watershed, especially around the stream corridors and the historic farmsteads of the region, threatens to destroy significant historic and prehistoric cultural features.

Access to the streams in the watershed for recreational activities is limited.

OPPORTUNITIES

The Swatara Creek water trail offers the opportunity for developing formal access points to Swatara Creek for canoeing/boating or other recreational pursuits. The water trail also offers an opportunity for recreational users to become more familiar with the unique and significant natural and cultural features in close proximity to the trail.

Development of a trail system/greenway utilizing Swatara Creek, its major tributaries, abandoned rail lines, Swatara State Park, and the Union Canal could provide a major source of recreation, protection of significant cultural resources, and travel through the watershed.

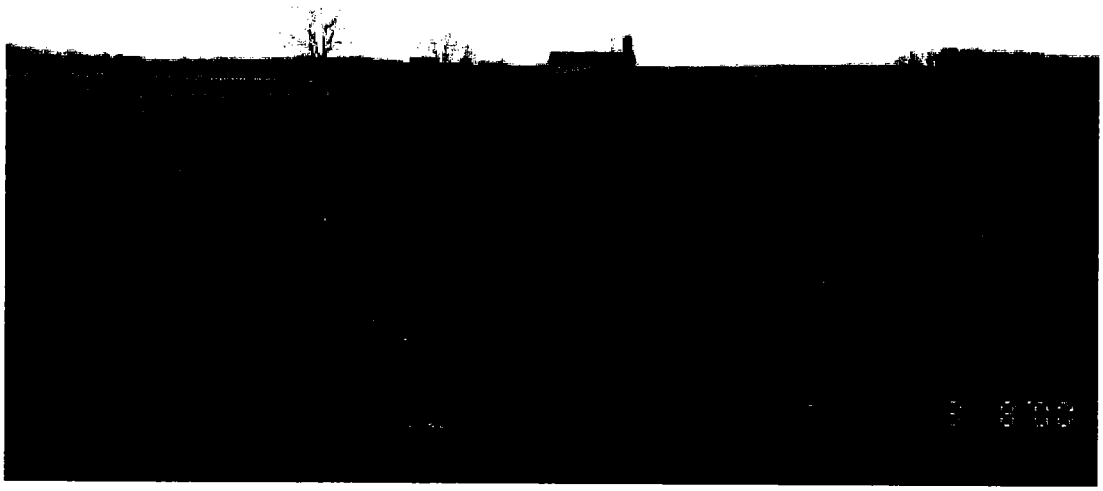
Improvements to and expansion of the Union Canal Tunnel Park and other historically significant features would result in expanded recreational opportunities and greater interpretation and protection for significant features within the watershed.

F. Other Resource Opportunities

Development of the Swatara State Park would assist in developing tourism in the northern Lebanon, Southern Schuylkill County portion of the watershed. This would also bring additional revenues into the region.

Development of the Swatara Greenway would provide a contiguous source of habitat and travel for wildlife and recreation in the watershed.

CHAPTER 10:



MANAGEMENT OPTIONS

10. MANAGEMENT OPTIONS

The following Management options were developed to address the issues, concerns, constraints, and opportunities presented in Chapter 9. These management options will be prioritized and placed in an Appendix F of this document. Specific projects will also be included with these management options in Appendix F. This matrix will list potential partners, potential funding sources, and recommended beginning dates.

A. Project Area Characteristics

Raise the sensitivity and awareness of County, Local, and Municipal Planning Organizations (MPO's) to farmland and habitat loss.
Education of decision makers about the importance of the farmland and habitats of the watershed, along with available measures to protect these resources is essential to reducing their loss. Utilizing existing land control ordinances, in conjunction with modern design and open space planning can allow for continued development without the complete conversion of special habitat areas and agricultural settings.

Work with local, county, and regional planning organizations to develop and carry out plans for the protection of environmental amenities in the watershed.
Educating decision makers about important features in the watershed including, but not limited to wetlands, riparian buffers, and large forested tracts is the first step in protecting them. Support tax break for conservation and innovative developments. Utilize transfer of development rights as a method of protecting them.

Complete a comprehensive examination the traffic conditions of the watershed. Identify areas of congestion, its causes, and impacts. Develop a strategy to address these problem areas utilizing alternative forms of transportation (mass transit, car-pooling, bike lanes) where possible.
Continued population growth in the watershed is predicted for the foreseeable future. The resulting increase in traffic on rural and minor arterial roadways will continue to compound congestion problems that already exist within the watershed. Working together with Penn DOT and local planning organizations to identify and prioritize existing and future problem areas is an important step to solving them. Developing and implementing potential solutions to congestion problems without major new construction and before the problems become unmanageable would be attractive to Penn DOT and the local municipalities experiencing the growth and development.

Update comprehensive plans for the municipalities of the watershed that are over 10 years old. Include environmental resource inventories and protection of resources as part of the document. Complete multi municipal/multi county plans where prudent and feasible.
Comprehensive plans are living documents that need periodic review before they become outdated and irrelevant to the current conditions of the community. Periodic review and update of the plan incorporates new issues and removes areas that are no longer relevant.

Support implementation of land conservation techniques in subdivision design.
Rural clustering and other modern design methods can greatly reduce the area of land utilized as part of a residential subdivision development. Utilizing incentives such as increased lot density can promote these

conservation practices without the negative adversarial aspects associated with ordinances. Support initiatives to return residential development to traditional urban centers. Utilize in-fill development to reduce sprawl out from built up areas

Assess how increasing population is impacting the watershed. Explore establishing growth areas and rural areas within the municipalities of the watershed.
Utilizing planning funds to establish these growth areas will allow for the orderly development of municipalities, while protecting important open space and farmland. This situation allows municipalities to better allocate limited resources towards expensive infrastructure projects. It also reduces the costs of municipal services by permitting growth in the areas that can best support them. Looking at the recent effects of population growth on municipalities can also lead to steps being taken to address any potential problems in the municipalities just experiencing this growth.

Update and implement Act 537 sewage management plans that are over 10 years old for the municipalities in the watershed. Replace on-lot septic systems in the established growth areas. Assist in upgrading older on lot systems in the established rural areas.
Increased population in the watershed increases demands for services including sewage. Proactive planning and development of management plans for sewage systems in the watershed is important to improve/maintain the quality of effluent discharged into the streams of the watershed.

Actively enforce land uses controls for areas along waterways in the watershed. Especially keeping development out of floodplains. Develop strategies to protect riparian zones.
Almost every municipality in the watershed has zoning ordinances and floodplain development regulations; however, increased encroachment on the stream corridor has been noted. Protecting these riparian and floodplain zones is critically important to the future health of waterways in the watershed.

Partner with local universities to develop mutually beneficial programs for student education, and protection and enhancement of the watershed. Identify other volunteer and non-profit groups to coordinate activities and projects with to avoid duplication of effort.
A major difficulty associated with volunteer groups is a lack of personnel/assistance in completing everyday tasks associated with running the organization. Utilizing college students would allow more time for projects in the watershed as well as providing real word experience to the college students.

Utilize the Rivers Conservation Plan as a tool in protecting, managing, and preserving the Swatara Creek watershed.
The Swatara Creek Watershed River Conservation Plan is meant to be a living and working document. The management options developed are for issues identified as important during the course of the study. Changes in conditions and attitudes may also result in changes to the management options. This document should be periodically updated, especially the management options, to address changes in the watershed as well as changes in attitude concerning what issues are important in the watershed.

B. Land Resources

Expand upon the partnership in place between the Lebanon County Conservation District and Ft. Indiantown Gap (FIG) for environmental resource and endangered species protection.
FIG is the largest single landholder in the watershed. It contains habitats and species not found in the rest of the watershed. Expanding the existing partnership including both Dauphin County and other conservation groups from the watershed would be mutually beneficial. It would ensure that the species and habitats are taken into account when all management decisions are made, would assist organizations in completing important projects in the watershed, and help FIG to obtain the trust and respect associated with being good stewards of their resources.

Continue and expand watershed wide cleanup days.
Clean up days on Swatara Creek have become an annual event, combining the enjoyment of a family canoe day on Swatara Creek with the service of litter cleanup. In addition to SCWA, several other groups have initiated cleanups on tributaries and headwaters of Swatara Creek. Although canoeing opportunities on these other tributaries is limited, other hiking or biking outings for cleanups should be explored and implemented in conjunction with the Canoe the Swattie Day, if feasible.

Identify "Brownfield" areas within the watershed for possible assessment, cleanup, and redevelopment. Identify other potential hazard areas within the watershed.
Pennsylvania ACT 2 legislation provides funding for communities to redevelop their abandoned industrial/ commercial sites. By revitalizing these abandoned buildings, eyesores are removed from the community, local tax and employment bases are preserved, and undeveloped "Greenfields" are protected. Redevelopment of residential areas, like those completed by Habitat for Humanity in urban areas is equally as important in the preservation of "Greenfields".

Support current recycling efforts within the watershed. Consider expanding theses efforts as an alternative to further landfill development.

Develop an educational program for demonstrating and promoting riparian buffers, especially for use in FFA, 4H, scout groups, and secondary schools.
The majority of the watershed is still in agricultural use, and is controlled by farmers. By educating future farmers about the environmental benefits of buffers to the watershed, the environment can be protected in two ways: 1) The children relaying the information to their parents and they in turn implementing it; or 2) educating the future owners and users of the land at an early age and having them implement it when they begin to run the operation. This program can be an expansion of programs already implemented by Lebanon County Conservation District; or a new program developed and implemented in all of the schools in the watershed.

Support pollution control legislation (Bottle Bill).

Encourage local farmers to enroll their property in agricultural security areas, set aside programs and conservation easements.
As presented earlier, farmers control the majority of the land in the watershed. Although pressure to develop

these farmlands is high there appears to be a desire for lands to stay in agriculture if economically possible. Assisting these farmers by informing them of tax advantages (property, inheritance) of conserving farmland as well a potential economic advantages associated with new set aside programs (Conservation Reserve Enhancement Program). ASA's need to be updated by municipalities at least every seven years.

C. Water Resources

Implement the remaining projects for reclaiming AMD impacted streams in the upper Swatara Creek watershed developed by Dan Koury in the Swatara Creek Reclamation Document.
The rehabilitation plan developed by Dan Koury in 1998, prioritizing projects according to importance and feasibility, has been successfully implemented on several projects in the watershed. The substantial improvements seen in the quality of water exiting the mining region is testimony to the effectiveness of this plan. Continued implementation of the plan should be considered essential to the long-term improvement of water quality in the northern portion of the watershed.

Utilize the 1998 - Swatara Creek Watershed Rehabilitation Plan by Dan Koury as a model to develop rehabilitation plans for agricultural and urban runoff problems in each of the major drainages in the watershed.
As stated previously the restoration plan developed by Dan Koury has been shown to be effective in addressing AMD issues in the northern portion of the watershed. Utilizing this same comprehensive methodology to address other NPS issues in the remainder of the watershed, with adjustments for drainage size and scope, should be equally effective for the remainder of the watershed.

Develop a comprehensive plan to protect and monitor water quality and the results of improvements to streams in the major drainages of the watershed. Tailor the monitoring programs to sources of potential degradation in each drainage. Utilize this information to develop a database of information for the entire watershed.
Water Quality has been presented as the most important issue in the watershed according to the survey of issues conducted by SCWA. To utilize the limited restoration funds effectively and efficiently, a comprehensive system of determining baseline conditions, identifying locations for projects, and monitoring the success or failure of these projects. Work for local streams, especially those on the 303(d) impaired waters list, to meet TMDL attainment.

Develop and implement streambank stabilization and habitat enhancement projects for the streams in the watershed.
Addressing NPS pollution often involves the stabilization and restoration of streambanks along the affected waterway. Likewise stream habitat enhancement projects are utilized to increase the quality and quantity of habitat for fish and invertebrates. Projects like those proposed on the Upper and Lower Little Swatara streams are good specific examples of these types of projects.

Develop a comprehensive management plan for the Quittapahilla Creek watershed.
The Quittapahilla Creek Watershed Association is a well-established organization in the Swatara Creek watershed. They feel the need to develop a comprehensive management plan specifically for the Quittapahilla

watershed that complements the objectives of the Swatara Creek Plan.

Develop an agreement for habitat and water quality improvement in Manada Creek with Ft. Indiantown Gap.
Much of the Manada Creek watershed is located on FIG property, previously mentioned as the largest landholder in the watershed. Manada Creek is listed as containing a reproducing brook trout population. Qualitative indications of habitat and species decline has led to concern by the Doc Fritchey Chapter of Trout Unlimited (TU), an organization that serves as a caretaker to the stream. A formalized agreement will allow TU to work with FIG on a watershed basis to protect and enhance the stream while allowing for continued training at FIG.

Develop a watershed organization for protection and enhancement of the Little Swatara Creek.
This option has been initiated and funded by a 2000 Growing Greener Grant. However, continued support and assistance will be needed for this fledgling group.

Develop storm water management plans for developed areas in the major drainages of the watershed. Identify new technologies for enhancing infiltration and groundwater recharge, especially in areas of urban development.
As stated previously, development in sections of the watershed is growing at a rapid pace. Limiting the adverse effects caused by this development on peak flows (increased) and base flows (reduced) through implementation of an innovative storm water management plan would greatly improve the long term outlook for the receiving waters and Swatara Creek. New permeable pavement systems have been shown to be effective in reducing runoff in paved areas as well as increasing infiltration into the ground.

Make the stream corridor more user friendly.
There are many access points, points of interest, recreational facilities, etc. located in the watershed; however, locating many of these places is difficult. Developing the Swatara Creek Water Trail is a great first step in making the watershed more user friendly. Utilizing or combining this and other mapped amenities in the watershed together to produce a useage map along with identifiable signing of the amenities will improve access and usage of the facilities in the watershed.

Develop a plan of action to preserve and rehabilitate the infrastructure of the publicly owned lakes in the watershed, especially Sweet Arrow Lake and Stoevers Dam.
The Swatara Creek watershed contains no natural lakes. Flatwater recreation is limited to those manmade facilities open for public use. With the Swatara State Park dam being indefinitely withdrawn from the permit process, the existing resources will become even more important as sources of recreation in the watershed. Rehabilitation or repair of these facilities (notably Sweet Arrow Lake, and Stoevers Dam) is essential for their long-term survival and use.

Develop areas for handicap access to Swatara Creek or other tributaries in the watershed.
There is minimal handicap access to the amenities in the watershed. Development of access areas including

fishing piers and stream accesses will maximize the use by this special population.

Continue work to restore the fishery on the northern section of the watershed. Expand these efforts to assist with reestablishing the migratory fish population in the watershed and development of a stream habitat enhancement plan for other stream sections in the watershed.
Water quality in the northern portion of the watershed has greatly improved fish populations and diversity in the streams of this area. Streams once considered sterile now contain diverse fisheries (generally warm water species). Continued improvement is needed to reestablish more pollution intolerant species of fish and invertebrates. Continued success of the shad restoration program in the Susquehanna River may result in the return of this migratory fish to the watershed. If this is the case, structures to assist the shad in bypassing the low head dams on the streams should be considered.

Support the development of the shad population into the watershed.
Return of the shad to one of its historic nurseries would result in a cultural, environmental and economic benefit to the Swatara and could result in attempts to return other species that previously existed within the watershed.

Develop an educational program for elementary and secondary schools on water quality and the responsible use of the watershed.
Educating youth is the best chance for long-term protection and improvement in the watershed. The better our younger population understands the threats and needs of our streams, the more likely they will work to protect them as they get older.

Inventory riparian buffers in the watershed. Identify areas that need to have riparian buffers established.
Riparian buffers serve a multitude of functions, from filtering runoff to providing thermal protection to streams, to providing travel corridors for wildlife. Identifying areas that need these buffers and developing buffers on them will provide all of these functions listed as well as stabilize the geomorphology of the stream channel.

Inventory NPS pollution problems in the major drainages of the watershed, develop a hierarchy and implementation plan for addressing these problem areas. Promote the development of conservation landscaping and management practices to reduce this sediment load.
NPS pollution has replaced point sources as the major impairment of waters in the commonwealth as well as the watershed. Steps to prioritize and address these problems in the watershed must be initiated to efficiently obtain and utilize limited remediation funds.

Expand sewage capacity in the areas with the highest projected growth rates.
Areas of high growth can overwhelm municipal treatment systems and on site septic systems have a limited life span. Therefore, expanded capacity in the plants is the most reasonable method of addressing potential degradation to local waterways.

Work to ensure that development does not occur in floodplain areas.
Municipalities within the watershed have regulations limiting development in floodplain. However, as observed while canoeing the Swatara Creek (in Dauphin County), development is encroaching closer and closer to the

stream channel.

Investigate possible uses for by-products of mining or other industrial operations in the watershed.
One of the newest fields of research is obtaining marketable resources out of mine drainage. These resources include metals and acid. Byproducts of any such discovery would be a potential source of funding for watershed products as well as cleanup of degraded water.

Stay involved with the Swatara State Park Project. Support completion of a study to determine if a reservoir in the park is a preferred option for a supplementary water supply for Lebanon County and flow augmentation for the Susquehanna River.
Although the original proposal for developing a dam and lake in Swatara State Park has been taken off of the table, the development of the state park is still important to the region as well as the watershed. Development of the park will increase use of the park as well as bring a new stream of revenue in to the area. Although the construction of a dam that serves as a strictly recreational facility has been dismissed the need for a supplemental water supply and flow augmentation to the Susquehanna River is still a potential need for the dam and associated lake at the state park.

D. Biological Resources

Preserve ecological and visual amenities in the watershed. Utilize both voluntary protection and market purchase for preservation. Develop funding sources and a regional land trust organization to facilitate these actions.
The steps of this option are already in motion. Several groups including agricultural preservation boards, conservation districts, and land conservancies are working to protect the features that increase the livability of the region from complete development. Other organizations, including a regional land trust, are in the process of being formed.

Identify areas of significant invasive species populations. Develop an integrative management plan to control these species.
Invasive species are a significant problem within the watershed. They reduce diversity, are of limited habitat value, and limited in their ability to stabilize streambank soils.

Educate the public to the dangers and modes of transport of invasive species, including the zebra mussel, to reduce the chances of infestation in the watershed.
The zebra mussel is not established in the watershed, but it has been identified in the Susquehanna Drainage. Because it is hardy and can be easily transported into the watershed, education to the users of the watershed is extremely important.

Identify riparian buffers in the major drainages of the watershed. Identify areas for further riparian buffers creation to assist wildlife travel corridors.
As stated in the water resources section, reestablishing riparian buffers would have multiple benefits including as use for wildlife habitat and travel corridors.

Consider and if appropriate complete Natural Heritage Inventories for Lebanon and Schuylkill Counties. Assess the watershed for species of special concern. Develop and implement a plan for protection of these resources.
Natural Heritage Inventories completed for Berks and Dauphin Counties can be utilized as blueprints to complete studies in Lebanon and Schuylkill Counties. When completed a comprehensive view of special features in the watershed will be obtained and protection priorities and strategies can be developed.

Inventory wetlands in stream corridors for protection and possible enhancement.
NWI maps, hydric soils, and other secondary resources can be used to determine the major locations of wetlands in the watershed, especially along the stream corridors, and determine which would be the best candidates for restoration and enhancement. The wetland located along Route 422 at the headwaters of Quittapahilla Creek is a good example of a wetland for potential enhancement.

Look into and if appropriate, establish a local chapter of PA Cleanways.
PA Cleanways is a Non-Profit Corporation helping people clean up their environment. The goal of the organization is to protect, restore, and maintain the environmental and scenic qualities of roadways, waterways and pathways from illegal dumping and littering. Utilizing this group to address littering/dumping problems along the roadways and trails of the watershed, in conjunction with the work already being completed by other organizations on the streams of the watershed, would enhance and protect the aesthetic of the region.

E. Cultural Resources

Encourage and develop educational programs on the environment in the watershed and especially Swatara State Park.
Future protection of natural resources and amenities in the watershed is dependent upon educating the youth of the watershed to their value and importance. Utilizing Swatara State Park and other environmentally significant locations in the watershed gives students a hands-on look at the importance and needs of these features.

Develop better access to Swatara Creek and its tributaries for recreational use.
Limited access to Swatara Creek and some of the larger tributaries in the watershed increases pressure at the existing access points. Developing more access areas along the streams will more evenly distribute usage and pressure along the streams and protect the resource.

Develop rail trails from Swatara State Park Railroad Corridor to Lebanon and the Conewago Trail and in the Union Canal corridor from the Tulpehocken watershed boundary to Hershey and Middletown.
Portions of these projects are already being developed. Completion of the projects would provide for miles of recreational trail use and stream access; as well as provide corridors for alternate transportation in the watershed.

Expand upon the recently developed Swatara Creek Water Trail.
The Swatara Water Trail contains areas proposed for additional access points. Developing landowner

agreements for these areas would open up the trail to greater usage by providing the opportunity for shorter trips. This would also provide greater access to the stream and trail.

Increase recreational opportunities within the watershed, including park, recreational fields, stream accesses, etc.
Continued population growth in the watershed will tax and eventually overwhelm the park and recreation facilities of the area. Developing recreational areas (both passive and active), especially in floodplains, would address the recreational needs as well as floodplain protection.

Increase passive recreational opportunities in the watershed.
Not all recreation is active. Developing areas for quiet recreational pursuits including scenic views and nature areas will protect significant features in the watershed and provide recreational enjoyment without the substantial cost of developing active recreational facilities.

Complete proposed enhancements to Quittie Creek Nature Park.
The Friends of Old Annville in association with numerous other organizations and individuals has developed the Quittie Creek Nature Park as an area for passive recreation and nature. Development of interpretive sites and improved access are part of the long-term goals for the site. As a significant resource along the largest tributary to Swatara Creek developing and implementing these plans would be beneficial to Swatara Creek and the watershed.

Develop a plan for the preservation of historic resources in the watershed.
Because the watershed extends over four different counties, historical resources are recorded in varying styles at varying levels of detail. Compiling a synopsis of all of the information pertinent to the watershed would produce a comprehensive look at what information is available regarding the history of the watershed, and what information is lacking.

Complete a comprehensive park and recreation plan for the watershed. Address handicapped access as a portion of this report.

F. Swatara State Park

Maximize the recreational potential of the state park.
Although the Swatara State Park Dam has been removed from the permitting process, Swatara State Park remains an important feature in the watershed. Development of facilities and amenities is essential to maximize the recreational potential of the park as well as increase attendance.

Support any development of the state park to increase tourism as an economic presence in the region.
Tourism is the fastest growing industry in the state. The Swatara State Park has the potential to have a significant positive impact on the economy of the watershed by increasing the volume of visitors coming into the watershed. However, making the park a regional visitors attraction will require improvements and amenities to being completed.

G. Swatara Creek Greenway

Implement management options developed in the greenways plan.
The management plan developed as part of Swatara Creek Greenway and River Conservation Plan provides a comprehensive blueprint for developing a greenway along Swatara Creek in Dauphin County. Implementing these options is important for protecting valuable riparian areas and enhancing the recreational and aesthetic features along the stream.

Develop a trail and greenway master plan for the entire watershed.
Numerous trail systems and greenways are located within the watershed or are planned for the future. These systems range from well maintained through trails like the Appalachian and Horse Shoe trails, to small-unimproved trail loops in the woodlands of the watershed. Developing a comprehensive plan for these areas would identify and inventory the resources located within the watershed. It would also identify areas being considered for future trails/greenways. This information could be utilized to develop linkages between existing and future trails and to allocate resources to areas that are in the greatest need for maintenance and upgrades.

Create an overlay zone for stream buffers in the watershed.
An overlay zoning district is a special-purpose zoning district that is superimposed over existing zoning jurisdictions. It is designed to provide additional standards and regulations for specific areas based on special conditions such as environmental factors, historical features or neighborhood preservation. It can be used to protect the natural and scenic qualities of Swatara Creek by restricting development within the overlay zone. This overlay zone can (and should) include the floodplain and other features that the steering committee and/or municipality wants to protect. When used correctly, overlay zoning is a good land use development tool.

Increase partnerships with public and private entities to foster land stewardship.
Expanding upon the partnering initiatives started by the SCWA. There are limited funds and resources available to complete all of the projects proposed. In order to obtain the greatest return for the effort and resources expended, partnering with other organizations that have the same goals and objectives is essential. Compiling a comprehensive list of all organizations in the watershed and their objectives is an important first step in this process.

Expand greenway initiatives into Lebanon and Schuylkill Counties.
The Greenway proposals along Swatara Creek in Dauphin County can and should be expanded to encompass the areas along Swatara Creek in Lebanon and Schuylkill Counties as well.

APPENDIX A
Minutes of Public Meetings
Public Comments and Responses for "Draft" Document
Municipalities of Swatara Creek Watershed

SWATARA CREEK WATERSHED
RIVER CONSERVATION PLAN
AGENDA
July 12 & 13, 2000

7:00PM -- Introductions of Presenters and Attendees

Making comments to the Draft Plan.

7:15PM -- Swatara Creek: A Watershed at Work (10 min. video)

7:25PM -- Brief description of the Rivers Conservation Plan process (4 Steps)
- -- Relationships to:
  Swatara - Dauphin Greenway
  Swatara State Park
  Indiantown Gap Future Plans

7:40PM -- Break

7:50PM -- Executive Summary of DRAFT RCP

-- Geographic Information System (GIS) for Local Planning
- -- Local Support & Endorsement Procedure
- -- Municipal & Agency cooperation
- -- GIS data & Zoning Regulations

-- Issues & Concerns to Management Options review

-- Comment Process; Public Comments by Attendees; Q & A

8:30PM Adjournment

SWATARA CREEK WATERSHED
RIVER CONSERVATION PLAN

Minutes July 12, 2000
Northern Lebanon High School
Fredericksburg, PA
Lebanon County

Attendees:

Barnett, Flynn - Trout Unlimited
Blouch, Dick - citizen
Bomberger, Harvey - citizen
Boyer, James - Mackin Eng. --Presenter
Chubb, Ed - Dauphin Co. Parks & Rec.
Conner, Betty - Secr. SCWA, Inc.
Conner, George - citizen
Embich, Tom - V.P. SCWA, Inc.
Graham, Eugene - Carmeuse - Pa. Limestone Co.
Kaufman, George - Mayor, Jonestown
Lasky, Ann - Quittapahilla WA
Lasky, David - QWA
Light, Karen - Audubon Society
Litz, JoEllen - Pres. SCWA, Inc.
Ney, Joan - citizen
Wertz, Chuck - Lebanon Co. Cons. Dist.

After introductions by those present, President Litz introduced the 10 minute video: *Swatara Creek: A Watershed at Work.*

When the introduction video was complete, Mr. Boyer was introduced and the Power Point presentation explaining the PA DCNR four step process for a Rivers Conservation Plan was given. The comments received on previous drafts were reviewed and the process for making comments on this - May 31, 2000 draft was explained. Locations for review of the draft were given - Lebanon Community Library and Derry Township/Hershey Public Library, plus the availability of the document from the SCWA via e-mail attachments. Forms for submitting comments were made available at the meeting and at the locations mentioned.

The GIS (Geographic Information System) core of the plan was described and the purpose of it for planning and coordination of future projects described.

After a brief break, Mr. Boyer continued the Power Point presentation by reviewing the key elements of the RCP (Rivers Conservation Plan).

Executive Summary over view:

- Historical Issues regarding water quality in the watershed.
- Modern impacts of development, farm run-off, and the need to manage growth to lower impacts.
- The improvements made in the Swatara Creek watershed in the past 20 years, putting the stream well on its way to improved water quality.
- The funding of the RCP.

- The number one (#1) land use in the watershed is agriculture.
- The major concerns expressed by previous commenters is water quality.
- Non-point sources of pollution were most often cited as a major water quality concern.
- Growth and development of the watershed was viewed as a major future impact.
- The transition status of the Swatara State Park was noted and the neutral position taken by the RCP on the SSP, because its future has not been decided by the Commonwealth.
- The potential for the future expansion of the Dauphin -Swatara Greenway was noted as included in the RCP by reference, as are the more recent local government comprehensive plans.

The Management Options section was reviewed with regard to the major projects that are emerging:

- Water resource improvements
- Non-point source pollution problems being addressed
- Establishment of riparian buffers and stream-bank stabilization
- Assessing the potential impacts of CAFOs and mitigating there impacts
- Review of the status of the older dams in the watershed.

Some of the primary projects being considered:

- Acid mine drainage abatement program detailed by the Koury report for the Northern Swatara Creek watershed area and mainly by the Northern Swatara Creek Watershed Assoc.
- Development of similar programs for control of non-point source (NPS) in the agricultural areas and the suburban/urban development areas
- Development and implementation of a comprehensive water quality monitoring plan for the watershed
- Assessment of the major and minor drainage of the watershed regarding need for riparian buffers, stream-bank protection designs, and implementation of riparian restoration areas.
- Development of the Little Swatara Creek Watershed Assoc.
- Development of a specific management plan for the Quittapahilla Creek Watershed.
- Continued work to expand fisheries in the watershed
- Assess the infrastructure needs of recreational uses within the watershed.
- Improve the access to and user friendly status of the Swatara Creek.
- Determine the supplemental water supply needs in the watershed.
- Identify the needs for expanded sewage treatment capacity in areas with the highest projected growth rates.

Major issues for watershed characteristics by Land Use:

- Develop a strategy regarding traffic capacity within the watershed.
- Update older municipal comprehensive plans using the multi-municipal regional approach (Urban Sprawl Legislation related).
- Look at defining growth areas and restricted growth - rural areas within the watershed.
- Update 537 (sewage plans) plans in the high-growth areas; replace on-lot systems where feasible to reduce groundwater contamination potential.
- Inventory "brownfield" areas within the watershed for priority clean-up and renovation into usable sites.
- Develop a strategy

- Develop a strategy for farmland protection.
- Expand upon the partnership with Fort Indiantown Gap for conservation uses and protection of environmental amenities.

Issues for Biological Resources:

- Identify riparian buffers for wildlife corridor benefits
- Inventory species of special concern - Natural Heritage Inventory
- Preserve features which need protection - ecological and visual amenities
- Inventory wetland areas along stream corridors
- Educate public with regard to invasive species.
- Identify areas of invasive species and develop plans to better manage their control

Issues for Cultural Resources:

- Encourage development of education programs for environmental study in the watershed
- Develop rail trails as interconnections within the watershed and adjacent region for future Greenway corridor.
- Expand upon Swatara Water Trail
- Increase recreational opportunities within the watershed - passive and active
- Complete proposed enhancements to Quittie Creek Nature Park
- Develop a plan for the preservation of historic resources in the watershed.

Issues for Swatara State Park:

- Maximize the recreational potential of the state park.
- Support development of the state park to increase tourism as an economic benefit in the region.

Issues or Swatara Creek Greenway:

- Implement management options developed for the Dauphin Greenways Plan
- Develop a trail and Greenway master plan for the watershed.
- Create an overlay zone for stream buffers in the watershed.
- Increase public private partnerships to foster land stewardship
- Expand greenways initiatives in Lebanon, and Schuylkill Counties.

At this point the forum was opened for comments and statements related to the presentation of the RCP.

Mr. Graham described the potential access for recreation purposes on the Quittapahilla Creek at the Carmeuse, Inc. property along Clear Spring Road and the Creek, near Annville. The site is proposed to include handicapped access.

Mr. Kaufman commented on the future plans for access to the Swatara Creek from the recently acquired farm property along Main St., Jonestown at the Swatara and across from Scotto's Restaurant. Eventually parking and a canoe/boat ramp is planned along with recreation facilities on the site.

Mr. Chubb commented that the Dauphin Swatara Greenway has an extension component that would eventually connect it to the Schuylkill River at Reading. The long term project is being called the Union Canal Heritage Greenway and Trail.

Mr. Lasky commented on the potential for a Greenway along the Quittapahilla Creek coupled with flood plain protection.

The meeting closed with comments on the long term use of the document, its living nature and need for periodic updating and project prioritization.

Those present were encouraged to make additional comments in writing if they desired.

Closing comments recognized the terrific job done by the local newspapers, radio stations, and specific reporters for coverage of the announcement of meeting. Also, a list of 500 people were e-mailed the announcement prior to the comment period and meetings.

SWATARA CREEK WATERSHED
RIVER CONSERVATION PLAN

Minutes July 13, 2000
Lower Dauphin High School
Hummelstown, PA
Dauphin County

Attendees:

Boyer, Jim - Mackin Eng. -- presenter
Carney, Ed - South Hanover Township Board of Supervisors
Conner, Betty - Secr. SCWA, Inc.
Conner, George - citizen
Conner, John - Manada Conservancy
Connor, Ken - Camp Central
Embich, Tom - V.P. SCWA,Inc.
Mandia, Matt - Derry Township Parks & Rec.
Memmi, Skip - Derry Township Board of Supervisors

The July 13 session went almost exactly as the previous July 12 session with regard to video, and Power Point presentation; therefore it is not reported in detail again.

The comments during and at the end of the session are as follows:

Mr. Carney commented on the Blue Marsh project, Berks County in relationship to the Tulpehocken drainage joint comprehensive planning benefits and the potential to do similar things within the Swatara Creek drainage with regard to 100 year flood plain control, and limited flood plain development with unique on-lot treatment or limits to development in that zone.

Mr. Ken Connor presented the possibility that Camp Central will submit an application for development of the recreational, small lake improvements and riparian amenities of Camp Central (a 69 acre property), located in Bethel Township, Lebanon County. Details of the proposal were asked of Mr. Connor to be submitted to the SCWA.

Mr. Memmi raised questions regarding water supply development as part of the plan; examination of the future of the Union Deposit Dam on Swatara Creek, and the possible project for rebuilding a covered bridge at Fulling Mill Road to Clifton Heights area of Derry Township. These will be taken into long term consideration as part of the plan.

Mr. Mandia asked about the comment process. how long the comment period is open and if additional projects can be proposed for inclusion in the plan. These were answered by Mr. Boyer and Embich regarding the open comment period to Aug. 14, 2000, and that township proposed projects are welcome for inclusion in the projects listing.

Meetings set for watershed proposal

By AMANDA PARRY
Staff Writer

NORTH LEBANON — There's fine tuning and there's fine-tuning.

And then there's the Swatara Creek Watershed Association's version of fine-tuning.

The conservationist group will hold two public meetings this week to accept suggestions for a rough draft of a 10-chapter Rivers Conservation Plan it has been developing over the past two years.

"We've tried to cover everything," said Association President Jo Ellen Litz. "But if there's something we forgot that people think should be in there, we'd like them to let us know."

The plan, which was designed with the help of the Mackin Engineering firm and funded by the Department of Conservation and Natural Resources (DCNR) and the William Penn Foundation, is part of an attempt to get the Swatara Watershed on the Pennsylvania Rivers Conservation Registry, a list of waterways eligible for conservationist funding from the DCNR and other state agencies.

Membership would be beneficial because it would open up an entire new set of funding for projects initiated by communities, municipalities and organizations involved in the watershed, according to Litz.

The plan includes a comprehensive study of the watershed area with information on land usage, zoning, population composition and water quality. The last two chapters cover conservation issues and concerns and the initiatives that member organizations and municipalities hope to undertake in order take to address these problems.

The plan is a prerequisite for membership on the registry because it helps organizations and communities wishing to participate in the conservation effort to do so efficiently by making them aware of the overall situation and each other, DCNR spokeswoman Gretchen Leslie said.

"It keeps organizations from asking for money willy-nilly, without any idea what other groups are trying to do," Leslie said. "It ensures a certain level of coordination that is going to benefit everyone involved."

Members of the SCWA and a representative from Mackin Engineering will answer questions and take suggestions about the plan at two meetings this week. The first will take place at 7 p.m. tomorrow in the Northern Lebanon High School auditorium. The second will be held at 7 p.m. Thursday in the Lower Dauphin Middle School cafeteria.

The document can be reviewed either at SCWA Headquarters, 2501 Cumberland St., Suite 2 from 7 a.m. to 4 p.m. Monday through Friday; or during regular business hours at either the Lebanon Community Library or the Hershey Library. Copies are also available via e-mail, at: swatara@mbcomp.com.

The SCWA will accept suggestions until Aug. 14 and hopes to submit a draft to the DCNR for review by the 31st, Litz said.

Parry can be reached via e-mail at:

amandaparry@LDNews.com

MACKIN ENGINEERING
MECHANICSBURG, PA
PROJECT NO: 4079-001
KRN ☐ PGH
JRR ☐ ___ Accts
RBS ☐ ___ ___
JEB ☐ ___ ___
JUL 28 '00
Corres. File ☐ Admin File
☐ Contract File ☐ Mktg
☐ Enclosure To: ___

7/12/2000 PUBLIC FORUM

[illegible] everyone [illegible]

Editor [illegible]

The Swatara [illegible] watershed is under [illegible] ance [illegible]

The [illegible] ommunity [illegible] ies to indi[illegible] been verwhelm[illegible] want o thank th[illegible] nittee who [illegible] nd convict[illegible] uide the [illegible] two ears [illegible]

The Swatara [illegible] our Monte Carlo [illegible] sn't it wonder[illegible] extraordinary [illegible] people an accomplish [illegible] work ogether? To [illegible] healthy, wholesome community, we need [illegible] connections [illegible] the land and water [illegible]

From the Rivers Conservation Plan, we will have a joint community vision to help us focus on beneficial projects, clean up and maintain our water quality, have safe fish to eat, and a safe Swatara where we can play.

Nature can also enrich us economically. Good economic choices are good environmental choices, so long as we measure the strength of our economy by how it sustains jobs and the dignity of jobs over generations. How many local jobs depend on clean water? For example, we have a lot of food industries — Hershey, Wengert's Dairy, San Georgio — this plan provides a chance to invest in our environment and supporting infrastructure.

Have you ever noticed how pollution seems to migrate toward communities who are not aware of the valuable resource they have in their midst? That's why community participation in planning can help protect our property values. Rather than letting outsiders tell us how to run things, a close connection to the earth and our local area gives us a special clarity of vision about the destiny of our community.

Another thing, if we would ask our school students where their water comes from, would they answer the spigot, or would they answer the Swatara Watershed? If your child isn't sure, would a floating environmental classroom help raise their awareness of the Swatara?

Maybe you don't feel qualified to express your opinion. Consider that Pennsylvania provides for public ownership of our water. Therefore, any citizen who lives near, fishes, swims in or drinks from our public water supply, or gets aesthetic pleasure from watching the Swatara has an interest in its welfare. It gives everyone a reason to express an opinion. If you missed the public meetings, it's not too late to comment.

In an effort to make this easy, the Swatara Creek Watershed Association will accept written comment by letter, fax, or e-mail. By Aug. 14, mail your letter to 2501 Cumberland St., Lebanon PA 17042; fax 274-1175, or e-mail swatara@mbcomp.com. Upon request, we can e-mail the Rivers Conservation Plan to you, or you can review the plan at the Swatara Watershed office or the Lebanon Community or Hershey libraries.

Jo Ellen Litz,
President,
Swatara Creek
Watershed
Association

COMMUNI

7/12/2000

Problems still plague Swatara Creek

Watershed Association aims to get grants for stream-saving projects

AL WINN
OUR LEBANON BUREAU

LEBANON — There is good s and bad news about the tara Creek watershed. [illegible] rst the bad. According to a ntly released draft of a Riv Conservation Plan for the ershed, Swatara Creek and ributaries are still plagued excessively high metal nts and acidity in water ing from abandoned coal es in Schuylkill County. [illegible] hile the state has had some ess in cleaning up the mess from 150 years of coal min the central and lower por s of the watershed face sure from farm runoff and easing development [illegible] e good news at least in is the plan itself. The plan sored by the Swatara k Watershed Association paid for in part by the state artment of Conservation Natural Resources will municipalities [illegible] ts for stream-related projects, said Jo Ellen Litz, association president.

A draft of the plan is available for inspection at the association's headquarters, 2501 Cumberland St., and Litz said she will e-mail the plan on request. Litz can be reached at 273-7658.

Comments the association gets at two public meetings could be incorporated into the plan. Ideas submitted by one or more of the 50 municipalities in the watershed will get priority when it comes to funding implementation projects in the future, Litz said.

Projects could include buffers of vegetation to protect streams from farm runoff, water-quality monitoring, and parks and other sites to improve access to the creek, said DCNR spokeswoman Gretchen Leslie.

The draft plan offers more than a few ideas for projects already. Two of them involve preservation and enhancement of two of the watershed's lakes. Near Pine Grove, Schuylkill County is about to take over Sweet Arrow Lake, which in recent years has been preserved by private landowners.

Stoevers Lake, part of the Lebanon City park system, is also on the list.

So is a Swatara Creek water trail being developed by the association. When finished, the trail will enable canoeists to float on the creek from Pine Grove to Middletown with put-in places every few miles.

Farther downstream, the ambitious Dauphin County Greenway is in the plan with the recommendation it be extended into Lebanon County and possibly connect with a Tulpehocken Creek greenway in Berks County. DCNR is getting planning under way to add a number of amenities to the undeveloped Swatara State Park.

The department has been promoting a watershed-wide planning process to avoid duplication, Leslie said.

"We want to get as many people at the table at one time as possible," Leslie said.

Since the department started awarding grants for River Conservation Plans in 1995, 15 have been completed, including one for the Susquehanna River from the Clarks Ferry bridge to the Dauphin-Northumberland County line and another one for the Tulpehocken Creek watershed, which includes part of eastern Lebanon County.

DCNR is beginning to fund projects in areas covered by completed plans, Leslie said.

About 50 more plans, including the one being prepared for Swatara Creek, are in various stages of planning, she said.

Once the comment period is over, the association will need to get written support from at least half of the 50 municipalities and four counties in the watershed.

That should be no problem, Litz said. The group has had to rely on many of those municipalities for information included in the plan.

"The municipalities were terrific," Litz said.

Al Winn may be reached at 272-3759 or at awinn@patriotnews.com.

Pennsylvania Department of Conservation and Natural Resources
Rachel Carson State Office Building
P.O. Box 8475
Harrisburg, PA 17105-8475
August 15, 2000

Bureau of Recreation and Conservation (717) 783-2712

RECEIVED
BY DATE
TL 8/17/00

Mr. Thomas R. Embich
Vice-President
SCWA, Inc.
P.O. Box 706
Hershey, PA 17033-0706

RE: Swatara Creek Watershed Association, Inc.
Swatara Creek Watershed River Conservation Plan
KEY-RCP-97-08

Dear Mr. Embich:

I have reviewed the draft Swatara Creek Watershed River Conservation Plan submitted by Mackin Engineering. I want to commend the Swatara Creek Watershed Association and Mackin Engineering for the work that you have done on the Plan thus far.

I regret to inform you that at present the Plan does not meet the requirements for listing on the Pennsylvania Rivers Conservation Registry. However, with minor revisions, as indicated below, you should become eligible for listing.

General Plan Comments

- Title of the Plan – The title of the final plan should be revised to read: The Swatara Creek Watershed Conservation Plan. Drop the word River from the title.

- Labeling of maps and the description of text that refers to the maps must be consistent throughout the Plan. Identification of figures must be the same (i.e., Land Use is identified in the text as figure 2-1, it is shown on the map as figure 1).

- Are there any outstanding or unique features within the watershed that should be featured in the inventory ?

Executive Summary

- I recommend adding the goals, objectives and projects of the Management Options section of the Plan. Section D of the Summary would need to be revised so that it is not redundant. The Summary would be the document that would be distributed to the general public throughout the watershed.

Project Area Characteristics

- Part A – Location – Branchdale should be one word, not two words.

- Page 2-10 – Zoning – The study indicates that 44 out of 46 municipalities had zoning. However, the zoning map indicates that all or portions of ten municipalities do not have zoning. The zoning map needs to be revised and updated to reflect current zoning in the watershed.

- Figure 2 – Zoning Map – You need to add an additional color to the map (white preferably) that shows the municipalities that do not have zoning.

- Page 2-21 – Indicates that there are roadways located on the Swatara Creek Watershed Transportation Map. Where is this map ? It should also include railroads, airports and heliports.

Water Resources

- Page 4-1 – Major Tributaries to Swatara Creek Table – Lorberry Creek, Good Spring Creek and other acid mine impacted waterways should be listed as tributaries, given their significance on the watershed.

- Page 4-8 – Water Quality – General Watershed Characteristics – The reference to the Poconos should be eliminated. Schuylkill County is not considered part of the Poconos.

Biological Resources

- Rare or threatened species should be identified within the Plan.

- Page 5-3 – Terrestrial Wildlife – Does anyone have any concerns regarding the diversity of wildlife or lack of it in the watershed ?

Cultural Resources

- Page 6-8 – Veterans Park paragraph – last sentence – I suggest replacing the word meant with the word used.

Management Options

- In some instances, more specification is needed. Areas of concern, such as eroded areas, lack of riparian buffers and lack of river access, should be defined and targeted. Both watershed wide and locally supported management options should be included.

- You should consider developing a listing of targeted areas that need streambank stabilization and habitat enhancement.

- You should consider a Comprehensive Park and Recreation Study for the entire watershed. Areas of handicap access should be included in the study.

- Page 10-4 – Water Resources – The projects remaining to be implemented as identified in the Swatara Creek AMD Reclamation Document should be listed in the management options.

Should you have any other questions or comments, please contact me at the above telephone number.

Sincerely,

Terry L. Hough

Terry L. Hough
Environmental Planner
Grants Project Management Division

TLH:mk

cc: Jim Boyer, Mackin Engineering Company
Lori Kieffer Yeich, Regional Advisor

Response to Comments Received From Terry Hough

Comment 1, Title Page: River has been removed from title of document.

Comment 2, Figures: Map figures have been numbered to match their reference in the plan.

Comment 3, General: No outstanding or unique feature outside of those already presented in the document need to be inventoried.

Comment 4, Executive Summary: Management options have been added to the Executive summary.

Comment 4, Page 2-1 Location: Branch Dale is presented as two words on Pennsylvania's Official Transportation and Tourism Map.

Comment 5, Zoning: Zoning map for the plan has been updated.

Comment 6, Zoning Map: Same as previous comment.

Comment 7, Page 2-21 Transportation: Figure has been added to include all transportation facilities.

Comment 8, Page 4-1 Major Tributaries: Lorberry and Good Spring Creeks are tributaries to major tributaries of Swatara Creek; therefore they are not included.

Comment 9, Page 4-8 General Watershed Characteristics: The reference refers to the geologic formation at the headwaters of Swatara Creek; it has been clarified.

Comment 10, Biological Resources: Threatened and endangered species in the watershed are listed in the document text. Other species of concern are listed in Appendix E.

Comment 11, Page 5-3 Terrestrial Wildlife: No concerns about diversity were noted, other than those associated with invasive plant and animal species.

Comment 12, Page 6-8 Cultural Resources: Change to verbiage has been made.

Comment 13, Management Options: More specifics have been added to the Management options in Appendix G.

Comment 14, Management Options: The Section 303d list of impaired waters will be utilized to develop these projects. This has been specified in the Management Options.

Comment 15, Management Options: A comprehensive Park and Recreation study for the watershed has been added to the management options. This study will also address handicapped access.

Comment 16, Page 10-4 Management Options: It would be repetitive to repeat options discussed in the AMD reclamation document, as they are already published.

Swatara Creek Rivers Conservation Plan Comments Sheet

(Use additional sheets as needed)

Name: THOMAS A. KOTAY Date: 7/30/00

Organization: LEBANON CO. RESIDENT Review Location: HOME / E-MAIL

Page/Paragraph	Comments
1-1	THE VAILED REFERENCE TO A DAM ON SWATARA CREEK SHOULD BE REMOVED FROM 2ND IP
LAST IP ON 2-9	UNTIL IT'S A DAM (WHICH I HOPE NEVER HAPPENS), IT'S SWATARA CREEK STATE PARK. THE FULL & CORRECT NAME SHOULD BE USED EVERYWHERE IN THIS DOCUMENT.
CHAPTER 7	THIS IS A SLANTED DISCUSSION, UNLIKE THE FACTS & FIGURES IN THE REST OF THE DOCUMENT. AN EIS WILL BE REQUIRED BEFORE THE CORPS MAKES ANY DECISION.
	THIS CHAPTER INCLUDES NO DISCUSSION ON THE DEVASTATION THAT A DAM & ALL OF ITS RELATED RECREATION & SPIN-OFF DEVELOPMENT WILL HAVE ON THE WATERSHED.
	WHY? BECAUSE THIS PORTION OF THE PLAN HAD TO BE WRITTEN BY DCNR & MS. LITZ!
	THIS PLAN SHOULD NOT BE THE VEHICLE TO "DRUM UP" SUPPORT FOR A DAM.
CHAPTER 8	THE GREENWAY CONCEPT IS EXCELLENT, BUT A DAM WILL ONLY TURN THIS PORTION OF
	THE CORRIDOR INTO A SPRAWLING, DEVELOPED MESS.

General comments on overall document:

VERY GOOD, EXCEPT FOR THE BIASED DISCUSSION ON THE DAM & ITS CONSEQUENCES FOR THE WATERSHED & LEBANON COUNTY.

Recommendations for inclusion in document:

A BALANCED DISCUSSION ON THE PROS & CONS OF A DAM!

Response to Comments Received From Thomas A. Kotay:

Comment 1, Page 1-1 Paragraph 2: No reference to a dam on Swatara Creek is implied by this paragraph. Major recreational resource refers to the use of the stream and entire watershed as a source for fishing, canoeing, hiking, etc.

Comment 2, Page 2-9 Last paragraph: The actual name of the State Park is Swatara State Park – Reference Pennsylvania Official Transportation and Tourism Map.

Comment 3, Chapter 7: This chapter presents the actual events associated with the development of Swatara State Park. The chapter presents the development options proposed by the DCNR. No support or opposition to the proposed developments is expressed or implied by this write up. Changes to the chapter have been made to more clearly express recent developments regarding the development of the park.

Comment 4, Chapter 8: The chapter presents information regarding the Dauphin County Greenway. There is no dam proposed for Dauphin County.

Swatara Creek Rivers Conservation Plan Comments Sheet

Return to SCWA, 2501 Cumberland St., Suite 2, Lebanon PA 17042
(Use additional sheets as needed)

Name: Chuck Wertz Date: August 2, 2000

Organization: Lebanon County Conservation District Review Location: Northern Lebanon High School

Page/Paragraph	Comments
10-1 / 5th par. Support...	Include references to "in-fill" development and bringing residential development back downtown, encourage new land use bill implementation, reference transfer
	of development rights. Support tax breaks for conservation and innovation. Accomodate an aging population moving them back to services in town.
10-3 / 4th par. Identify....	Identify programs like Habitat for Humanity, reference "burned and boarded fields" and give abandoned residential sites the same mention and importance of industrial and commercial sites.
10-4 / 1st Encourage...	Reference need for municipalities to update ag security areas at least every 7 years. Some are being difficult and discouraging signing on to the ASA.
10-4 / 5th par. Develop....	Assist in issues related to recycling of landfills and other less resource-consumptive/impacting alternatives to landfills. Support /encourage use of non-polluting fuels, biomass/methane gas generation of electricity.
10-5 / 1st par. Develop a com	Add a reference to attainment of the TMDL for the Quittapahilla Creek
10-8 / 1st par. Educate the...	Perhaps a little too specific and should just make reference to "invasive, noxious or nuisance species?

General comments on overall document:

Response to Comments Received From Chuck Wertz:

Comment 1, Page 10-1 Paragraph 5: Changes to paragraphs 2 and 5 of the document have been made to address the points of this comment.

Comment 2, Page 10-3 Paragraph 4: the paragraph has added the importance of the reuse of residential sites.

Comment 3, Page 10-4 Paragraph 1: Paragraph changed to mention updating ASA's every 7 years.

Comment 4, Page 10-4 Paragraph 5: A management option regarding recycling has been placed in the Management Options section of the report.

Comment 5, Page 10-5 Paragraph 1: Change in paragraph referencing TMDL for streams in the watershed was made.

Comment 6, Page 10-8 Paragraph 1: Change was made to paragraph.

511 E. Walnut St.
Lebanon, PA 17042
Aug. 2, 2000

Jo Ellen Litz, President
SCWA
2501 Cumberland St. Suite 2
Lebanon, PA 17042

Dear President Litz:

I would like to offer the following comments in regards to the SCWA's River Conservation Plan, relating mainly to page 5-5.

1. Regarding the cooperative trout hatchery mentioned on Bachman Run, these projects are known as cooperative trout nurseries. Fingerling trout are furnished to the cooperating clubs by the PA Fish & Boat Commission. The clubs then in turn feed and raise these trout to a suitable size and stock them in waters open to public fishing. IGMR Rod & Gun Club operates a nursery on Indiantown Run, and is furnished with 4000 brook trout, 2000 rainbow trout, and 2000 brown trout. The Quittapahilla Rod & Gun Club and the Hershey Boy Scouts operate a nursery on the headwaters of Spring Creek in Derry Twp., and are furnished with 5500 brook trout and 500 brown trout.

2. Trout Run and the Quittapahilla Creek are listed as stocked trout streams, omitted is the Snitz Creek and Bachman Run.

3. Mention is made of an American Eel being found by a PFBC survey crew, this survey was conducted on June 28, 1999. A survey conducted on July 7 and September 1, 1977 turned up with no eels being found. The 1999 survey also produced one (1) smallmouth bass (Micropterus dolomieui) and several Sculpins (Cottus spp.), which were not found in the 1977 surveys.

I hope that this information will be of value to you.

Cordially,

Lloyd

Lloyd I. Hartman

Response to Comments Received From Lloyd I. Hartman

Comment 1, Page 5-5: Discussion on cooperative nurseries has been expanded to include information presented.

Comment 2, Page 5-5: Snitz Creek and Bachman Run have been added to the stocked waters list.

Comment 3, Page 5-5: Comment on American Eel noted.

From: Jo Ellen Litz, Lebanon Body Shop, Litz Co., Swatara Creek Watershed Association <litz@mbcomp.com>

To: Jim Boyer <jeb@mackinengineering.com>; TOM EMBICH <TREMBICH@NBN.NET>

Date: Thursday, August 03, 2000 4:12 PM

Subject: Fw: ADDITIONS/CORRECTIONS TO LITTLE SWATARA MAILING LIST WELCOME

Jo Ellen,
>
> A couple things: (I'll be out for the next week)
>
> Comments from a quick overview of the Draft Rivers Conservation Plan:
>on page 6-7, Chapter 6, shouldn't Levitz Park be in the heading of Parks
>adjacent to streams?
>
> And it may prove beneficial to have the schools in the Watershed
>identified and mapped.
>
> Speaking of maps. The copy I reviewed didn't have any. I'm guessing
>that larger ones would accompany this or will the maps be added into the
>report. It would make it easier to read if smaller maps (8x11 or 14) are
>included with the text.
>
>Ok on to another subject:....

>Gina

Response to Comments Received From Gina Mason

Comment 1, Page 6-7: Levitz Park has been added to the write up on parks along the streams.

Comment 2, Chapter 2: Map of school districts in the watershed has been added to Chapter 2.

Comment 3, Maps: Maps were not included with e-mail reviews due to file size and limited clarity.

From: Jertone@aol.com <Jertone@aol.com>
To: litz@mbcomp.com <litz@mbcomp.com>
Date: Wednesday, July 19, 2000 7:32 PM
Subject: Swatara Dam

I applaud you and your watershed groups effort on behalf of the people of Lebanon Co. I support the development of the dam, however, if its construction is finally abandoned what will become of the Swatara Park? How come nothing else has been built or established at the park? Are there plans for picnic area (tables, etc), expansion of hiking,biking and horseback riding trails? How about camping sites and development of access areas for canoeing? Keep up the good work. J. Secoges

Response to Comments Received From J. Secoges

Comment 1, Chapter 7: Changes to Chapter 7 should clarify confusion on the development of Swatara State Park.

Swatara Creek Municipalities List

MUNICIPALITY		ADDRESS			PHONE
*NORTH ANNVILLE	TOWNSHIP	RD4, 2854 WATERWORKS WAY	ANNVILLE	17003	867-1814
*ANNVILLE	TOWNSHIP	PO BOX 178, N. LANCASTER ST.	ANNVILLE	17003	867-4476
*E HANOVER	TOWNSHIP	RD2 BOX 673	ANNVILLE	17003	865-3614
*S LONDONDERRY	TOWNSHIP	MUNICIPAL BUILDING	CAMPBELLTOWN	17010	838-5556
*CORNWALL	BOROUGH	SACRED HEART PARSIH	CORNWALL	17016	274-3436
*CONEWAGO	TOWNSHIP	3279 OLD HERSHEY RD	ELIZABETHTOWN	17022	534-8556
*BETHEL	TOWNSHIP	150 S PINE GROVE ST	FREDERICKSBRUG	17026	865-4005
*E HANOVER	TOWNSHIP	8848 JONESTOWN RD	GRANTVILLE	17028	469-0833
**SOUTH HANOVER	TOWNSHIP	111 W 3 UNION DEPOSIT	HERSHEY	17033	566-0224
*DERRY	TOWNSHIP	235 HOCKERSVILLE RD	HERSHEY	17033	534-2200
HUMMELSTOWN	BORO	136 S HANOVER ST	HUMMELSTOWN	17036	566-2555
*JONESTOWN	BOROUGH	BORO HALL	JONESTOWN	17038	865-3381
*SWATARA	TOWNSHIP	1 SUPERVISOR DR	JONESTOWN	17038	865-4803
*UNION	TOWNSHIP	RD1	JONESTOWN	17038	865-4039
**CLEONA	BORO	140 W WALNUT ST.	CLEONA	17042	272-7167
LEBANON	CITY OF	3 E HIGH ST	LEBANON	17042	274-2308
*NORTH CORNWALL	TOWNSHIP	320 S 18TH ST.	LEBANON	17042	273-9200
*SOUTH ANNVILLE	TOWNSHIP	RD4, FONTANA	LEBANON	17042	867-2148
*SOUTH LEBANON	TOWNSHIP	1800 S 5TH AVE.	LEBANON	17042	274-0481
*NORTH LEBANON	TOWNSHIP	725 KIMMERLINGS RD.	LEBANON	17046	273-7132
*WEST LEBANON	TOWNSHIP	322 N 22ND ST.	LEBANON	17046	274-1598
*MIDDLETOWN	BORO	60 W EMAUS ST	MIDDLETOWN	17057	948-3050
*BOROUGH OF	ROYALTON	BURD & DOCK STS	MIDDLETOWN	17057	944-4831
*LONDONDERRY	TOWNSHIP	GEYR CHURCH RD	MIDDLETOWN	17057	944-1066
*LOWER SWATARA	TOWNSHIP	1499 SPRING GARDEN DR	MIDDLETOWN	17057	939-9377
*JACKSON	TOWNSHIP	60 N RAMONA RD	MYERSTOWN	17067	866-4771
*PALMYRA	BOROUGH	325 S RAILROAD ST.	PALMYRA	17078	838-6361
*NORTH LONDONDERRY	TOWNSHIP	RIDGE RD	PALMYRA	17078	838-1373
*W CORNWALL	TOWNSHIP	73 S ZINN'S MILL RD	QUENTIN	17083	272-9841
*LOWER PAXTON	TOWNSHIP	75 S HOUCKS RD	HARRISBURG	17109	657-5610
*SWATARA	TOWNSHIP	599 EISENHOWER BLVD	HARRISBURG	17111	564-2551
*W HANOVER	TOWNSHIP	7171 ALLENTOWN BLVD	HARRISBURG	17112	652-4841

Swatara Creek Municipalities List

MUNICIPALITY		ADDRESS			PHONE
FOSTER	TOWNSHIP	RD2 BOX 2537	POTTSVILLE	17901	570-544-6218
*REILY	TOWNSHIP	PO BOX 1	BRANCHDALE	17923	570-544-6121
*WAYNE	TOWNSHIP	PO BOX 97	FRIEDENSBURG	17933	570-739-2629
*BRANCH	TOWNSHIP	PO BOX 222	LLEWELLYN	17944	570-544-4283
*PORTER	TOWNSHIP	309 WICONISCO ST	MUIR	17957	570-544-4283
**PINE GROVE	BORO	1 SNYDER AVE	PINE GROVE	17963	570-345-3555
**PINE GROVE	TOWNSHIP	RD4 BOX 260A	PINE GROVE	17963	570-345-4202
*TREMONT	TOWNSHIP	RD4 BOX 394	PINE GROVE	17963	570-345-4950
*WASHINGTON	TOWNSHIP	RD3 BOX 228	PINE GROVE	17963	570-345-4471
*FRAILEY	TOWNSHIP	23 MARYLAND ST	DONALDSON	17981	570-695-3980
*TREMONT	BOROUGH	224 W LAUREL ST	TREMONT	17981	
*BETHEL	TOWNSHIP	PO BOX 24	BETHEL	19507	717-933-8813
*TULPEHOCKEN	TOWNSHIP	PO BOX 272	REHRERSBURG	19550	717-953-5747
*UPPER TULPEHOCKEN	TOWNSHIP	PO BOX H	STRAUSSTOWN	19559	610-488-7170
*LEBANON COUNTY	COUNTY	400 S 8TH ST	LEBANON	17042	274-2801
*DAUPHIN COUNTY	COUNTY	FRONT & MARKET STS	HARRISBURG	17101	255-2741
*SCHUYLKILL COUNTY	COUNTY	COURTHOUSE	POTTSVILLE	17901	325-3611
*BERKS COUNTY	COUNTY	633 COURT ST., 13TH FLOOR	READING	19601	478-6136

APPENDIX B
Anderson Land Cover Classification Description

Level 1: ***Urban or Built-Up Land*** is comprised of areas of intensive use with much of the land covered by structures. Included in this category are high-density developed areas such as cities, commercial complexes, industrial areas, compact residential clusters, and strip areas along transportation corridors. Urban or Built-Up Land is further classified into six sub-categories.

Level 2:

Residential land uses range from high density multi-unit structures located in urban centers to low density single family homes, where houses are on lots greater than one acre located on the periphery of suburban expansion. Rural residential and recreational subdivisions are also included in this category since this type of land is typically almost entirely committed to residential land use.

Commercial and Service areas include urban central business districts, shopping centers, and commercial strips. These areas may also include some noncommercial uses too small to be identified separately. Institutional land uses, such as the various educational, religious, health, correctional, and military facilities are also part of this category.

Industrial areas include light manufacturing facilities designed for assembly, finishing, processing, and packaging, to heavy manufacturing facilities that use raw materials such as iron ore, timber or coal. These heavy-manufacturing facilities can include mills, electrical power plants, tank farms, chemical plants, stockpiles, surface structures associated with the mining industry and heavy duty transportation facilities.

Transportation, Communication, and Utility land uses occur in some degree with all other urban or built-up land use categories. They will be included in each category unless they can be mapped separately from the land use in which they occur. For this reason, the statistical summary of these areas is only a portion of the total. Transportation classification typically includes highways, railways, parking lots, rail stations, rail yards, and airport facilities. Communications include, areas used for radio, radar, or television and phone towers. Utilities can include facilities and stations used in the treatment, processing, and transportation of water, oil, gas, and electricity substations.

Mixed Urban or Built Up Land classification is used for a mixture of Level 2 categories where individual uses cannot be separated. This use typically includes development along transportation routes and in cities, towns, and other areas where separate land uses are mixed.

Other Urban or Built Up Land typically consists of uses such as golf courses and driving ranges, urban parks, cemeteries, waste dumps, water control structures, and ski resorts. It also includes land that is considered vacant or undeveloped within urban areas.

Photo 2-1 Example of Urban Built Up Land within the Swatara Watershed, in the Borough of Hummelstown

Level 1: ***Agricultural Land*** may be defined broadly as land used for production of food and fiber. Within the watershed three subgroups of the Level 1 Agricultural Land classification were identified.

Level 2:

Cropland and Pasture include crop land harvested, summer-fallow crop land on which failure occurs, cropland in soil improvement grass and legume areas, cropland used in pasture rotation with crops, and pastures on land more or less predominately used for the purpose of animal grazing.

Orchards, Groves, Vineyards, Nurseries, and Ornamental Horticultural Areas include orchards, groves and vineyards that produce fruit and nut crops. Nurseries and horticultural areas include floricultural, seed-and-sod areas, greenhouses, and nurseries, which provide seedlings for planting. Many of these areas may be included in other categories such as cropland and pasture.

Confined Feeding Operations include large scale, specialized live stock production enterprises such as beef cattle feed lots, dairy operations with confined feeding, poultry farms, and hog feed lots.

Level 1: ***Forest Land*** is land that contains a tree-crown aerial density (crown closure percentage) of 10 percent or more. These are areas stocked with trees capable of producing timber or other wood products, and exert an influence on the climate or water

regime. Within the watershed three different types of Level 2 data were identified for the Forest Land classification.

Level 2:
Deciduous Forest Land includes all forested areas having a predominance of trees that lose their leaves at the end of the frost-free season or at the beginning of a dry season. In most areas these include the hardwoods.

Evergreen Forest Land includes all forested areas where the trees are predominately those which remain green throughout the year. Both coniferous and broad-leaved evergreens are included in this category.

Mixed Forest Land includes all forested areas where both evergreen and deciduous trees are growing and neither are predominate. When more than one-third intermixture of either evergreen or deciduous species occurs in a specific area, it is classified as Mixed Forest Land.

Level 1: ***Water***, simply put, this category includes all areas within land mass that are persistently covered with water, provided that, they are at least 1/8 mile wide and if extended cover at least 40 acres.

Level 2:
Streams and Canals include rivers, creeks, canals, and other linear bodies of water. When the watercourse in interrupted by a control structure, the impounded area will be placed in the reservoir category.

Lakes are non-flowing, naturally enclosed bodies of water, including regulated natural lakes, but excluding reservoirs. Islands that are too small to be delineated are included in the water area.

Reservoirs are artificial impoundments of water used for irrigation, flood control, municipal water supplies, recreation, hydroelectric power generation, and so forth. Dams, levees, other water-control structures, and the excavation of water-control structures and spillways are included in the Other Urban or Built-up Land category.

Level 1: ***Wetland,*** are areas where the water table is at, near, or above the land surface for a significant part of most years. Wetlands are usually associated with topographic lows, even in mountainous regions.

Level 2:
Forested Wetlands are wetlands dominated by woody vegetation. They include flooded bottomland hardwoods, shrub swamps, and wooded swamps including those around bogs.

Level 1: ***Barren Land,*** is land with a limited ability to support life in which less than one-third of the area has vegetation or other cover. In general, it is an area of thin soil, and or rock. Vegetation, if present, is thin, widespread and scrubby. Within the watershed two sub-classifications of Barren land were present.

Level 2:

Strip Mines, Quarries, and Gravel Pits include mining activities that have significant surface cavities. Vegetation cover and overburden are removed to expose such deposits as coal, iron ore, limestone, copper, etc. Quarrying of building and decorative stone and recovery of sand and gravel deposits also result in large open surface pits and are included in this classification. Current mining activity is not always distinguishable, and inactive, unreclaimed, and active strip mines, quarries, borrow pits, and gravel pits are included in this category until other cover or use has been established.

Photo 2-2: Limestone quarry located between Annville and Lebanon along Route 422

Transitional Areas are categorized as areas in transition from one land use category to another. They are categorized when the data could not be interpreted. Usually these areas include forests that are cleared for agricultural use, wetlands being drained for development or when any type of land use ceases as areas become temporarily bare during construction for future uses.

* *Definitions taken from Geological Survey Professional Paper 964, United States Government 1976*

APPENDIX C
Summary of Hazardous Waste Information

AREA REPORT (CERCLIS DATA)

search used- Zip : 17003
City : ALL
County : LEBANON
State : PA
NPL Status : ALL
Level of Detail: HIGH

Results:

This search was taken from RTK NET's (the Right-To-Know Network)'s copy of EPA's CERCLIS database. RTK NET is run by OMB Watch and Unison Institute at 1742 Connecticut Ave. NW, Washington DC 20009 Phone: 202-234-8494
The search was done on 03/07/2000.

If you don't see the words *END OF REPORT* at the end of this search, then this Web search didn't complete -- back up and try it again.

Site Name: USA INDIANTOWN GAP LANDFILL
Street: FT INDIANTOWN GAP RESERV
City: ANNVILLE State: PA Zip: 17003
County: LEBANON EPA ID: PA8210020444
MSA: Congressional District: 17
Lat/Long : 4027220/07632150 USGS Hydro Unit: 02050305
National Priority List (Superfund) Status: NOT ON NPL
Discovery Date: 12/01/1980
Ownership: FEDERALLY OWNED
This is a Federal facility.

List of alias names for site follows-
Alias Name: US ARMY INDIANTOWN GAP LANDFILL
Street: INDIANTOWN GAP RESERV
City: ANNVILLE State: PA Zip: 17003
Lat/Long: 4019420/07630540
Description:

List of operable units and events follows-
Operable Unit: SITE EVALUATION/DISPOSITION
Event(s)-
Event: DISCOVERY Area: PRE-REMEDIAL
Date : 12/01/1980
Lead Agency : EPA FUND-FINANCED

Event: SCREENING SITE INSPECTION Area: PRE-REMEDIAL
Start: 02/01/1981 Complete: 02/01/1981
Event Qualifier: DEFERRED TO RCRA (SUBTITLE C) OR NRC
Lead Agency : FEDERAL FACILITIES

Event: PRELIMINARY ASSESSMENT Area: PRE-REMEDIAL
Date : 06/01/1981
Event Qualifier: LOWER PRIORITY
Lead Agency : FEDERAL FACILITIES

Event: PRELIMINARY ASSESSMENT Area: PRE-REMEDIAL
Start: 03/15/1992 Complete: 03/15/1992
Event Qualifier: HIGHER PRIORITY
Lead Agency : FEDERAL FACILITIES

Databases

About RTK NET

Resources

Help

RCRIS Search

About the Data

Database name: RCRIS - RCRA Information System

Date of last update (on RTK NET): 02/15/1997
Update cycle (how often a new set of data is made): continuous

From an EPA Web page:

> ***Resource Conservation and Recovery Information System (RCRIS)***
>
> *Under the Resource Conservation and Recovery Act (RCRA), generators, transporters, treaters, storers, and disposers of hazardous waste as defined by the federally recognized hazardous waste codes, are required to provide information concerning their activities to state environmental agencies, who in turn provide the information to regional and national U.S. EPA offices.*
>
> *RCRIS is used by the Environmental Protection Agency (EPA) to support its implementation of the Resource Conservation and Recovery Act (RCRA), as amended by the Hazardous and Solid Waste Amendments of 1984 (HSWA). The system is primarily used to track handler permit or closure status, compliance with Federal and State regulations, and cleanup activities. Other uses of the data include program management, regulation development, waste handler inventorying, corrective action tracking, regulation enforcement, facility management planning, and environmental program progress assessment.*

RTK NET has a complete copy of RCRIS. RCRIS does not have "reporting years" as other databases do. If you are looking for information about quantities and shipment of hazardous waste, you'll probably do better using the BRS database.

Some common RCRA abbreviations are:

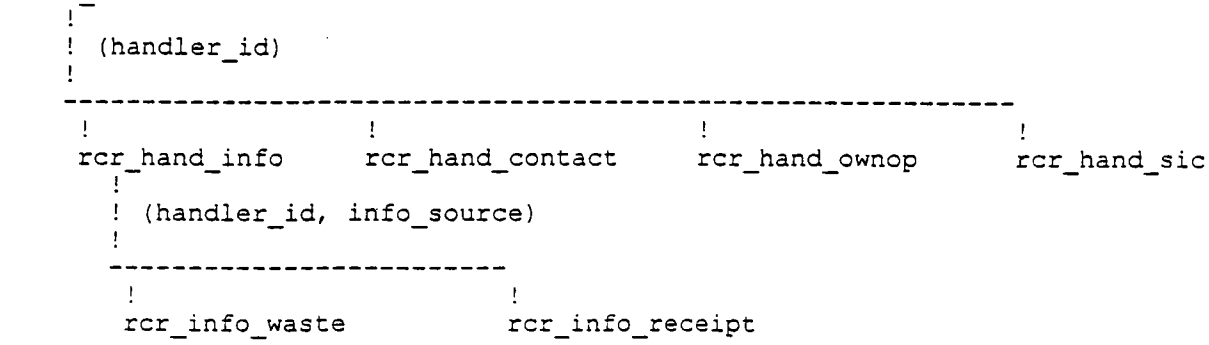
1. LQG = Large Quantity Generator -- a facility that generates a large amount of hazardous waste
2. SQG = Small Quantity Generator -- a facility that generates a small amount
3. CESQG = Conditionally Exempt SQG -- SQG conditionally exempt from reporting
4. TSD = Treatment, Storage, or Disposal Facility -- a facility that treats, stores, or disposes (i.e. landfill/incinerator) hazardous waste

   Transporters, who move waste from place to place, are also listed within RCRIS. Because they are included, RCRIS uses the word "handler" to describe a regulated entity instead of "facility".

RCRIS Data Structure (tables)

RCRIS is a complex dataset, with many different data tables or files. The most important parts of the file structure are shown below. Words within parantheses indicate "join fields" that link one table and another.

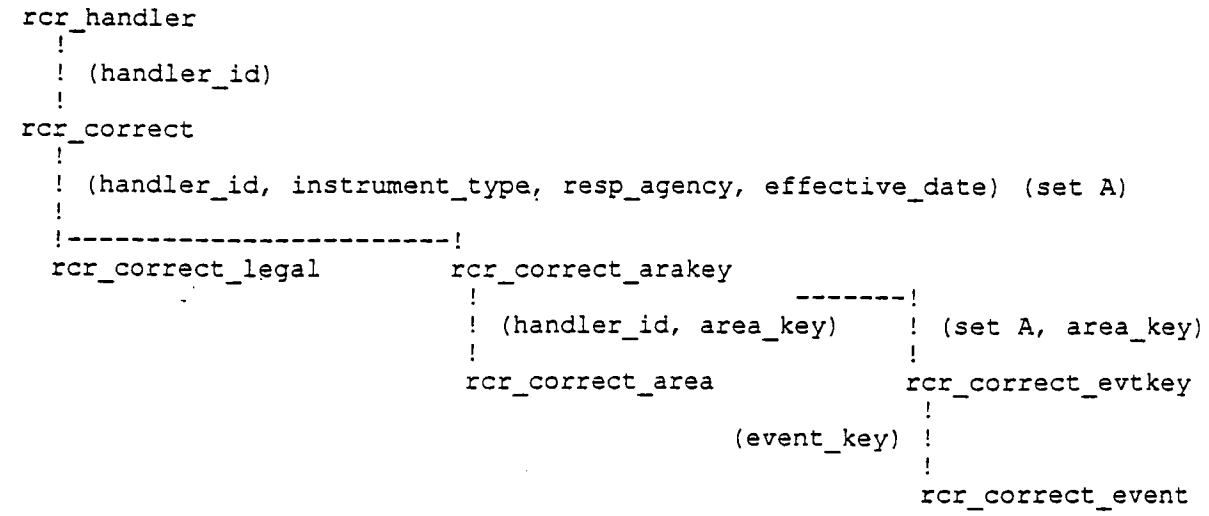
Handler Tree




```
rcr_handler       : basic handler information; one record per handler
rcr_hand_info     : one record per information source on a handler
rcr_hand_contact  : one record per contact for a handler
rcr_hand_ownop    : one record per owner or operator of a handler
rcr_hand_sic      : one record per SIC code for a handler
rcr_info_waste    : one record per waste reported by a handler
rcr_info_receipt  : one record per receipt of an information source

Note: the information in rcr_info_waste and other associated tables not shown
  is about to be deleted from RCRIS due to poor data quality.  It held
  information on quantities and types of waste that was judged to be more
  accurately represented in the BRS database.
```

Corrective Actions Tree




```
rcr_correct       : one record per corrective action
rcr_correct_legal : one record per legal authority for a corrective action
rcr_correct_arakey: link table; no new information beyond link
```

```
rcr_correct_evtkey: link table; no new information beyond link
rcr_correct_area  : one record per corrective action area
rcr_correct_event : one record per corrective action event
```

Violations Tree

```
rcr_handler
  !
  ! (handler_id)
  !
rcr_viol
  !
  ! (vio_control_number)
  !
  ------------------------------
   !                           !
   rcr_viol_evalkey            rcr_viol_enfrkey
     !                              !
     ! (handler_id, evaluation_key)  ! (enforcement_key, same as below)
     !                              !
     rcr_viol_eval                  rcr_viol_enfr
      !                                  !
      ! (handler_id, evl_control_number,  ! (handler_id, enf_control_number,
      !  resp_agency)                     !  resp_agency)
      !                                  !
      rcr_eval_area                      !
                                         !
                                         !
          ------------------------------------------------
          !                      !                      !
          rcr_enfr_multimed      rcr_enfr_milestone     rcr_enfr_penalty
```

```
rcr_viol          : one record per violation
rcr_viol_evalkey  : link table; no information beyond link
rcr_viol_enfrkey  : link table; no information beyond link
rcr_viol_eval     : one record per evaluation
rcr_viol_enfr     : one record per enforcement action
rcr_eval_area     : one record per evaluation area
rcr_enfr_multimed : one record per multimedia code
rcr_enfr_milestone: one record per enforcement milestone
rcr_enfr_penalty  : one record per penalty
```

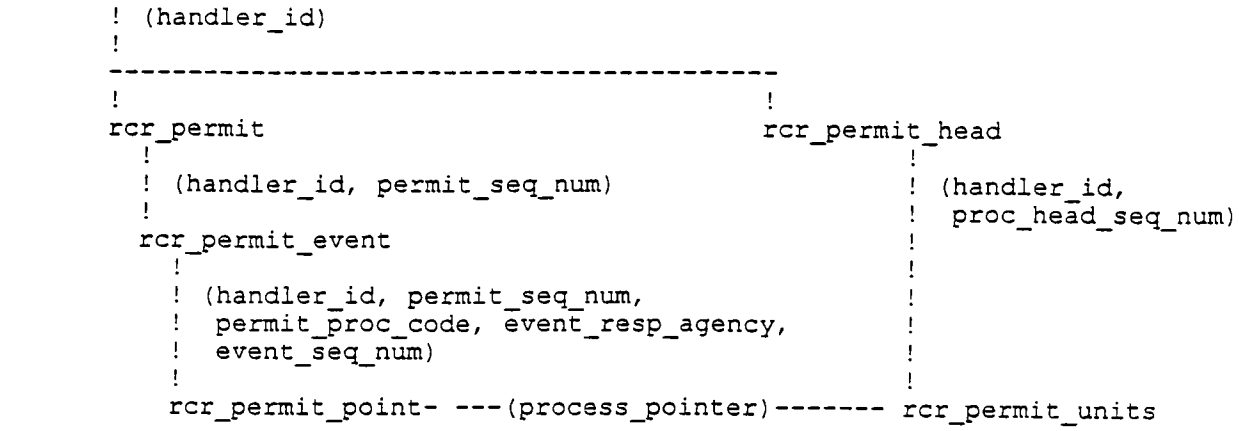
Commitment Tree

```
rcr_commit
  !
  ! (commitment_type, start_month, module_event, commit_id)
  !
  rcr_commit_handler
    !
    ! (handler_id)
    !
  rcr_handler
```

```
rcr_commit        : one record per commitment
rcr_commit_handler: link table; no new information beyond link
```

Permit and Process Unit Tree

```
rcr_handler
  !
```




```
rcr_permit        : one record per permit
rcr_permit_head   : one record per process unit
rcr_permit_units  : process unit records, both current and historical
rcr_permit_event  : one record per permit event
rcr_permit_point  : link table; no new information beyond link
```

How to get RCRIS data on RTK NET

RCRIS data can currently be accessed only through a Standard Reports program. The standard reports have the following options:

1. Facility: Selects a report that will give you data on a particular facility.
2. Area: Selects a report that will give data on all facilities in a geographic area, such as a state, city, or county.
3. Industry: Select a report that will give data on all facilities in a particular industry, as defined by a SIC code.

**** End of Help on RCRIS ****

AREA REPORT (RCRIS DATA)

search used- Zip : 17963*
City : ALL
County : SCHUYLKILL
State : PA
Violations : Handlers with and without violations
Handler Type: All Generators
Level of Detail: LOW

This search was taken from RTK NET's (the Right-To-Know Network)'s copy of EPA's RCRIS database. RTK NET is run by OMB Watch and Unison Institute at 1742 Connecticut Ave., NW, Washington DC, 20009 - Phone: 202-234-8494
The search was done on 03/02/2000.
This copy of the database was last updated on 08/31/1999.

If you don't see the words *END OF REPORT* at the end of your search, then your Web search didn't complete -- back up and try it again.

Results:

Handler Name : FELTY H M SALES & SERVICE
Street : ROUTE 443 E
City : PINE GROVE State: PA Zip: 17963
County : SCHUYLKILL Handler ID: PAD014922371
Mailing Addr.: RD 1 BOX 148
Mailing City : PINE GROVE State: PA Zip: 17963
SIC Code(s) :
1st Contact : LINDA NAGLE Phone: 7173453363 Title: ASST MGR
1st Current Owner: FELTY, HAROLD & MARIE Phone: 2155551212
Generator Status : Small Quantity Generator (SQG)
TSD Status : None
Latitude: 4033400 Longitude: 07619090
Number of permits : 0 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 12/08/1987 Last date: 12/08/1987

Handler Name : GARYS AUTO BODY
Street : RT 125
City : PINE GROVE State: PA Zip: 17963
County : SCHUYLKILL Handler ID: PAD981946221
Mailing Addr.: RD 4 BOX 419
Mailing City : PINE GROVE State: PA Zip: 17963
SIC Code(s) :
1st Contact : GARY DITZLER Phone: 7173456161 Title: OWNER
1st Current Owner: DITZLER, GARY P Phone: 2155551212
Generator Status : Small Quantity Generator (SQG)
TSD Status : None
Latitude: 4033400 Longitude: 07619090
Number of permits : 0 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 06/09/1987 Last date: 06/09/1987

Handler Name : GOLD MILLS INC
Street : 113 N TULPEHOCKEN ST
City : PINE GROVE State: PA Zip: 17963
County : SCHUYLKILL Handler ID: PAD002377703
Mailing Addr.: PO BOX 26969
Mailing City : GREENSBORO State: NC Zip: 274196969

SIC Code(s) : 2231 2258 2221
1st Contact : GEORGE NICHOLS Phone: 7173452611 Title: CORPORATE
1st Current Owner: GUILFORD MILLS INC Phone: 9192927550
Owner Street : 4925 W MARKET ST
Owner City : GREENSBORO State: NC Zip: 27407
1st Operator : PENN DYE AND FINISHING COMPANY INC Phone: 7173452611
Operator Street : PO BOX 116
Operator City : PINE GROVE State: PA Zip: 17963
Generator Status : Large Quantity Generator (LQG)
TSD Status : None
Latitude: 4023150 Longitude: 07623150
Number of permits : 3 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0
Corrective actions to date : 1
First date information received for handler: 08/18/1980 Last date: 11/19/1980

Handler Name : HEINBACH AUTO BODY WORKS
Street : RD #1 BOX 145
City : PINE GROVE State: PA Zip: 17963
County : SCHUYLKILL Handler ID: PAD981744303
Mailing Addr.: RD #1 BOX 145
Mailing City : PINE GROVE State: PA Zip: 17963
SIC Code(s) :
1st Contact : WILLARD HEINBACH Phone: 7173453810 Title: OWNER
1st Current Owner: HEINBACH, WILLARD Phone: 2155551212
Generator Status : Small Quantity Generator (SQG)
TSD Status : None
Latitude: 4033400 Longitude: 07619090
Number of permits : 0 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 11/12/1986 Last date: 11/12/1986

Handler Name : PINE GROVE ALL AMERICAN PLAZA
Street : I81 EX 1 & 31 HWY 443
City : PINE GROVE State: PA Zip: 17963
County : SCHUYLKILL Handler ID: PAD987400223
Mailing Addr.: RD 1 BOX 326
Mailing City : PINE GROVE State: PA Zip: 17963
SIC Code(s) :
1st Contact : GEORGE TICE Phone: 7173456110 Title: GEN MGR
1st Current Owner: ALL AMERICAN PLAZAS INC Phone: 7172491919
Owner Street : I81 EXIT 17 & PA TPKE EXIT 16
Owner City : CARLISLE State: PA Zip: 17013
Generator Status : Small Quantity Generator (SQG)
TSD Status : None
This handler is a hazardous waste transporter.
Type of Land Disposal: PRIVATE
Number of permits : 0 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 07/26/1993 Last date: 07/26/1993

Handler Name : PINE GROVE FORD INC
Street : RTE 443 PO BOX 345
City : PINE GROVE State: PA Zip: 17963
County : SCHUYLKILL Handler ID: PAD987388063
Mailing Addr.: RTE 443 PO BOX 345
Mailing City : PINE GROVE State: PA Zip: 17963
SIC Code(s) :

1st Contact : DARLENE HELEVA Phone: 7173452886 Title:
1st Current Owner: DARLENE A HELEVA Phone: 7173452886
Owner Street : RT 443 PO BOX 345
Owner City : PINE GROVE State: PA Zip: 17963
Generator Status : Small Quantity Generator (SQG)
TSD Status : None
Number of permits : 0 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 08/25/1992 Last date: 12/22/1992

Handler Name : PINE GROVE LANDFILL INC
Street : SCHULTZ RD BOX 447
City : PINE GROVE State: PA Zip: 17963
County : SCHUYLKILL Handler ID: PA0000341859
Mailing Addr.: PO BOX 307
Mailing City : PINE GROVE State: PA Zip: 17963
SIC Code(s) :
1st Contact : FRANK HENSHAW II Phone: 7173452777 Title: FACIL MGR
1st Current Owner: PINE GROVE LANDFILL INC Phone: 7173452777
Owner Street : RD 4 BOX 447 SCHULTZ RD
Owner City : PINE GROVE State: PA Zip: 17963
Generator Status : Large Quantity Generator (LQG)
TSD Status : None
Type of Land Disposal: PRIVATE
Number of permits : 0 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 05/18/1994 Last date: 05/18/1994

Handler Name : ZEIGLER-HARRIS CORP
Street : RD 1 RT 645
City : PINE GROVE State: PA Zip: 17963
County : SCHUYLKILL Handler ID: PAD990754970
Mailing Addr.: PO BOX 98
Mailing City : PINE GROVE State: PA Zip: 17963
SIC Code(s) : 3431
1st Contact : JAMES WATSON Phone: 7173458021 Title: PLT ENG
Generator Status : Small Quantity Generator (SQG)
TSD Status : None
Latitude: 4033400 Longitude: 07619090
Number of permits : 0 Number of recorded violations to date: 2
Number of penalties: 0 Total Dollars: $0
Enforcement actions to date: 1
First date information received for handler: 08/18/1980 Last date: 08/18/1980

END OF REPORT

AREA REPORT (RCRIS DATA)

search used- Zip : 17901*
City : ALL
County : SCHUYLKILL
State : PA
Violations : Handlers with and without violations
Handler Type: All Generators
Level of Detail: LOW

This search was taken from RTK NET's (the Right-To-Know Network)'s copy of EPA's RCRIS database. RTK NET is run by OMB Watch and Unison Institute at 1742 Connecticut Ave., NW, Washington DC, 20009 - Phone: 202-234-8494
The search was done on 03/02/2000.
This copy of the database was last updated on 08/31/1999.

If you don't see the words *END OF REPORT* at the end of your search, then your Web search didn't complete -- back up and try it again.

Results:

Handler Name : ALLIED CORP CHEMICAL SECTOR
Street : WESTWOOD RD
City : POTTSVILLE State: PA Zip: 17901
County : SCHUYLKILL Handler ID: PAD069776185
Mailing Addr.: PO BOX 697
Mailing City : POTTSVILLE State: PA Zip: 17901
SIC Code(s) : 2821
1st Contact : RASUO GHERGHEL Phone: 7176223384 Title: COOR ENV AFF
1st Current Owner: ALLIED CHEMICAL CORP Phone: 7176223384
Owner Street : PO BOX 697
Owner City : POTTSVILLE State: PA Zip: 17901
1st Operator : ALLIED CHEMICAL CORPORATION Phone: 7176223384
Operator Street : PO BOX 697
Operator City : POTTSVILLE State: PA Zip: 17901
Generator Status : Large Quantity Generator (LQG)
TSD Status : Treatment/Storage
Latitude: 4040370 Longitude: 07614210
Number of permits : 3 Number of recorded violations to date: 9
Number of penalties: 0 Total Dollars: $0
Enforcement actions to date: 3
First date information received for handler: 08/18/1980 Last date: 11/19/1980

Handler Name : ALLIED GAS CO POTTSVILLE DIST
Street : N CENTRE & COAL ST
City : POTTSVILLE State: PA Zip: 17901
County : SCHUYLKILL Handler ID: PAD987271285
Mailing Addr.: 55 S THIRD ST
Mailing City : OXFORD State: PA Zip: 19363
SIC Code(s) :
1st Contact : GEORGE RHODES Phone: 2159322000 Title: VP
1st Current Owner: ALLIED GAS CO Phone: 2155551212
Generator Status : Small Quantity Generator (SQG)
TSD Status : None
Latitude: 4040580 Longitude: 07615060
Number of permits : 1 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 04/06/1989 Last date: 09/13/1993

Handler Name : RELIABLE MACHINE SHOP
Street : 513 HOTEL ST
City : POTTSVILLE State: PA Zip: 17901
County : SCHUYLKILL Handler ID: PAD987332335
Mailing Addr.: 150 PINE CREST VILLAGE
Mailing City : PINE GROVE State: PA Zip: 17963
SIC Code(s) :
1st Contact : SUE MARKOWICZ Phone: 7173451150 Title: SCTRY
1st Current Owner: NAHAS THOMAS R Phone: 2155551212
Generator Status : Small Quantity Generator (SQG)
TSD Status : None
Number of permits : 0 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 03/26/1991 Last date: 03/26/1991

Handler Name : SEIDERS PRINTING CO INC
Street : 110 E ARCH ST
City : POTTSVILLE State: PA Zip: 17901
County : SCHUYLKILL Handler ID: PAD002379436
Mailing Addr.: 110 E ARCH ST
Mailing City : POTTSVILLE State: PA Zip: 17901
SIC Code(s) : 2759 2752 2791 2789
1st Contact : GEORGE SEIDERS Phone: 7176220570 Title:
1st Current Owner: SEIDERS GEORGE E Phone: 7176220500
Owner Street : 110 E ARCH ST
Owner City : POTTSVILLE State: PA Zip: 17901
Generator Status : Small Quantity Generator (SQG)
TSD Status : None
Type of Land Disposal: PRIVATE
Latitude: 4040580 Longitude: 07615060
Number of permits : 0 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 08/12/1980 Last date: 08/12/1980

Handler Name : UNITED METAL RECEPTACLE CORP
Street : 14TH & LAUREL STS
City : POTTSVILLE State: PA Zip: 17901
County : SCHUYLKILL Handler ID: PAD052922960
Mailing Addr.: 14TH & LAUREL STS
Mailing City : POTTSVILLE State: PA Zip: 17901
SIC Code(s) : 3411
1st Contact : RICHARD WEISS Phone: 7176227715 Title:
1st Current Owner: GREENBERG, MILTON & WEISS, SAM Phone: 2155551212
Generator Status : Large Quantity Generator (LQG)
TSD Status : None
Latitude: 4040580 Longitude: 07615060
Number of permits : 0 Number of recorded violations to date: 2
Number of penalties: 0 Total Dollars: $0
Enforcement actions to date: 1
First date information received for handler: 08/18/1980 Last date: 08/18/1980

Handler Name : W R C PROCESSING CO
Street : WALNUT LANE RD 1
City : POTTSVILLE State: PA Zip: 17901
County : SCHUYLKILL Handler ID: PAD981038227
Mailing Addr.: WALNUT LANE RD 1
Mailing City : POTTSVILLE State: PA Zip: 17901

SIC Code(s) : 3399
1st Contact : PAUL BARRICK Phone: 7037349800 Title: E EXEC VICE PR
Generator Status : Large Quantity Generator (LQG)
TSD Status : Treatment/Storage
Latitude: 4040580 Longitude: 07615060
Number of permits : 0 Number of recorded violations to date: 12
Number of penalties: 2 Total Dollars: $10,000
Enforcement actions to date: 7
First date information received for handler: 10/29/1984 Last date: 10/29/1984

Handler Name : WALCO FABRICATING CO
Street : 501 WEST BACON ST
City : POTTSVILLE State: PA Zip: 179013917
County : SCHUYLKILL Handler ID: PA0000484618
Mailing Addr.: PO BOX 792
Mailing City : POTTSVILLE State: PA Zip: 17901
SIC Code(s) : 2542
1st Contact : PETER 11 CHWASTIAK Phone: 7176284523 Title: MGR
1st Current Owner: JOSEPH T WALACAVAGE Phone: 7175444208
Owner Street : RD 1 BOX 1632
Owner City : POTTSVILLE State: PA Zip: 17901
Generator Status : Large Quantity Generator (LQG)
TSD Status : None
Type of Land Disposal: PRIVATE
Number of permits : 0 Number of recorded violations to date: 4
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 07/06/1994 Last date: 07/06/1994

Handler Name : WATCHERS MIKE USED CAR
Street : 1540 W MARKET ST
City : POTTSVILLE State: PA Zip: 17901
County : SCHUYLKILL Handler ID: PAR000019455
Mailing Addr.: 1540 W MARKET ST
Mailing City : POTTSVILLE State: PA Zip: 17901
SIC Code(s) :
1st Contact : MIKE WATCHERS Phone: 7176223290 Title: OWNER
1st Current Owner: WATCHERS MIKE Phone: 7176223290
Owner Street : 1540 W MARKET ST
Owner City : POTTSVILLE State: PA Zip: 17901
Generator Status : Small Quantity Generator (SQG)
TSD Status : None
Type of Land Disposal: PRIVATE
Number of permits : 0 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 05/07/1996 Last date: 05/07/1996

Handler Name : WEST END CLEANERS
Street : 1912 WEST END AVE
City : POTTSVILLE State: PA Zip: 17901
County : SCHUYLKILL Handler ID: PAD108048869
Mailing Addr.: 1912 WEST END AVE
Mailing City : POTTSVILLE State: PA Zip: 17901
SIC Code(s) : 7216
1st Contact : LEO V POST Phone: 7176228670 Title:
1st Current Owner: POST, LEO V Phone: 2155551212
Generator Status : Small Quantity Generator (SQG)
TSD Status : None
Latitude: 4040580 Longitude: 07615060

AREA REPORT (RCRIS DATA)

search used- Zip : 17028*
City : ALL
County : DAUPHIN
State : PA
Violations : Handlers with and without violations
Handler Type: All Generators
Level of Detail: LOW

This search was taken from RTK NET's (the Right-To-Know Network)'s copy of EPA's RCRIS database. RTK NET is run by OMB Watch and Unison Institute at 1742 Connecticut Ave., NW, Washington DC, 20009 - Phone: 202-234-8494
The search was done on 03/02/2000.
This copy of the database was last updated on 08/31/1999.

If you don't see the words *END OF REPORT* at the end of your search, then your Web search didn't complete -- back up and try it again.

Results:

Handler Name : BICKLE AUTO BODY
Street : BOW CREEK RD RD 1
City : GRANTVILLE State: PA Zip: 17028
County : DAUPHIN Handler ID: PAD982574436
Mailing Addr.: BOW CREEK RD RD 1 BOX 5393
Mailing City : GRANTVILLE State: PA Zip: 17028
SIC Code(s) :
1st Contact : DONALD BICKLE Phone: 7174697618 Title:
1st Current Owner: BICKLE, DONALD Phone: 2155551212
Generator Status : Small Quantity Generator (SQG)
TSD Status : None
Latitude: 4023280 Longitude: 07641050
Number of permits : 0 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 08/08/1988 Last date: 08/08/1988

Handler Name : CITY-SUBURBAN OIL CO
Street : US RTE 22 EAST
City : GRANTVILLE State: PA Zip: 17028
County : DAUPHIN Handler ID: PAD014192991
Mailing Addr.: PO BOX 2240 RD 1
Mailing City : GRANTVILLE State: PA Zip: 17028
SIC Code(s) :
1st Contact : JAMES TALLEY Phone: 7174690338 Title: OWNER
1st Current Owner: TALLEY, JAMES A Phone: 2155551212
Generator Status : Small Quantity Generator (SQG)
TSD Status : None
This handler is a hazardous waste transporter.
Latitude: 4023280 Longitude: 07641050
Number of permits : 0 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 05/20/1986 Last date: 05/20/1986

Handler Name : TEXAS EASTERN-GRANTVILLE STA
Street : 1 MILE N W OF GRANTVILLE
City : GRANTVILLE State: PA Zip: 17028
County : DAUPHIN Handler ID: PAD981937758
Mailing Addr.: PO BOX 2521

Mailing City : HOUSTON State: TX Zip: 77252
SIC Code(s) :
1st Contact : R SALZER Phone: 7137595388 Title: R MGR
1st Current Owner: TEXAS EASTERN P/L CO Phone: 2155551212
Generator Status : Large Quantity Generator (LQG)
TSD Status : None
Latitude: 4023280 Longitude: 07641050
Number of permits : 0 Number of recorded violations to date: 1
Number of penalties: 0 Total Dollars: $0
Enforcement actions to date: 1
First date information received for handler: 03/31/1987 Last date: 03/31/1987

END OF REPORT

1st Current Owner: AMP INC Phone: 7175640100
Owner Street : PO BOX 3608
Owner City : HARRISBURG State: PA Zip: 171053608
Generator Status : Small Quantity Generator (SQG)
TSD Status : None
Type of Land Disposal: PRIVATE
Number of permits : 0 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 11/27/1995 Last date: 11/27/1995

Handler Name : AMP INC
Street : 2900 FULLING MILL RD
City : MIDDLETOWN State: PA Zip: 17057
County : DAUPHIN Handler ID: PAR000025619
Mailing Addr.: PO BOX 3608 MS258-01
Mailing City : HARRISBURG State: PA Zip: 171053608
SIC Code(s) :
1st Contact : JEFFREY BURD Phone: 7179852126 Title: ENV COORDINATOR
1st Current Owner: AMP INC Phone: 7175640100
Owner Street : PO BOX 3608
Owner City : HARRISBURG State: PA Zip: 171053608
Generator Status : Small Quantity Generator (SQG)
TSD Status : None
Type of Land Disposal: PRIVATE
Number of permits : 0 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 11/22/1996 Last date: 11/22/1996

outside watershed

Handler Name : CLEVELAND BROS EQUIP CO INC
Street : 4491 CHAMBERS HILL RD
City : HARRISBURG State: PA Zip: 17057
County : DAUPHIN Handler ID: PAD981737000
Mailing Addr.: PO BOX 2535
Mailing City : HARRISBURG State: PA Zip: 17057
SIC Code(s) :
1st Contact : DANIEL FISHER Phone: 7175643763 Title: SVC MGR
1st Current Owner: CLEVELAND BROS EQUIP CO Phone: 2155551212
Generator Status : Small Quantity Generator (SQG)
TSD Status : None
Latitude: 4011420 Longitude: 07643060
Number of permits : 0 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 10/03/1986 Last date: 10/03/1986

outside watershed

Handler Name : DYNAMIC PRODUCTS CORP
Street : MAIN & NISSLEY STS
City : MIDDLETOWN State: PA Zip: 17057
County : DAUPHIN Handler ID: PAD031327638
Mailing Addr.: PO BOX 272
Mailing City : MIDDLETOWN State: PA Zip: 17057
SIC Code(s) :
1st Contact : GEORGE JACOBY Phone: 7179447646 Title: SUPT
1st Current Owner: DYNAMIC PRODUCTS CORP Phone: 2155551212
Generator Status : Large Quantity Generator (LQG)
TSD Status : None
Latitude: 4011420 Longitude: 07643060
Number of permits : 0 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0

AREA REPORT (RCRIS DATA)

search used- Zip : 17026*
City : ALL
County : LEBANON
State : PA
Violations : Handlers with and without violations
Handler Type: All Generators
All Treatment/Storage/Disposal facilities
Transporters
Level of Detail: LOW

This search was taken from RTK NET's (the Right-To-Know Network)'s copy of EPA's RCRIS database. RTK NET is run by OMB Watch and Unison Institute at 1742 Connecticut Ave., NW, Washington DC, 20009 - Phone: 202-234-8494
The search was done on 03/06/2000.
This copy of the database was last updated on 08/31/1999.

If you don't see the words *END OF REPORT* at the end of your search, then your Web search didn't complete -- back up and try it again.

Results:

Handler Name : SHERWIN WILLIAMS CO THE
Street : 370 N PINE GROVE ST
City : FREDERICKSBURG State: PA Zip: 17026
County : LEBANON Handler ID: PAR000013458
Mailing Addr.: 370 N PINE GROVE ST
Mailing City : FREDERICKSBURG State: PA Zip: 17026
SIC Code(s) : 5231 2851 7359
1st Contact : JOHN DUBOTS Phone: 7178654111 Title: MANAGER
1st Current Owner: SHERWIN WILLIAMS CO THE Phone: 2165662000
Owner Street : 101 PROSPECT AVE
Owner City : CLEVELAND State: OH Zip: 44115
Generator Status : Large Quantity Generator (LQG)
TSD Status : None
Type of Land Disposal: PRIVATE
Number of permits : 0 Number of recorded violations to date: 2
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 11/20/1995 Last date: 01/26/1999

END OF REPORT

AREA REPORT (RCRIS DATA)

search used- Zip : 17038*
City : ALL
County : LEBANON
State : PA
Violations : Handlers with and without violations
Handler Type: All Generators
All Treatment/Storage/Disposal facilities
Transporters
Level of Detail: LOW

This search was taken from RTK NET's (the Right-To-Know Network)'s copy of EPA's RCRIS database. RTK NET is run by OMB Watch and Unison Institute at 1742 Connecticut Ave., NW, Washington DC, 20009 - Phone: 202-234-8494
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Results:

Handler Name : AMP INC LICKDALE PLT
Street : RT 72 AT LICKDALE I 81 EXIT 30
City : JONESTOWN State: PA Zip: 170389708
County : LEBANON Handler ID: PAR000033142
Mailing Addr.: RR 1 BOX 1933
Mailing City : JONESTOWN State: PA Zip: 170389708
SIC Code(s) :
1st Contact : BARRY BECHTEL Phone: 7176477663 Title: ENV ENG
1st Current Owner: AMP INC Phone: 7175922205
Owner Street : PO BOX 3608 BLDG 176
Owner City : HARRISBURG State: PA Zip: 171053608
Generator Status : Large Quantity Generator (LQG)
TSD Status : None
Type of Land Disposal: PRIVATE
Number of permits : 0 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 02/02/1998 Last date: 02/02/1998

Handler Name : JOE MAYS EXXON
Street : RD1 BOX 1296 RT 72
City : JONESTOWN State: PA Zip: 17038
County : LEBANON Handler ID: PAD987366218
Mailing Addr.: RD1 BOX 1296
Mailing City : JONESTOWN State: PA Zip: 17038
SIC Code(s) :
1st Contact : JOE MAY Phone: 7178656266 Title: OWNER
1st Current Owner: JOE MAY Phone: 7178656266
Owner Street : RD1 BOX 1296
Owner City : JONESTOWN State: PA Zip: 17038
Generator Status : Small Quantity Generator (SQG)
TSD Status : None
Number of permits : 0 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 02/13/1992 Last date: 02/13/1992

Handler Name : KLEINFELTER CHEVROLET

AREA REPORT (RCRIS DATA)

search used- Zip : 17046*
City : ALL
County : LEBANON
State : PA
Violations : Handlers with and without violations
Handler Type: All Generators
All Treatment/Storage/Disposal facilities
Transporters
Level of Detail: LOW

This search was taken from RTK NET's (the Right-To-Know Network)'s copy of EPA's RCRIS database. RTK NET is run by OMB Watch and Unison Institute at 1742 Connecticut Ave., NW, Washington DC, 20009 - Phone: 202-234-8494
The search was done on 03/06/2000.
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If you don't see the words *END OF REPORT* at the end of your search, then your Web search didn't complete -- back up and try it again.

Results:

Handler Name : HERR IND INC
Street : 602 N 22ND ST
City : LEBANON State: PA Zip: 17046
County : LEBANON Handler ID: PAR000021725
Mailing Addr.: PO BOX 5249
Mailing City : LANCASTER State: PA Zip: 176065249
SIC Code(s) :
1st Contact : DAVID YOUNG Phone: 7172709519 Title: SHOP SUPERVISOR
1st Current Owner: HERR IND INC Phone: 7175696619
Owner Street : 610 E OREGON RD
Owner City : LIITITZ State: PA Zip: 17543
Generator Status : Small Quantity Generator (SQG)
TSD Status : None
Type of Land Disposal: PRIVATE
Number of permits : 0 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 07/31/1996 Last date: 07/31/1996

Handler Name : HOOVER CONTAINMENT INC
Street : 201 N 5TH AVE
City : LEBANON State: PA Zip: 17046
County : LEBANON Handler ID: PAD982568461
Mailing Addr.: 6740 BAY MEADOW DR
Mailing City : GLEN BURNIE State: MD Zip: 21060
SIC Code(s) : 3443
1st Contact : THOMAS ZIMMERMAN Phone: 7172702691 Title: GEN MGR
1st Current Owner: HOOVER CONTAINMENT INC Phone: 4107870010
Owner Street : 6740 BAY MEADOW DR
Owner City : GLEN BURNIE State: MD Zip: 21060
Generator Status : Large Quantity Generator (LQG)
TSD Status : None
Type of Land Disposal: PRIVATE
Latitude: 4019040 Longitude: 07626100
Number of permits : 0 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 12/16/1988 Last date: 12/16/1988

Handler Name : LEBANON FINISHED PRODS
Street : 203 N 5TH AVE
City : LEBANON State: PA Zip: 17046
County : LEBANON Handler ID: PAR000023366
Mailing Addr.: 203 N 5TH AVE
Mailing City : LEBANON State: PA Zip: 17046
SIC Code(s) :
1st Contact : ROBERT HIGH Phone: 7172749481 Title: PARTNER
1st Current Owner: HIGH ROBERT Phone: 7178656522
Owner Street : RD 1 BOX 2120
Owner City : JONESTOWN State: PA Zip: 17038
Generator Status : Large Quantity Generator (LQG)
TSD Status : None
Type of Land Disposal: PRIVATE
Number of permits : 0 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 09/17/1996 Last date: 09/17/1996

Handler Name : THETA SERVICES INC
Street : 200 NARROWS DRIVE
City : LEBANON State: PA Zip: 170469265
County : LEBANON Handler ID: PAD981945645
Mailing Addr.: 200 NARROWS DRIVE
Mailing City : LEBANON State: PA Zip: 170469265
SIC Code(s) :
1st Contact : JIM STINER Phone: 7172746572 Title: MGR
1st Current Owner: ALLEGHANY PROPERTIES C/O JONES MOTOR Phone: 2159487900
Owner Street : 900 BRIDGE ST
Owner City : SPRING CITY State: PA Zip: 19475
Generator Status : Small Quantity Generator (SQG)
TSD Status : None
Type of Land Disposal: PRIVATE
Latitude: 4019040 Longitude: 07626100
Number of permits : 0 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 07/29/1987 Last date: 07/29/1987

Handler Name : TOMS AUTO SALES
Street : N 7TH ST 3 MI N OF MAPLE ST RT 2 BOX 1785
City : LEBANON State: PA Zip: 170469659
County : LEBANON Handler ID: PAR000256446
Mailing Addr.: RT 2 BOX 1785 N 7TH ST
Mailing City : LEBANON State: PA Zip: 170469659
SIC Code(s) :
1st Contact : THOMAS VRAGOVICH Phone: 7172722906 Title: OWNER
1st Current Owner: VRAGOVICH THOMAS Phone: 7172722906
Owner Street : RT 2 BOX 1785
Owner City : LEBANON State: PA Zip: 170469659
Generator Status : Small Quantity Generator (SQG)
TSD Status : None
Type of Land Disposal: PRIVATE
Number of permits : 0 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 11/20/1996 Last date: 11/20/1996

END OF REPORT

Number of permits : 0 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 12/29/1986 Last date: 12/29/1986

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out of Watersne

Handler Name : PENNSY SUPPLY INC
Street : 200 PRESCOTT RD
City : LEBANON State: PA Zip: 17042
County : LEBANON Handler ID: PAD982566499
Mailing Addr.: PO BOX 3331
Mailing City : HARRISBURG State: PA Zip: 17104
SIC Code(s) :
1st Contact : MARK GIBBLE Phone: 7172743661 Title:
1st Current Owner: PENNSY SUPPLY INC Phone: 7172334511
Owner Street : PO BOX 3331
Owner City : HARRISBURG State: PA Zip: 17104
Generator Status : Small Quantity Generator (SQG)
TSD Status : None
Type of Land Disposal: PRIVATE
Latitude: 4019040 Longitude: 07626100
Number of permits : 0 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 06/14/1988 Last date: 06/14/1988

Handler Name : PHARMALOZ DIV OF JOEL INC
Street : 500 N 15TH AVE
City : LEBANON State: PA Zip: 17042
County : LEBANON Handler ID: PAD121726244
Mailing Addr.: P O BOX 1216
Mailing City : LEBANON State: PA Zip: 17042
SIC Code(s) :
1st Contact : BARBARA GARRETT Phone: 7172749800 Title: QC
1st Current Owner: DECK, DAVID & CHERYL Phone: 2155551212
Generator Status : Small Quantity Generator (SQG)
TSD Status : None
Latitude: 4019040 Longitude: 07626100
Number of permits : 0 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 12/12/1988 Last date: 12/12/1988

Handler Name : PLASTERER EQUIPMENT CO INC
Street : 2550 E CUMBERLAND ST
City : LEBANON State: PA Zip: 17042
County : LEBANON Handler ID: PAD014319842
Mailing Addr.: 2550 E CUMBERLAND ST
Mailing City : LEBANON State: PA Zip: 17042
SIC Code(s) :
1st Contact : FRANK CONRAD Phone: 7172732616 Title: MGR
1st Current Owner: PLASTERER EQUIPMENT CO Phone: 2155551212
Generator Status : Small Quantity Generator (SQG)
TSD Status : None
Latitude: 4019040 Longitude: 07626100
Number of permits : 0 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 08/08/1989 Last date: 08/08/1989

Handler Name : PRINTED TERRY FINISHING CO INC

Street : 16TH & WILLOW STS
City : LEBANON State: PA Zip: 17042
County : LEBANON Handler ID: PAD987300845
Mailing Addr.: PO BOX 746
Mailing City : LEBANON State: PA Zip: 17042
SIC Code(s) :
1st Contact : RALPH GASSERT Phone: 7172738101 Title: MGR
1st Current Owner: PRINTED TERRY FINISHING CO INC Phone: 7172738101
Owner Street : 16TH & WILLOW STS
Owner City : LEBANON State: PA Zip: 17042
Generator Status : Large Quantity Generator (LQG)
TSD Status : None
Number of permits : 0 Number of recorded violations to date: 3
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 07/10/1991 Last date: 07/10/1991

Handler Name : QUILL CORP
Street : 1 KEYSTONE DR
City : LEBANON State: PA Zip: 17042
County : LEBANON Handler ID: PAD987389285
Mailing Addr.: 1 KEYSTONE DR
Mailing City : LEBANON State: PA Zip: 17042
SIC Code(s) :
1st Contact : GEORGE KERN Phone: 7172704335 Title: SAFETY SECURITY
1st Current Owner: HARVEY MILLER Phone: 7086345712
Owner Street : 100 SCHELTER RD
Owner City : LINCOLNSHIRE State: IL Zip: 60069
Generator Status : Small Quantity Generator (SQG)
TSD Status : None
Number of permits : 0 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 09/29/1992 Last date: 09/29/1992

Handler Name : REGAL CAST INC
Street : 307 N 9TH AVE
City : LEBANON State: PA Zip: 17042
County : LEBANON Handler ID: PA0000020750
Mailing Addr.: PO BOX 1170 307 N 9TH AVE
Mailing City : LEBANON State: PA Zip: 17042
SIC Code(s) :
1st Contact : ANTHONY REGINA Phone: 7172701888 Title: EXEC VICE PRES
1st Current Owner: HERSCHKOWITZ JANIS Phone: 7172736787
Owner Street : 64 REXMONT RD
Owner City : CORNWALL State: PA Zip: 17016
Generator Status : Small Quantity Generator (SQG)
TSD Status : None
Type of Land Disposal: PRIVATE
Number of permits : 0 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 09/28/1993 Last date: 09/28/1993

Handler Name : REPPERTS
Street : 1500 E CUMBERLAND ST
City : LEBANON State: PA Zip: 17042
County : LEBANON Handler ID: PAD014437370
Mailing Addr.: 1500 E CUMBERLAND ST
Mailing City : LEBANON State: PA Zip: 17042
SIC Code(s) :

Handler Name : LEBANON SEWAGE TREATMENT PLANT CITY OF
Street : 250 DAIRY RD BOX 2210
City : LEBANON State: PA Zip: 17042
County : LEBANON Handler ID: PAT440012565
Mailing Addr.: 250 DAIRY RD BOX 2210
Mailing City : LEBANON State: PA Zip: 17042
SIC Code(s) :
1st Contact : JAMES FRAYTIC Phone: 7172722841 Title: SUPERI
1st Current Owner: CITY OF LEBANON Phone: 2155551212
Generator Status : None
TSD Status : None
This handler is a hazardous waste transporter.
Latitude: 4019040 Longitude: 07626100
Number of permits : 0 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 08/18/1980 Last date: 08/18/1980

Handler Name : LEBANON STEEL FOUNDRY
Street : 101 E LEHMAN ST
City : LEBANON State: PA Zip: 17042
County : LEBANON Handler ID: PAD003018272
Mailing Addr.: 101 E LEHMAN ST
Mailing City : LEBANON State: PA Zip: 17042
SIC Code(s) :
1st Contact : JACK JUPPENLATZ Phone: 7172731611 Title:
1st Current Owner: LEBANON STEEL FOUNDRY Phone: 2155551212
Generator Status : Large Quantity Generator (LQG)
TSD Status : None
Latitude: 4019040 Longitude: 07626100
Number of permits : 0 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 08/18/1980 Last date: 08/18/1980

Handler Name : LEBANON TOOL CO
Street : 7TH AVE & E WEIDMAN STS
City : LEBANON State: PA Zip: 17042
County : LEBANON Handler ID: PAD003005121
Mailing Addr.: 7TH AVE & WEIDMAN ST
Mailing City : LEBANON State: PA Zip: 17042
SIC Code(s) :
1st Contact : SHARON BUNDERMAN Phone: 7172733711 Title:
Generator Status : Conditionally Exempt SQG
TSD Status : None
Latitude: 4019040 Longitude: 07626100
Number of permits : 0 Number of recorded violations to date: 1
Number of penalties: 0 Total Dollars: $0
Enforcement actions to date: 1
First date information received for handler: 08/30/1985 Last date: 08/30/1985

Handler Name : LEFFLER, CARLOS, R INC - LEBANON
Street : 1999 E CUMBERLAND ST
City : LEBANON State: PA Zip: 17042
County : LEBANON Handler ID: PAD981734502
Mailing Addr.: 1999 E CUMBERLAND ST
Mailing City : LEBANON State: PA Zip: 17042
SIC Code(s) :
1st Contact : KERNEL ROOT Phone: 7178662105 Title: VP

AREA REPORT (RCRIS DATA)

search used- Zip : 17042*
City : ALL
County : LEBANON
State : PA
Violations : Handlers with and without violations
Handler Type: All Generators
All Treatment/Storage/Disposal facilities
Transporters
Level of Detail: LOW

This search was taken from RTK NET's (the Right-To-Know Network)'s copy of EPA's RCRIS database. RTK NET is run by OMB Watch and Unison Institute at 1742 Connecticut Ave., NW, Washington DC, 20009 - Phone: 202-234-8494
The search was done on 03/06/2000.
This copy of the database was last updated on 08/31/1999.

If you don't see the words *END OF REPORT* at the end of your search, then your Web search didn't complete -- back up and try it again.

Results:

Handler Name : AAMCO TRANSMISSION
Street : 143 E PENN AVE
City : CLEONA State: PA Zip: 17042
County : LEBANON Handler ID: PAD172276339
Mailing Addr.: 143 E PENN AVE
Mailing City : CLEONA State: PA Zip: 17042
SIC Code(s) : 7537
1st Contact : ROB KIRBY Phone: 7172741881 Title:
1st Current Owner: KIRBY, ROB Phone: 2155551212
Generator Status : Small Quantity Generator (SQG)
TSD Status : None
Latitude: 4019040 Longitude: 07626100
Number of permits : 0 Number of recorded violations to date: 0
Number of penalties: 0 Total Dollars: $0
First date information received for handler: 09/28/1987 Last date: 09/28/1987

Handler Name : ALCOA INC
Street : 3000 STATE DR
City : LEBANON State: PA Zip: 170428899
County : LEBANON Handler ID: PAD001887579
Mailing Addr.: 3000 STATE DR
Mailing City : LEBANON State: PA Zip: 170428899
SIC Code(s) : 3334
1st Contact : R. BRENDEL Phone: 7172737661 Title: O. PLT MECH ENG
1st Current Owner: ALCOA INC Phone: 4125534822
Owner Street : 201 ISABELLA ST
Owner City : PITTSBURGH State: PA Zip: 152125858
Generator Status : Large Quantity Generator (LQG)
TSD Status : None
Type of Land Disposal: PRIVATE
Latitude: 4019040 Longitude: 07626100
Number of permits : 0 Number of recorded violations to date: 4
Number of penalties: 4 Total Dollars: $5,000
Enforcement actions to date: 4
First date information received for handler: 08/15/1980 Last date: 08/15/1980

APPENDIX D
Mining Permits and Sinkhole Locations

Mining Operations in the Swatara Creek Watershed

file created 1/18/00

County	Township	Operator Name	Type	Permit #	Site Status
Berks	Bethel	Bechtold, Mark J.	noncoal small	SM 524-1	active
		Reber, Roy E.	noncoal small	06880806	active
		Barry Bashore, Inc.	noncoal small	06890801	active
Dauphin	Lower Swatara	Haines & Kibblehouse, Inc.	noncoal large	22880302	active
		Rocky Licensing Corp.	noncoal large	22880301	active
	South Hanover	Pennsy Supply, Inc.	noncoal large	22920301	active
		Pennsy Supply, Inc.	noncoal large	7175SM1	active
	West Hanover	Blue Mtn. Building Stone Co.	noncoal small	22982801	not started
		Blue Mtn. Building Stone Co.	noncoal small	22890801	active
Lebanon	Cornwall	Sheridan Corp.	noncoal large	38850301	active
		Sheridan Corp.	noncoal large	38950301	active
		Sheridan Corp.	noncoal large	38970301	not started
	East Hanover	Dale Gingrich	noncoal small	38910801	active
	Jackson	Esh Stephen S.	noncoal small	SM 420-1	active
	North Annville	Carmeuse Pennsylvania, Inc.	noncoal large	38870301	active
	North Lebanon	Sanger, Glenn	noncoal small	SM 412-1	active
	North Londonderry	Tarmac America	noncoal large	38970302	not started
	South Lebanon	Pennsy Supply, Inc.	noncoal large	7674SM1	active
	West Cornwall	Pennsy Supply, Inc.	noncoal large	7675SM1	active
Schuylkill	Foster	Bucket Coal Co.	coal	54891301	active
		Neumister Coal Co.	coal	54851340	active
		Keystone Quarry, Inc.	noncoal large	54980302	active
		Schuylkill Contracting Co.	noncoal large	54980301	not started
	Frailey	Jeddo-Highland Coal Co.	coal	54970204	active
		Meadowbrook Coal Co., Inc.	coal	54900102	active
		Gale Coal Co., Inc.	coal	54980103	not started
		Devil's Hole, Inc.	coal	54960203	active

	M&H Coal Co.	coal	54921301	active
	Lucas & Partners	coal	54851314	abandoned
	Mountain Run Enterprises	coal	54871304	regraded
	Buck Mtn. Coal Co.	coal	54851343	active
	A. & J. Processing Co.	coal	54941601	active
	Shermans Coal Co.	coal	54931601	active
	L. & L. Coal Co.	coal	54901301	forfeiture
	J.R. & L. Coal Co.	coal	54871301	active
	D.J.T. Coal Co.	coal	54941303	active
	Par L Coal Co.	coal	54981301	active
Pine Grove Twp.	Blaschak Coal Corp.	coal	54880201	active
Porter Twp.	Westwood Energy Properties Ltd Prnsp	coal	54860206	active
	Summit Anthracite, Inc.	coal	54851336	active
Reilly	Jeddo-Highland Coal Co.	coal	54773215	active
	Swatara Coal Co.	coal	54830702	active
	CLS Coal Co.	coal	54840207	active
	White Pine Coal Co., Inc.	coal	54890102	active
	Hegins Mining Co.	coal	54840205	active
	Blackwood Inc.	coal	54900101	active
	A D Coal Co.	coal	54850112	inactive
	A.K.A. Coal Inc.	coal	54851345	inactive
	Rhen Coal Co.	coal	54851317	active
Tremont	Meadowbrook Coal Co., Inc.	coal	54830206	active
	Meadowbrook Coal Co., Inc.	coal	54910206	active
	Lensco Corp.	coal	54840101	active
	Lensco Corp.	coal	54860106	active
	Michael Coal Co.	coal	54850103	active
	Harriman Coal Co.	coal	54840102	active
	Harriman Coal Co.	coal	54860109	active
	Harriman Coal Co.	coal	54880203	active
	Harriman Coal Co.	coal	54920103	active
	Harriman Coal Co.	coal	54713018	inactive
	Kintzel Coal Co.	coal	54851304	inactive
	D.G.W. Coal Co.	coal	54851302	regraded
	Summit Coal Co.	coal	54881301	inactive

Shadle Coal Co.	coal	54851323	active
H.L.&W. Coal Co.	coal	54951302	not started
Little Buck Coal Co.	coal	54851342	active
B&B Anthracite Coal Co.	coal	54851325	active
West End Coal Co., Deep Mine	coal	54871302	active
Potts Contracting Co., Inc.	coal	54901305	regraded
New Lincoln Coal CO., Inc.	coal	54851347	active
Big Diamond Coal Co.	coal	54861310	regraded
R.&D. Coal Co.	coal	54861303	active
Lincoln Sand & Gravel Co.	noncoal small	54870801	active

BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY

Deparment of Conservation and Natural Resources

SINKHOLE QUERY REPORT

Sinkhole	County	Municipality	Quadrangle	Geologic Formation
642 - 1	DAUPHIN	SWATARA T	HARRISBURG EAST	ST PAUL GP
	Latitude: 401514 Longitude: 764847			
	Comments:			
642 - 2	DAUPHIN	SWATARA T	HARRISBURG EAST	ST PAUL GP
	Latitude: 401511 Longitude: 764847			
	Comments:			
642 - 3	DAUPHIN	SWATARA T	HARRISBURG EAST	ST PAUL GP
	Latitude: 401510 Longitude: 764849			
	Comments:			
642 - 4	DAUPHIN	SWATARA T	HARRISBURG EAST	HERSHEY
	Latitude: 401724 Longitude: 764836			
	Comments:			
642 - 5	DAUPHIN	HARRISBURG C	HARRISBURG EAST	ST PAUL GP
	Latitude: 401521 Longitude: 765115			
	Comments:			
642 - 6	DAUPHIN	HARRISBURG C	HARRISBURG EAST	ST PAUL GP
	Latitude: 401503 Longitude: 765139			
	Comments:			
643 - 1	DAUPHIN	DERRY T	HERSHEY	EPLER
	Latitude: 401523 Longitude: 764235			
	Comments:			
643 - 2	DAUPHIN	DERRY T	HERSHEY	EPLER
	Latitude: 401509 Longitude: 764220			
	Comments:			
643 - 3	DAUPHIN	DERRY T	HERSHEY	EPLER
	Latitude: 401508 Longitude: 764219			
	Comments:			
643 - 4	DAUPHIN	DERRY T	HERSHEY	EPLER
	Latitude: 401528 Longitude: 764220			
	Comments:			
643 - 5	DAUPHIN	DERRY T	HERSHEY	EPLER
	Latitude: 401528 Longitude: 764215			
	Comments:			
643 - 6	DAUPHIN	DERRY T	HERSHEY	EPLER
	Latitude: 401528 Longitude: 764214			
	Comments:			
643 - 7	DAUPHIN	DERRY T	HERSHEY	EPLER
	Latitude: 401528 Longitude: 764212			
	Comments:			
643 - 8	DAUPHIN	DERRY T	HERSHEY	EPLER
	Latitude: 401528 Longitude: 764210			
	Comments:			
643 - 9	DAUPHIN	DERRY T	HERSHEY	EPLER
	Latitude: 401428 Longitude: 764209			
	Comments:			
643 - 10	DAUPHIN	DERRY T	HERSHEY	EPLER
	Latitude: 401528 Longitude: 764207			

	Comments:		
643 - 11	DAUPHIN DERRY T	HERSHEY	EPLER
	Latitude: 401521 Longitude: 764159		
	Comments:		
643 - 12	DAUPHIN DERRY T	HERSHEY	EPLER
	Latitude: 401600 Longitude: 764030		
	Comments:		
643 - 13	DAUPHIN DERRY T	HERSHEY	EPLER
	Latitude: 401614 Longitude: 763931		
	Comments:		
643 - 14	DAUPHIN DERRY T	HERSHEY	EPLER
	Latitude: 401604 Longitude: 763917		
	Comments:		
643 - 15	DAUPHIN DERRY T	HERSHEY	BUFFALO SPRINGS
	Latitude: 401527 Longitude: 763822		
	Comments:		
643 - 16	DAUPHIN DERRY T	HERSHEY	STONEHENGE
	Latitude: 401542 Longitude: 763807		
	Comments:		
643 - 17	DAUPHIN DERRY T	HERSHEY	STONEHENGE
	Latitude: 401551 Longitude: 763812		
	Comments:		
643 - 18	DAUPHIN DERRY T	HERSHEY	STONEHENGE
	Latitude: 401609 Longitude: 763810		
	Comments:		
643 - 19	DAUPHIN DERRY T	HERSHEY	STONEHENGE
	Latitude: 401609 Longitude: 763803		
	Comments:		
643 - 20	DAUPHIN DERRY T	HERSHEY	EPLER
	Latitude: 401638 Longitude: 763939		
	Comments:		
643 - 21	DAUPHIN DERRY T	HERSHEY	EPLER
	Latitude: 401642 Longitude: 763940		
	Comments:		
643 - 22	DAUPHIN DERRY T	HERSHEY	EPLER
	Latitude: 401557 Longitude: 764107		
	Comments:		
643 - 23	DAUPHIN DERRY T	HERSHEY	EPLER
	Latitude: 401556 Longitude: 764107		
	Comments:		
643 - 24	DAUPHIN DERRY T	HERSHEY	EPLER
	Latitude: 401559 Longitude: 764055		
	Comments:		
643 - 25	DAUPHIN DERRY T	HERSHEY	EPLER
	Latitude: 401559 Longitude: 764053		
	Comments:		
643 - 26	DAUPHIN DERRY T	HERSHEY	EPLER
	Latitude: 401558 Longitude: 764053		
	Comments:		
643 - 27	DAUPHIN DERRY T	HERSHEY	EPLER
	Latitude: 401533 Longitude: 764234		
	Comments:		

643 - 28	DAUPHIN DERRY T Latitude: 401514 Longitude: 764257 Comments:	HERSHEY	EPLER
643 - 29	DAUPHIN DERRY T Latitude: 401613 Longitude: 763900 Comments:	HERSHEY	STONEHENGE
644 - 58	DAUPHIN DERRY T Latitude: 401706 Longitude: 763645 Comments:	PALMYRA	EPLER
644 - 59	DAUPHIN DERRY T Latitude: 401620 Longitude: 763644 Comments:	PALMYRA	STONEHENGE
644 - 66	DAUPHIN DERRY T Latitude: 401545 Longitude: 763640 Comments:	PALMYRA	BUFFALO SPRINGS
689 - 1	DAUPHIN HARRISBURG C Latitude: 401456 Longitude: 765147 Comments:	STEELTON	ST PAUL GP
690 - 1	DAUPHIN DERRY T Latitude: 401448 Longitude: 764247 Comments:	MIDDLETOWN	EPLER
690 - 2	DAUPHIN DERRY T Latitude: 401450 Longitude: 764239 Comments:	MIDDLETOWN	EPLER
690 - 3	DAUPHIN DERRY T Latitude: 401355 Longitude: 764318 Comments:	MIDDLETOWN	EPLER
690 - 4	DAUPHIN DERRY T Latitude: 401453 Longitude: 764228 Comments:	MIDDLETOWN	EPLER
690 - 5	DAUPHIN DERRY T Latitude: 401454 Longitude: 764227 Comments:	MIDDLETOWN	EPLER

BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY

Deparment of Conservation and Natural Resources

SINKHOLE QUERY REPORT

Sinkhole	County	Municipality	Quadrangle	Geologic Formation
644 - 1	LEBANON	PALMYRA B	PALMYRA	EPLER
	Latitude: 401844 Longitude: 763452			
	Comments:			
644 - 2	LEBANON	PALMYRA B	PALMYRA	EPLER
	Latitude: 401840 Longitude: 763458			
	Comments:			
644 - 3	LEBANON	PALMYRA B	PALMYRA	EPLER
	Latitude: 401839 Longitude: 763501			
	Comments:			
644 - 4	LEBANON	PALMYRA B	PALMYRA	EPLER
	Latitude: 401851 Longitude: 763457			
	Comments:			
644 - 5	LEBANON	PALMYRA B	PALMYRA	EPLER
	Latitude: 401849 Longitude: 763456			
	Comments:			
644 - 6	LEBANON	PALMYRA B	PALMYRA	EPLER
	Latitude: 401902 Longitude: 763435			
	Comments:			
644 - 7	LEBANON	PALMYRA B	PALMYRA	ONTELAUNEE
	Latitude: 401901 Longitude: 763503			
	Comments:			
644 - 8	LEBANON	PALMYRA B	PALMYRA	EPLER
	Latitude: 401843 Longitude: 763508			
	Comments:			
644 - 9	LEBANON	PALMYRA B	PALMYRA	EPLER
	Latitude: 401841 Longitude: 763507			
	Comments:			
644 - 10	LEBANON	PALMYRA B	PALMYRA	EPLER
	Latitude: 401840 Longitude: 763509			
	Comments:			
644 - 11	LEBANON	PALMYRA B	PALMYRA	EPLER
	Latitude: 401838 Longitude: 763518			
	Comments:			
644 - 12	LEBANON	PALMYRA B	PALMYRA	EPLER
	Latitude: 401838 Longitude: 763520			
	Comments:			
644 - 13	LEBANON	PALMYRA B	PALMYRA	EPLER
	Latitude: 401840 Longitude: 763520			
	Comments:			
644 - 14	LEBANON	PALMYRA B	PALMYRA	EPLER
	Latitude: 401839 Longitude: 763522			
	Comments:			
644 - 15	LEBANON	PALMYRA B	PALMYRA	EPLER
	Latitude: 401842 Longitude: 763532			
	Comments:			
644 - 16	LEBANON	PALMYRA B	PALMYRA	EPLER
	Latitude: 401841 Longitude: 763539			

	Comments:		
644 - 17	LEBANON PALMYRA B Latitude: 401854 Longitude: 763609	PALMYRA	ONTELAUNEE
	Comments:		
644 - 18	LEBANON PALMYRA B Latitude: 401851 Longitude: 763600	PALMYRA	ONTELAUNEE
	Comments:		
644 - 19	LEBANON PALMYRA B Latitude: 401839 Longitude: 763608	PALMYRA	EPLER
	Comments:		
644 - 20	LEBANON PALMYRA B Latitude: 401827 Longitude: 763605	PALMYRA	EPLER
	Comments:		
644 - 21	LEBANON PALMYRA B Latitude: 401825 Longitude: 763603	PALMYRA	EPLER
	Comments:		
644 - 22	LEBANON PALMYRA B Latitude: 401820 Longitude: 763608	PALMYRA	EPLER
	Comments:		
644 - 23	LEBANON PALMYRA B Latitude: 401822 Longitude: 763552	PALMYRA	EPLER
	Comments:		
644 - 24	LEBANON PALMYRA B Latitude: 401817 Longitude: 763557	PALMYRA	EPLER
	Comments:		
644 - 25	LEBANON PALMYRA B Latitude: 401815 Longitude: 763600	PALMYRA	EPLER
	Comments:		
644 - 26	LEBANON PALMYRA B Latitude: 401815 Longitude: 763547	PALMYRA	EPLER
	Comments:		
644 - 27	LEBANON PALMYRA B Latitude: 401819 Longitude: 763533	PALMYRA	EPLER
	Comments:		
644 - 28	LEBANON PALMYRA B Latitude: 401815 Longitude: 763532	PALMYRA	EPLER
	Comments:		
644 - 29	LEBANON PALMYRA B Latitude: 401817 Longitude: 763527	PALMYRA	EPLER
	Comments:		
644 - 30	LEBANON PALMYRA B Latitude: 401831 Longitude: 763524	PALMYRA	EPLER
	Comments:		
644 - 31	LEBANON PALMYRA B Latitude: 401806 Longitude: 763528	PALMYRA	EPLER
	Comments:		
644 - 32	LEBANON PALMYRA B Latitude: 401832 Longitude: 763514	PALMYRA	EPLER
	Comments:		
644 - 33	LEBANON PALMYRA B Latitude: 401831 Longitude: 763510	PALMYRA	EPLER
	Comments:		

644 - 34	LEBANON PALMYRA B Latitude: 401826 Longitude: 763510 Comments:	PALMYRA	EPLER
644 - 35	LEBANON PALMYRA B Latitude: 401822 Longitude: 763512 Comments:	PALMYRA	EPLER
644 - 36	LEBANON PALMYRA B Latitude: 401822 Longitude: 763509 Comments:	PALMYRA	EPLER
644 - 37	LEBANON PALMYRA B Latitude: 401820 Longitude: 763509 Comments:	PALMYRA	EPLER
644 - 38	LEBANON PALMYRA B Latitude: 401823 Longitude: 763500 Comments:	PALMYRA	EPLER
644 - 39	LEBANON PALMYRA B Latitude: 401835 Longitude: 763454 Comments:	PALMYRA	EPLER
644 - 40	LEBANON PALMYRA B Latitude: 401839 Longitude: 763443 Comments:	PALMYRA	EPLER
644 - 41	LEBANON PALMYRA B Latitude: 401837 Longitude: 763442 Comments:	PALMYRA	EPLER
644 - 42	LEBANON PALMYRA B Latitude: 401836 Longitude: 763438 Comments:	PALMYRA	EPLER
644 - 43	LEBANON PALMYRA B Latitude: 401834 Longitude: 763440 Comments:	PALMYRA	EPLER
644 - 44	LEBANON PALMYRA B Latitude: 401830 Longitude: 763442 Comments:	PALMYRA	EPLER
644 - 45	LEBANON PALMYRA B Latitude: 401831 Longitude: 763432 Comments:	PALMYRA	EPLER
644 - 46	LEBANON PALMYRA B Latitude: 401828 Longitude: 763437 Comments:	PALMYRA	EPLER
644 - 47	LEBANON PALMYRA B Latitude: 401824 Longitude: 763445 Comments:	PALMYRA	EPLER
644 - 48	LEBANON PALMYRA B Latitude: 401827 Longitude: 763451 Comments:	PALMYRA	EPLER
644 - 49	LEBANON PALMYRA B Latitude: 401758 Longitude: 763521 Comments:	PALMYRA	EPLER
644 - 50	LEBANON PALMYRA B Latitude: 401806 Longitude: 763545 Comments:	PALMYRA	EPLER
644 - 51	LEBANON PALMYRA B	PALMYRA	EPLER

	Latitude: 401802 Longitude: 763550 Comments:		
644 - 52	LEBANON PALMYRA B Latitude: 401801 Longitude: 763557 Comments:	PALMYRA	EPLER
644 - 53	LEBANON PALMYRA B Latitude: 401804 Longitude: 763607 Comments:	PALMYRA	EPLER
644 - 54	LEBANON PALMYRA B Latitude: 401751 Longitude: 763624 Comments:	PALMYRA	EPLER
644 - 55	LEBANON PALMYRA B Latitude: 401751 Longitude: 763628 Comments:	PALMYRA	EPLER
644 - 56	LEBANON PALMYRA B Latitude: 401800 Longitude: 763629 Comments:	PALMYRA	EPLER
644 - 57	LEBANON PALMYRA B Latitude: 401806 Longitude: 763629 Comments:	PALMYRA	EPLER
644 - 60	LEBANON NORTH LONDONDERRY T Latitude: 401750 Longitude: 763507 Comments:	PALMYRA	STONEHENGE
644 - 61	LEBANON NORTH LONDONDERRY T Latitude: 401749 Longitude: 763503 Comments:	PALMYRA	STONEHENGE
644 - 62	LEBANON NORTH LONDONDERRY T Latitude: 401739 Longitude: 763354 Comments:	PALMYRA	STONEHENGE
644 - 63	LEBANON SOUTH ANNVILLE T Latitude: 401815 Longitude: 763147 Comments:	PALMYRA	STONEHENGE
644 - 64	LEBANON SOUTH ANNVILLE T Latitude: 401645 Longitude: 763040 Comments:	PALMYRA	BUFFALO SPRINGS
644 - 65	LEBANON SOUTH ANNVILLE T Latitude: 401637 Longitude: 763036 Comments:	PALMYRA	SNITZ CREEK
644 - 67	LEBANON SOUTH ANNVILLE T Latitude: 401839 Longitude: 763232 Comments:	PALMYRA	RICKENBACH
644 - 68	LEBANON SOUTH ANNVILLE T Latitude: 401738 Longitude: 763149 Comments:	PALMYRA	MILLBACH
644 - 69	LEBANON PALMYRA B Latitude: 401812 Longitude: 763629 Comments:	PALMYRA	EPLER
644 - 70	LEBANON SOUTH ANNVILLE T Latitude: 401820 Longitude: 763235 Comments:	PALMYRA	STONEHENGE
644 - 71	LEBANON NORTH LONDONDERRY T Latitude: 401844 Longitude: 763436	PALMYRA	EPLER

	Comments:		
644 - 72	LEBANON PALMYRA B Latitude: 401825 Longitude: 763503 Comments:	PALMYRA	EPLER
644 - 73	LEBANON PALMYRA B Latitude: 401859 Longitude: 763542 Comments:	PALMYRA	ANNVILLE
645 - 1	LEBANON LEBANON C Latitude: 401938 Longitude: 762639 Comments:	LEBANON	STONEHENGE
645 - 2	LEBANON LEBANON C Latitude: 401945 Longitude: 752632 Comments:	LEBANON	STONEHENGE
645 - 3	LEBANON LEBANON C Latitude: 401947 Longitude: 752632 Comments:	LEBANON	STONEHENGE
645 - 4	LEBANON LEBANON C Latitude: 401948 Longitude: 762623 Comments:	LEBANON	STONEHENGE
645 - 5	LEBANON LEBANON C Latitude: 401939 Longitude: 762617 Comments:	LEBANON	STONEHENGE
645 - 6	LEBANON LEBANON C Latitude: 401937 Longitude: 762601 Comments:	LEBANON	STONEHENGE
645 - 7	LEBANON LEBANON C Latitude: 401940 Longitude: 752544 Comments:	LEBANON	STONEHENGE
645 - 8	LEBANON LEBANON C Latitude: 401927 Longitude: 752551 Comments:	LEBANON	STONEHENGE
645 - 9	LEBANON LEBANON C Latitude: 401928 Longitude: 752549 Comments:	LEBANON	STONEHENGE
645 - 10	LEBANON LEBANON C Latitude: 401926 Longitude: 752541 Comments:	LEBANON	RICHLAND
645 - 11	LEBANON LEBANON C Latitude: 401924 Longitude: 752532 Comments:	LEBANON	RICHLAND
645 - 12	LEBANON LEBANON C Latitude: 401927 Longitude: 752519 Comments:	LEBANON	RICHLAND
645 - 13	LEBANON LEBANON C Latitude: 401954 Longitude: 752545 Comments:	LEBANON	STONEHENGE
645 - 14	LEBANON LEBANON C Latitude: 402001 Longitude: 752557 Comments:	LEBANON	RICKENBACH
645 - 15	LEBANON LEBANON C Latitude: 402014 Longitude: 752545 Comments:	LEBANON	EPLER

645 - 16	LEBANON LEBANON C Latitude: 402010 Longitude: 752532 Comments:	LEBANON	EPLER
645 - 17	LEBANON LEBANON C Latitude: 402012 Longitude: 752527 Comments:	LEBANON	EPLER
645 - 18	LEBANON LEBANON C Latitude: 402005 Longitude: 752515 Comments:	LEBANON	EPLER
645 - 19	LEBANON LEBANON C Latitude: 401957 Longitude: 752519 Comments:	LEBANON	EPLER
645 - 20	LEBANON LEBANON C Latitude: 402006 Longitude: 752402 Comments:	LEBANON	EPLER
645 - 21	LEBANON LEBANON C Latitude: 402004 Longitude: 752404 Comments:	LEBANON	EPLER
645 - 22	LEBANON LEBANON C Latitude: 402002 Longitude: 752413 Comments:	LEBANON	EPLER
645 - 23	LEBANON LEBANON C Latitude: 402002 Longitude: 753417 Comments:	LEBANON	EPLER
646 - 1	LEBANON HEIDELBERG T Latitude: 401838 Longitude: 751904 Comments:	RICHLAND	RICHLAND
646 - 2	LEBANON HEIDELBERG T Latitude: 401908 Longitude: 751945 Comments:	RICHLAND	RICHLAND
646 - 3	LEBANON HEIDELBERG T Latitude: 401838 Longitude: 751904 Comments:	RICHLAND	RICHLAND
646 - 4	LEBANON HEIDELBERG T Latitude: 401914 Longitude: 751653 Comments:	RICHLAND	RICHLAND
646 - 5	LEBANON JACKSON T Latitude: 402038 Longitude: 751808 Comments:	RICHLAND	STONEHENGE
646 - 6	LEBANON MILLCREEK T Latitude: 402104 Longitude: 761537 Comments:	RICHLAND	RICKENBACH
647 - 1	LEBANON MILLCREEK T Latitude: 402057 Longitude: 761215 Comments:	WOMELSDORF	SNITZ CREEK
647 - 2	LEBANON MILLCREEK T Latitude: 402051 Longitude: 761233 Comments:	WOMELSDORF	SNITZ CREEK
647 - 3	LEBANON MILLCREEK T Latitude: 402105 Longitude: 761427 Comments:	WOMELSDORF	RICHLAND

APPENDIX E
NPDES Permits

Appendix E
NPDES Dischargers within the Swatara Creek Watershed

FACILITY	STREAM	MUNICIPALITY	COUNTY
Derry Township Municipal Authority 1	Swatara Cr.	Derry Twp.	Dauphin
Derry Township Municipal Authority 2	Swatara Cr.	Derry Twp.	Dauphin
Fort Indiantown Gap, U.S. Army	Swatara Cr.	East Hanover Twp.	Lebanon
Gold Mills Incorporated	Swatara Cr.	Pine Grove Boro	Schuylkill
Northern Lebanon County Authority	Swatara Cr.	Union Twp.	Lebanon
PA American Water Company	Swatara & Manada Cr.	South Hanover Twp.	Dauphin
Pine Grove Borough Authority	Swatara Cr.	Pine Grove Twp.	Schuylkill
Pine Grove Township	Swatara Cr.	Pine Grove Boro	Schuylkill
Redding Single Family STP	Swatara Cr.	Washington Twp.	Schuylkill
Swatara Township Authority	Swatara Cr.	Swatara Twp.	Dauphin
Swatara Village	Swatara Cr.	Pine Grove Twp.	Schuylkill
Tremont Municipal Authority	Swatara Cr.	Tremont Twp.	Schuylkill
United Water	Swatara Cr.	Hummelstown Boro	Dauphin
Crestview Village	Iron Run	Londonderry Twp.	Dauphin
Springford Village	UNT to Beaver Cr.	Lower Paxton Twp.	Dauphin
Norris SFS	UNT to Beaver Cr.	West Hanover Twp.	Dauphin
Soule SFS	UNT to Beaver Cr.	West Hanover Twp.	Dauphin
Wagner SFS	UNT to Beaver Cr.	West Hanover Twp.	Dauphin
Hershey Chocolate	Spring Cr.	Derry Twp.	Dauphin
Milton Hershey School	UNT to Spring Cr.	Derry Twp.	Dauphin
South Londonderry Authority	Spring Cr.	South Londonderry Twp.	Lebanon
Griffith SFS	UNT to Spring Cr.	Derry Twp.	Dauphin
Manada Creek MHP	UNT to Manada Cr.	East Hanover	Dauphin
Weaver SFS	Manada Cr.	East Hanover Twp.	Dauphin
West Hanover Water Authority	UNT to Manada Cr.	West Hanover Twp.	Dauphin
Malone SFS	UNT to Manada Cr.	East Hanover Twp.	Dauphin
Shadyback Acres MHP	UNT to Manada Cr.	West Hanover Twp.	Dauphin
Truckstops of America	UNT to Manada Cr.	West Hanover Twp.	Dauphin
Margie SFS	UNT to Manada Cr.	East Hanover Twp.	Dauphin
Martz SFS	UNT to Manada Cr.	East Hanover Twp.	Dauphin
Chesapeake Estates	Bow Creek	East Hanover Twp.	Dauphin
East Hanover Township	Bow Creek	East Hanover Twp.	Dauphin
Hampton Inn	Bow Creek	East Hanover Twp.	Dauphin
Zimmerman SFS	Manada Cr.	East Hanover Twp.	Dauphin
Grantville Econo Lodge	UNT to Bow Cr.	East Hanover Twp.	Dauphin
Annville Township Authority	Quittapahallia Cr.	Annville Twp.	Lebanon
Lebanon City STP	Quittapahilla Cr.	Annville Twp.	Lebanon
Huffman SFS	UNT to Quittapahilla Cr.	North Londonderry Twp.	Lebanon
Palm City MHP	Killinger Cr.	South Annville Twp.	Lebanon
Palmyra Borough Authority	Killinger Cr.	Palmyra Boro	Lebanon
Philadelphia Mixers Corporation	Killinger Cr.	Palmyra Boro	Lebanon
South Londonderry Authority	Killinger Cr.	South Londonderry Twp.	Lebanon
Tarmac Minerals	Killinger Cr.	North Londonderry Twp.	Lebanon
Walter Weaber & Sons	UNT to Gingrich Run	South Annville Twp.	Lebanon
Hershey Preserve	UNT to Gingrich Run	South Annville Twp.	Lebanon
Philhaven Hospital	Bachman Run	West Cornwall Twp.	Lebanon
Butler Manufacturing Company	UNT to Quittapahilla Cr.	Annville Twp.	Lebanon
Cornwall Open Pit Mine	Snitz Cr.	Cornwall Boro	Lebanon

Hershey Pasta Group	Brandywine Cr.	Lebanon City	Lebanon
Penn National Race Course	UNT to Swatara Cr.	East Hanover Twp.	Dauphin
World Challenge	UNT to Indiantown Run	East Hanover Twp.	Dauphin
ONO Industries	Reeds Cr.	East Hanover Twp.	Dauphin
Greater Lebanon Refuse Authority	UNT to Swatara Cr.	North Lebanon Twp.	Lebanon
Swatara MHP	UNT to Swatara Cr.	Swatara Twp.	Lebanon
Lebanon City Water	UNT to Swatara Cr.	Swatara Twp.	Lebanon
Wooded Acres Homeowners Assn.	Little Swatara Cr.	Bethel Twp.	Berks
Farmers Pride	Deep Run	Bethel Twp.	Lebanon
Fredericksburg Sewage and Water	Deep Run	Bethel Twp.	Lebanon
Grimes Poultry	Deep Run	Bethel Twp.	Lebanon
College Hill Poultry	Beach Run	Bethel Twp.	Lebanon
Keystone Protein Company	UNT to Beach Run	Bethel Twp.	Lebanon
Lebanon Valley MHP	UNT to Little Swatara Cr.	Bethel Twp.	Lebanon
Esther's Diner	UNT to Earlakill Run	Bethel Twp.	Lebanon
Redner's Wholesale Market	Earlakill Run	Bethel Twp.	Lebanon
Beiler SFS	Crosskill Cr.	Bethel Twp.	Lebanon
Truck Terminal Motel	UNT to Crosskill Cr.	Bethel Twp.	Lebanon
Gas SFS	UNT to Little Swatara Cr.	Bethel Twp.	Lebanon
Teen Challenge Training Camp	UNT to Little Swatara Cr.	Tulpehocken Twp.	Berks
Bethel Elementary School	UNT to Little Swatara Cr.	Bethel Twp.	Berks
Comfort Inn	UNT to Little Swatara Cr.	Bethel Twp.	Berks
Grimes Airport Subdivision	UNT to Little Swatara Cr.	Bethel Twp.	Berks
Union Township Industrial Park	Forge Cr.	Union Twp.	Lebanon
Dreisbach SFS	UNT to Monroe Cr.	Bethel Twp.	Lebanon
All American Plazas Inc.	UNT to Swatara Cr.	Pine Grove Twp.	Schuylkill
Tomazin Single Family STP	Swope Valley Run	Pine Grove Twp.	Schuylkill
PennDOT Safety Rest Area	UNT to Swatara Cr.	Pine Grove Twp.	Schuylkill
CRSS Westwood Inc.	Lower Rausch Cr.	Frailey Twp.	Schuylkill

Source: [NPDES Limits and Effluent Violations], Unpublished data by Pennsylvania Department of Environmental Protection, 1999a.

APPENDIX F
List of Avian Species Found in Swatara Creek Watershed
Threatened and Endangered Species - Agency Response Letters

AVIAN SPECIES LOCATED WITHIN THE SWATARA CREEK WATERSHED

Scientific Name	Common Name	Scientific Name	Common Name
Accipter cooperii	Cooper's Hawk	*Carpodacus mexicanus*	House Finch
Accipter gentilis	Northern Goshawk	*Carpodacus purpureus*	Purple Finch
Accipter straitus	Sharp-Shinned Hawk	*Cathartes aura*	Turkey Vulture
Actitis macularia	Spotted Sandpiper	*Catharus fascens*	Verry
Aegolius acadicus	Northern Saw-Whet Owl	*Catharus guttatus*	Hermit Thrush
Agelaius phoeniceus	Red-Winged Blackbird	*Catharus minimum*	Gray-Cheeked Thrush
Aix sponsa	Wood Duck	*Catharus ustulatus*	Swainson's Thrush
Ammodramus caudacutus	Sharp-Tailed Sparrow	*Certhia americana*	Brown Creeper
Ammodramus henslowii	Henslow's Sparrow	*Ceryle alcyon*	Belted Kingfisher
Ammodramus savannarum	Grasshopper Sparrow	*Chaaetura pelagica*	Chimney Swift
Anas acuta	Northern Pintail	*Charadrius vociferus*	Killdeer
Anas americana	American Wigeon	*Charadruis semipalmatus*	Semipalmated Plover
Anas crecca	Green-Winged Teal	*Chen caerulescens*	Greater Snow Goose
Anas discors	Blue-Winged Teal	*Chlidonias niger*	Black Tern
Anas penelope	Eurasian Wigeon	*Chordeiles minor*	Common Nighhthawk
Anas platyrhynchos	Mallard Duck	*Circus cyaneus*	Northern Harrier
Anas rubripes	American Black Duck	*Clangula hyemalis*	Oldsquaw
Anas strepera	Gadwall	*Coccothraustes vespertinus*	Evening Grosbeak
Aquila chrysaetos	Golden Eagle	*Coccyzus americianus*	Yellow-Billed Cuckoo
Archilochus colubris	Ruby-Throated Hummingbird	*Coccyzus erythropthalmus*	Black-Billed Cuckoo
Ardea alba	Great White Egret	*Colinus virginianus*	Bobwhite
Ardea herodias	Great Blue Heron	*Columba livia*	Rock Dove
Asio flammeus	Short-Eared Owl	*Contopus borealis*	Olive-Sided Flycatcher
Aytha affinis	Lesser Scaup	*Contopus virens*	Eastern Wood PeeWee
Aytha marila	Greater Scaup	*Coragyps atratus*	Black Vulture
Aythya americana	Redhead	*Corvus brachyrhynchos*	American Crow
Aythya collaris	Ring-Necked Duck	*Corvus corax*	Common Raven
Aythya valisineria	Canvasback	*Corvus ossifragus*	Fish Crow
Batramia longicauda	Upland Sandpiper	*Cyanocitta cristata*	Blue Jay
Bombycilla cedrorum	Cedar Waxwing	*Cygnus columbianus*	Whistling Swan
Bonasa umbellus	Ruffed Grouse	*Cygnus columbianus*	Tundra Swan
Botaurus lentiginosus	American Bittern	*Cygnus olor*	Mute Swan
Branta bernicla	Brant	*Dendroica caerulescens*	Black-Throated Blue Warbler
Branta canadensis	Canada Goose	*Dendroica castanea*	Bay-Breasted Warbler
Bubo virginianus	Great Horned Owl	*Dendroica cerulea*	Cerulean Warbler
Bubulcus ibis	Cattle Egret	*Dendroica coronata*	Yellow-Rumped Warbler
Bucephala albeola	Bufflehead	*Dendroica discolor*	Prairie Warbler
Bucephala clangula	Common Goldeneye	*Dendroica dominica*	Yellow-Throated Warbler
Buteo jamaicensis	Red-Tailed Hawk	*Dendroica fusca*	Blackburnian Warbler
Buteo lagopus	Rough-Legged Hawk	*Dendroica magnolia*	Magnolia Warbler
Buteo lineatus	Red-Shouldered Hawk	*Dendroica palmarum*	Palm Warbler
Buteo platypterus	Broad-Winged Hawk	*Dendroica pensylvanica*	Chestnut-Sided Warbler
Butorides straitus	Green-Backed Heron	*Dendroica petechia*	Yellow Warbler
Calaptes cafer	Northern Flicker	*Dendroica pinus*	Pine Warbler
Calcarius lapponicus	Lapland Longspur	*Dendroica striata*	Blackpoll Warbler
Calidris alpina	Dunlin	*Dendroica tigrina*	Cape May Warbler
Calidris melanotos	Pectoral Sandpiper	*Dendroica virens*	Black-Throated Green
Calidris pusilla	Semipalmated Sandpiper	*Dolichonyx oryzivorus*	Bobolink
Caprimulgus vociferus	Whip-Poor-Will	*Dryocopus pileatus*	Pileated Woodpecker
Cardinalis cardinalis	Northern Cardinal	*Dumetella carolinensis*	Catbird
Carduelis flammea	Common Redpoll	*Empidonax alnorum*	Alder Flycatcher
Carduelis pinus	Pine Siskin	*Empidonax flaviventris*	Yellow-Bellied Flycatcher
Carduelis tristis	American Goldfinch	*Empidonax minimus*	Least Flycatcher

Source: Environmental Documentation for the Swatara State Park Recreational Improvements Project, 1998

AVIAN SPECIES LOCATED WITHIN THE SWATARA CREEK WATERSHED

Scientific Name	Common Name	Scientific Name	Common Name
Empidonax traillii	Willow Flycatcher	*Oxyura jamaicensis*	Ruddy Duck
Empidonax virescens	Acadian Flycatcher	*Pandion haliaetus*	Osprey
Eremophila alpestris	Horned Lark	*Parula americana*	Northern Parula Warbler
Eudocimus albus	White Ibis	*Parus carolinensis*	Carolina Chickadee
Euphagus carolinus	Rusty Blackbird	*Parus atricapillus*	Black-Capped Chickadee
Euphagus cyanocephalus	Brewer's Blackbird	*Parus bicolor*	Tufted Titmouse
Falco columbarius	Merlin	*Passer domesticus*	House Sparrow
Falco peregrinus	Peregrine Falcon	*Passerculus sandwichensis*	Savannah Sparrow
Falco sparverius	Kestrel	*Passerella iliaca*	Fox Sparrow
Fulica america	American Coot	*Passerina cyanea*	Indigo Bunting
Gallinago gallinage	Commom Snipe	*Phalacrocorax auritus*	Double Crested Cormorant
Gallinula chloropus	Common Gallinule	*Phalaropus lobatus*	Red-Necked Phalarope
Gavia immer	Common Loon	*Phalaropus tricolor*	Wilson's Phalarope
Geothlypis trichas	Common Yellowthroat	*Phasianus colchicus*	Ring-Necked Pheasant
Grus canadensis	Sandhill Crane	*Pheucticus ludovicianus*	Rose-Breasted Grosbeak
Guiraca caerulea	Blue Grosbeak	*Picoides pubescens*	Downy Woodpecker
Haliaeetus leucocephalus	Bald Eagle	*Picoides villosus*	Hairy Woodpecker
Helmitheros vermivorus	Worm-Eating Warbler	*Pinicola enucleator*	Pine Grosbeak
Hirundo pyrrhonota	Cliff Swallow	*Pipila erythrophthalmus*	Rufous-Sided Towhee
Hirundo rustica	Barn Swallow	*Pipila maculatus*	Towhee
Hylocichla mustelina	Wood Thrush	*Piranga olivacea*	Scarlet Tanager
Icteria virens	Yellow-Breasted Chat	*Piranga rubra*	Summer Tanager
Icterus galbula	Baltimore Oriole	*Plectrophenax nivalis*	Snow Bunting
Icterus spurius	Orchard Oriole	*Plegadis falcinellus*	Glossy Ibis
Junco hyemalis	Junco	*Pluvialis dominica*	Lesser-Golden Plover
Lanius excubitor	Northern Shrike	*Pluvialis squatrola*	Black-Bellied Plover
Lanius ludovicianus	Loggerhead Shrike	*Podilymbus grisegena*	Red-Necked Grebe
Larus argentatus	Herring Gull	*Podilymbus podiceps*	Pied-Billed Grebe
Larus delawarensis	Ring-Billed Gull	*Polioptila caerulea*	Blue-Gray Gnatcatcher
Larus philadelphia	Bonaparte's Gull	*Pooectes gramineus*	Vesper Sparrow
Laterallus jamaicensis	Black Rail	*Porzana carolina*	Sora
Limnodromus griseus	Short-Billed Dowitcher	*Progne subis*	Purple Martin
Lophodytes cucullatus	Hooded Merganser	*Quiscalus quiscula*	Grackle
Loxia curvirostra	Red Crossbill	*Rallus limicola*	Virginia Rail
Loxia leucoptera	White-Winged Crossbill	*Recurvirostra americana*	American Avocet
Melanerpes carolinus	Red-Bellied Woodpecker	*Regulus calendula*	Ruby-Crowned Kinglet
Melanerpes frythrocephalus	Red-Headed Woodpecker	*Regulus satrapa*	Golden Crowned Kinglet
Melanitta nigra	Black Scoter	*Riparia riparia*	Bank Swallow
Meleagris gallopavo	Wild Turkey	*Sayornis phoebe*	Eastern Phoebe
Melospiza georgiana	Swamp Sparrow	*Scolopax minor*	American Woodcock
Melospiza lincolnii	Lincoln's Sparrow	*Seiurus aurocapillus*	Ovenbird
Melospiza melodia	Song Sparrow	*Seiurus motacilla*	Louisiana Waterthrush
Mergus merganser	Common Merganser	*Seiurus noveboracensis*	Northern Waterthrush
Mergus serrator	Red-Breasted Merganser	*Setophaga ruticilla*	American Redstart
Mimus polyglottos	Mockingbird	*Sialia sialis*	Bluebird
Mniotilta varia	Black-and-White Warbler	*Sitta canadensis*	Red-Breasted Nuthatch
Molothrus ater	Brown-Headed Cowbird	*Sitta carolinensis*	White-Breasted Nuthatch
Myiarchus crinitus	Great Crested Flycatcher	*Sphyrapicus varius*	Yellow-Bellied Sapsucker
Nyctea scandiaca	Snowy Owl	*Spiza americana*	Dickcissel
Oporornis formosus	Kentucky Warbler	*Spizella arborea*	American Tree Sparrow
Oporornis philadelphia	Mourning Warbler	*Spizella passerina*	Chirping Sparrow
Otus asio	Eastern Screech Owl	*Spizella pusilla*	Field Sparrow

Source: Environmental Documentation for the Swatara State Park Recreational Improvements Project, 1998

AVIAN SPECIES LOCATED WITHIN THE SWATARA CREEK WATERSHED

Scientific Name	Common Name	Scientific Name	Common Name
Stelgidopteryx serripennis	Northern Rough-Winged Swallow		
Sterna antillarum	Least Tern		
Strix varia	Barred Owl		
Sturnella magna	Eastern Meadowlark		
Sturnus vulgaris	European Starling		
Tachycineta bicolor	Tree Swallow		
Thryothorus ludovicianus	Carolina Wren		
Toxostoma rufum	Brown Thrasher		
Tringa flavipes	Lesser Yellowlegs		
Tringa melanoleuca	Greater Yellowlegs		
Tringa solitatia	Solitary Sandpiper		
Troglodytes aedon	House Wren		
Troglodytes troglodytes	Winter Wren		
Turdus migratorius	American Robin		
Tyrannus tyrannus	Eastern Kingbird		
Tyto alba	Common Barn Owl		
Vermivora chrysoptera	Golden-Winged Warbler		
Vermivora peregrina	Tennessee Warbler		
Vermivora pinus	Blue-Winged Warbler		
Vermivora ruficapilla	Nashville Warbler		
Vireo flavifrons	Yellow-Throated Vireo		
Vireo gilvus	Warbling Vireo		
Vireo griseus	White-Eyed Vireo		
Vireo olivaceus	Red-Eyed Vireo		
Vireo philadelphicus	Philadelphia Vireo		

Source: Environmental Documentation for the Swatara State Park Recreational Improvements Project, 1998

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pennsylvania Field Office
315 South Allen Street, Suite 322
State College, Pennsylvania 16801-4850

August 2, 1999

SLF/RWB AUG 4 1999
COPY

Ms. Stefanie L. Fedosick
R.I.D.C. Park West
Mackin Engineering Company
117 Industry Drive
Pittsburgh, PA 15275-1015

Dear Ms. Fedosick:

This responds to your July 12, 1999, request for information regarding federally listed and proposed endangered and threatened species within the area being reviewed for a Rivers Conservation Plan for the Swatara Creek watershed which encompasses portions of Berks, Dauphin, Lebanon and Schuylkill Counties, Pennsylvania. The following comments are provided pursuant to the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) to ensure the protection of endangered and threatened species.

The Swatara Creek watershed is within the range of the bog turtle (*Clemmys muhlenbergii*), a species that is federally listed as threatened. The northern population of the bog turtle (occurring in the states of Connecticut, New York, Pennsylvania, Maryland, New Jersey, Delaware and Massachusetts) has declined by approximately 50 percent, primarily over the past 15-20 years due to the hydrological alteration of its wetland habitat (via draining, ditching, filling, impoundment, and dredging), invasion and alteration of habitat by invasive native and exotic plant species (e.g., multiflora rose, *Phragmites*, red maple, reed canary grass, and purple loosestrife), and illegal collection for the pet trade.

Bog turtles inhabit shallow, spring-fed fens, sphagnum bogs, swamps, marshy meadows, and pastures characterized by soft, muddy bottoms; clear, cool, slow-flowing water, often forming a network of rivulets; high humidity; and an open canopy. Bog turtles usually occur in small, discrete populations occupying suitable wetland habitat dispersed along a watershed. The occupied "intermediate successional stage" wetland habitat is usually a mosaic of micro-habitats ranging from dry pockets, to areas that are saturated with water, to areas that are periodically flooded. Some wetlands occupied by bog turtles are located in agricultural areas and are subject to grazing by livestock. It appears that light to moderate grazing may benefit bog turtles by impeding succession in these wetlands (i.e., by preventing or minimizing the encroachment of invasive native and exotic plants). Heavy grazing, however, adversely affects turtles and degrades their habitat.

If planned conservation activities include construction or restoration of wetlands, their potential suitability as bog turtle habitat should be assessed, as described under Step 2 of the enclosed

Guidelines for Bog Turtle Surveys. This habitat survey could easily be conducted by a wetland biologist concurrent with a routine wetland identification and delineation. If any wetlands are identified as potential bog turtle habitat, efforts should be made to avoid any direct or indirect impacts to those wetlands. If adverse effects to these wetlands cannot be avoided, a more detailed and thorough survey will be necessary, as described under Step 3 of the *Guidelines for Bog Turtle Surveys*. The Step 3 survey should be conducted by a qualified biologist with bog turtle field survey experience (see enclosed list of qualified surveyors). Survey results should be submitted to the Fish and Wildlife Service for review and concurrence. If project activities might adversely affect bog turtles, additional consultation with the Service will be required, pursuant to section 7 of the Endangered Species Act.

In addition to this federally listed species, a species of special concern, the regal fritillary butterfly (*Speyeria idalia*), is also known to occur within the watershed study area at Fort Indiantown Gap Military Reservation (FTIG) in portions of Dauphin and Lebanon Counties. Based on studies conducted by The Nature Conservancy in the early 1990s, most of this species' habitat appears to be located between Blue and Second Mountains; however, the butterfly was also known to occur south of Blue Mountain near State Memorial Lake. FTIG supports the only remaining viable population of this species in the eastern United States; therefore, the Service considers this population to be of special ecological significance. Any action that might compromise the continued viability of the regal fritillary population on FTIG would likely constitute a significant environmental impact subject to assessment via an environmental impact statement.

Except for the bog turtle, regal fritillary butterfly, and occasional transient species, no other species of federal concern are known to occur within the project study area. An updated compilation of certain federal status species in Pennsylvania is enclosed for your information.

Requests for information regarding State-listed endangered or threatened species should be directed to the Pennsylvania Game Commission (birds and mammals), the Pennsylvania Fish and Boat Commission (fish, reptiles, amphibians and aquatic invertebrates), and the Pennsylvania Department of Conservation and Natural Resources (plants).

Please contact Michael McCarthy of my staff at 814-234-4090 if you have any questions or require further assistance.

Sincerely,

David Densmore
Supervisor

Enclosures

BUREAU OF FISHERIES

Delano R. Graff, Director
(814) 359-5154
FAX: (814) 359-5153

IN REPLY REFER TO
PNDI# 4028

COMMONWEALTH OF PENNSYLVANIA
PENNSYLVANIA FISH & BOAT COMMISSION
450 Robinson Lane
Bellefonte, PA 16823-9620

DIVISION OF FISHERIES MANAGEM.

Richard A. Snyder, Chief
(814) 359-5110
FAX: (814) 359-5153

Scmk/kob

COPY

OCT 13 1999

October 8, 1999

MACKIN ENGINEERING COMPANY
Stefanie L. Fedosick
R.I.D.C. Park West
117 Industry Drive
Pittsburgh, PA 15275-1015

RE: Environmental Impact Review - Rare, Candidate, Threatened, and Endangered Species
Swatara Creek River Conservation Plan
Mackin Project No. 4079-001
Berks, Schuylkill, Lebanon, and Dauphin Counties, Pennsylvania

Dear Ms. Fedosick:

I have reviewed the maps accompanying your recent correspondence which concerns the above referenced project. We have screened the individual project areas for extant rare and protected species under PFBC jurisdiction using the Pennsylvania Natural Diversity Inventory (PNDI) database and PFBC files. Listed below in tabular format are the results to our review:

Common Name	Scientific Name	PA Status	Taxonomic Group
Price's cave isopod	*Caecidotea pricei*	rare	crustacean
Bog turtle	*Clemmys muhlenbergii*	endangered	turtle
Timber rattlesnake	*Crotalus horridus*	candidate	snake
Yellow lampmussel	*Lampsilis cariosa*	rare	freshwater mussel
Obscure clubtail	*Progomphus obscurus*	rare	aquatic insect
Eastern floater	*Pyganodon cataracta*	rare	freshwater mussel
Allegheny cave amphipod	*Stygobromus allegheniensis*	rare	crustacean
Thorey's grayback dragonfly	*Tachopteryx thoreyi*	rare	aquatic insect

If any environmentally invasive projects are proposed for the project area, to avoid any potential adverse impacts to the species of concern please forward the proposal to our office (Nongame and Endangered Species Unit) for review on a case by case basis.

Please call me at (814) 359-5113 or (814) 359-5186 if you have any questions regarding my response. Thank you for your cooperation and attention to this matter of nongame species conservation.

Sincerely,

Andrew L. Shiels

Andrew L. Shiels, Leader
Nongame and Endangered Species Unit

CU/kjd

cc: R. Snyder, PFBC

COMMONWEALTH OF PENNSYLVANIA

PENNSYLVANIA GAME COMMISSION

2001 ELMERTON AVENUE
HARRISBURG, PA 17110-9797

ADMINISTRATIVE BUREAUS:
ADMINISTRATION.....717-787-5670
AUTOMOTIVE AND PROCUREMENT DIVISION.....717-787-6594
LICENSE DIVISION.....717-787-2084
PERSONNEL DIVISION.....717-787-7836
WILDLIFE MANAGEMENT.....717-787-5529
INFORMATION & EDUCATION.....717-787-6286
LAW ENFORCEMENT.....717-787-5740
LAND MANAGEMENT.....717-787-6818
REAL ESTATE DIVISION.....717-787-6568
MANAGEMENT INFORMATION SYSTEMS.....717-787-4076

August 2, 1999

SCF Rec'd
COPY
AUG 5 1999

MACKIN ENGINEERING
MECHANICSBURG, PA
PROJECT NO.: _____
☐ KRN ☐ ____ ☐ PGH
☐ JRR ☐ ____ ☐ Accts
☐ ☐ ____ ☐ ____
☐ ☐ ____ ☐ ____
☐ Corres. File ☐ Admin File
☐ Contract File ☐ Mktg
☐ Enclosure To: _____
Date 5/31 00

Ms. Stefanie L. Fedosick
Mackin Engineering Company
117 Industry Drive
Pittsburgh, PA 15275-1015

In re: Natural Resource Review
Swatara Creek Rivers Conservation Plan
Berks, Schuylkill, Lebanon, and Dauphin Counties, PA

Dear Ms. Fedosick;

This is in response to your letter dated July 12, 1999, requesting information concerning endangered and threatened species of birds and mammals and critical and unique habitats within the Swatara Creek watershed.

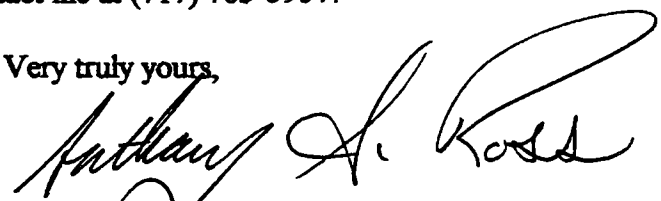
Our office review has determined that the below listed endangered and threatened species have historically occurred and might presently occur within the watershed.

Quadrangle	Species		Habitat
Elizabethtown	Upland Sandpiper (PA Threatened)	(*Bartramia longicauda*)	Fallow fields, pastures, grassy areas
Grantville	Bald Eagle (PA Endangered)	(*Haliaeetus leucocephalus*)	Riparian (Lakes & Rivers)
	Eastern Woodrat (PA Threatened)	(*Neotoma floridana*)	Mountainsides, valley sides, boulder piles
Middletown	Great Egret (PA Threatened)	(*Casmerodius albus egretta*)	Along streams, rivers, ponds, lakes, marshes, mudflats
Swatara Hill	Eastern Woodrat		
Tower City	Eastern Woodrat		

A review of the U.S. Department of the Interior's National Wetlands Inventory Map(s) indicates many wetland complexes that this agency classifies as critical and unique wildlife habitat, occur throughout the watershed. Also, State Game Lands, which are purchased by the Pennsylvania Game Commission for wildlife propagation and human recreation, are widely distributed throughout the watershed.

If you have any questions, please contact me at (717) 783-5957.

Very truly yours,



Anthony S. Ross
Wildlife Impact Review Coordinator
Division of Environmental
Planning and Habitat Protection
Bureau of Land Management

Pennsylvania Department of Conservation and Natural Resources
Rachel Carson State Office Building
P.O. Box 8552
Harrisburg, PA 17105-8552
October 15, 1999

Bureau of Forestry

717-787-3444

SLMCK/ROB
COPY
OCT 20 1999

Stephanie Fedosick
Mackin Engineering Company
117 Industry Drive
Pittsburgh, PA 15275-1015

Re: Pennsylvania Natural Diversity Inventory (PNDI) Search for Species Reported to Occur in Swatara Watershed, PA **PER NO: 8454**

Dear Ms. Fedosick:

In response to your data request on September 3, 1999 I have enclosed a printout listing all species of special concern tracked by the PNDI program reported to occur in or near the above area. Please contact our office if any land disturbance is planned for this site.

From left to right, the columns are as follows: scientific name, common name, global element rank, state element rank, state protection status, Pennsylvania Biological Survey suggested protection status, federal protection status, date last observed. Handouts explaining element ranks and protection statuses have been included in order to decipher the printout. If you have any further questions or problems feel free to contact me at the above number, and please refer to the P.E.R. Reference Number in future correspondence related to this project.

Please contact this office when the scope and boundaries of the project are more clearly defined. A more exact plan may reveal that these species will not be impacted and eliminate the need for a field examination of the site.

PNDI is a site specific information system that describes significant natural resources of Pennsylvania. This system includes data descriptive of plant and animal species of special concern, exemplary natural communities and unique geological features. PNDI is a cooperative project of the Department of Conservation and Natural Resources, The Nature Conservancy and the Western Pennsylvania Conservancy. This response represents the most up-to-date summary of the PNDI data files and is good for one year. An absence of recorded information does not necessarily imply actual conditions on-site. A field survey of any site may reveal previously unreported populations.

Legal authority for Pennsylvania's biological resources resides with three administrative agencies. The enclosure titled Pennsylvania Biological Resource Management Agencies outlines which taxonomic groups are managed by these agencies. Please phone this office if you have questions concerning this response or the PNDI system.

Sincerely,

Jeanne Brennan

Jeanne Brennan
Environmental Review Specialist
Pennsylvania Natural Diversity Inventory

PNDI Tracked Species Reported to occur in Swatara Creek Watershed

SNAME:	SCOMNAME:	GRANK:	SRANK:	PA	PBS	US	LASTOBS
AMMODRAMUS HENSLOWII	HENSLOW'S SPARROW	G4	S4B				1957-07-21
[illegible]GOTA STIGMA	SPINY OAKWORM MOTH	G5	S?				1994-08-24
ASIO OTUS	LONG-EARED OWL	G5	S2B,S2S3N		CU		1885-04-30
ASTER ERICOIDES	WHITE HEATH ASTER	G5	S3	TU	TU		1901-08-31
BARTRAMIA LONGICAUDA	UPLAND SANDPIPER	G5	S1S2B	PT	PT		1956-07-06
CAECIDOTEA PRICEI	PRICE'S CAVE ISOPOD	G3	S2S3				1995-08-25
CAECIDOTEA PRICEI	PRICE'S CAVE ISOPOD	G3	S2S3				1900-MID
CAREX LONGII	LONG'S SEDGE	G5	SU	TU	TU		1937-07-02
CISTOTHORUS PLATENSIS	SEDGE WREN	G5	S1B	PT	PT		1958
CISTOTHORUS PLATENSIS	SEDGE WREN	G5	S1B	PT	PT		1957
CLETHRIONOMYS GAPPERI RUPICOLA	KITTATINY RED-BACKED VOLE	G5T3Q	S3				1949-10-25
CLETHRIONOMYS GAPPERI RUPICOLA	KITTATINY RED-BACKED VOLE	G5T3Q	S3				1949-10-18
CLETHRIONOMYS GAPPERI RUPICOLA	KITTATINY RED-BACKED VOLE	G5T3Q	S3				1949-10-14
CLETHRIONOMYS GAPPERI RUPICOLA	KITTATINY RED-BACKED VOLE	G5T3Q	S3				1949-10-04
CLETHRIONOMYS GAPPERI RUPICOLA	KITTATINY RED-BACKED VOLE	G5T3Q	S3				1949-09-28
CLETHRIONOMYS GAPPERI RUPICOLA	KITTATINY RED-BACKED VOLE	G5T3Q	S3				1949-09-22
CRANGONYX DEAROLFI	PENNSYLVANIA CAVE AMPHIPOD	G1G2	S1				1937-09-03
CROTALUS HORRIDUS	TIMBER RATTLESNAKE	G4	S3S4	PC	CA		UNKNOWN
CRYPTOTIS PARVA	LEAST SHREW	G5	S1	PE	PE		1949-11-22
DODECATHEON AMETHYSTINUM	JEWELED SHOOTING-STAR	G4	S2	PT	PT		1997-05-01
DRYOBIUS SEXNOTATUS	SIX-BANDED LONGHORN BEETLE	G?	SH				UNKNOWN
ELEOCHARIS COMPRESSA	FLAT-STEMMED SPIKE-RUSH	G4	S1	PE	PE		1936-06-25
ELLISIA NYCTELEA	ELLISIA	G5	S2	PT	PT		1993-05-20
ELLISIA NYCTELEA	ELLISIA	G5	S2	PT	PT		1980-05-23
EROSIONAL REMNANT	EROSIONAL REMNANT	G?	S?				1979
EUPHYES CONSPICUUS	BLACK DASH	G4	S3				1996-07-21
EUPHYES CONSPICUUS	BLACK DASH	G4	S3				1988-07-06
[illegible]IANA VILLOSA	STRIPED GENTIAN	G4	S1	TU	PE		1994-10-05
HESPERIA LEONARDUS	LEONARD'S SKIPPER	G4	S3S4			(PS)	1998-08-21
HESPERIA LEONARDUS	LEONARD'S SKIPPER	G4	S3S4			(PS)	1998-08-21
HESPERIA LEONARDUS	LEONARD'S SKIPPER	G4	S3S4			(PS)	1995-08-17
HESPERIA LEONARDUS	LEONARD'S SKIPPER	G4	S3S4			(PS)	1995-08-17
HETERODON PLATIRHINOS	EASTERN HOGNOSE SNAKE	G5	S3S4				1998-06-22
ILEX OPACA	AMERICAN HOLLY	G5	S2	PT	PT		1994-09-14
ILEX OPACA	AMERICAN HOLLY	G5	S2	PT	PT		1994-07-12
INVERTEBRATE FOSSIL ANIMALS	INVERTEBRATE FOSSIL ANIMALS	G?	S?				1979
IXOBRYCHUS EXILIS	LEAST BITTERN	G5	S1B	PT	PE		1899-05-23
JUNCUS GYMNOCARPUS	COVILLE'S RUSH	G4	S3	PR	DL		1994-07-12
JUNCUS GYMNOCARPUS	COVILLE'S RUSH	G4	S3	PR	DL		1992-09-02
JUNCUS GYMNOCARPUS	COVILLE'S RUSH	G4	S3	PR	DL		1991-11-05
JUNCUS GYMNOCARPUS	COVILLE'S RUSH	G4	S3	PR	DL		1991-11-05
JUNCUS GYMNOCARPUS	COVILLE'S RUSH	G4	S3	PR	DL		1991-09-21
JUNCUS GYMNOCARPUS	COVILLE'S RUSH	G4	S3	PR	DL		1990-08-17
JUNCUS GYMNOCARPUS	COVILLE'S RUSH	G4	S3	PR	DL		1990-08-16
JUNIPERUS COMMUNIS	COMMON JUNIPER	G5	S2	N	TU		1949-06-13
LAGOA CRISPATA	BLACK-WAVED FLANNEL MOTH	G5	S1				1995-08-23
LAMPSILIS CARIOSA	YELLOW LAMPMUSSEL	G3G4	S3S4		CU		1997-05-13
LAMPSILIS CARIOSA	YELLOW LAMPMUSSEL	G3G4	S3S4		CU		1995-08-08
LYCAENA HYLLUS	BRONZE COPPER	G5	S2				1987-07-29
MATELEA OBLIQUA	OBLIQUE MILKVINE	G4?	S1	PE	PE		1927-07-20
MELICA NITENS	THREE-FLOWERED MELIC-GRASS	G5	S2	PT	PT		1926-07-19
MENZIESIA PILOSA	MINNIEBUSH	G4G5	S3	PR	PR		1991-10-03
[illegible]RALIZATION MATERIALS	MINERALIZATION MATERIALS	G?	S?				1979
[illegible]AS GRACILLIMA	BUSHY NAIAD	G5?	S2	PT	PT		1936-09-06
NELUMBO LUTEA	AMERICAN LOTUS	G4	S1	PE	PE		1953-08-20

PNDI Tracked Species Reported to occur in Swatara Creek Watershed

SNAME:.....	SCOMNAME:.....	GRANK:...	SRANK:.....	PA....	PBS...	US.....	LASTOBS...
NEOTOMA MAGISTER	ALLEGHENY WOODRAT	G3G4	S3	PT	PT		1992-04-29
NEOTOMA MAGISTER	ALLEGHENY WOODRAT	G3G4	S3	PT	PT		1992-04-07
NEOTOMA MAGISTER	ALLEGHENY WOODRAT	G3G4	S3	PT	PT		1992-04-06
NEOTOMA MAGISTER	ALLEGHENY WOODRAT	G3G4	S3	PT	PT		1990-04-11
NEOTOMA MAGISTER	ALLEGHENY WOODRAT	G3G4	S3	PT	PT		1949-09
PARONYCHIA FASTIGIATA VAR NUTTALLII	WHITLOW WORT	G5T3T5	S1S2	TU	PE		1948-08-18
PHYCIODES BATESII	TAWNY CRESCENT	G4	SH				1954-09
PYCNANTHEMUM PILOSUM	HAIRY MOUNTAIN-MINT	G5	SU	TU	PX		1976-07-22
PYGANODON CATARACTA	EASTERN FLOATER	G5	S2S3		H		1995-08-08
RANUNCULUS LONGIROSTRIS	EASTERN WHITE WATER-CROWFOOT	G5	S2S3	PT	PT		1949-06-13
ROTALA RAMOSIOR	TOOTH-CUP	G5	S3	PR	PR		1997-10-14
RUBUS CUNEIFOLIUS	SAND BLACKBERRY	G5	S1	TU	PE		1998-09-01
RUELLIA STREPENS	LIMESTONE PETUNIA	G4G5	S2	PT	PT		1993-05-20
RUELLIA STREPENS	LIMESTONE PETUNIA	G4G5	S2	PT	PT		1924-07-02
SPEYERIA IDALIA	REGAL FRITILLARY	G3	S1				1998
SPEYERIA IDALIA	REGAL FRITILLARY	G3	S1				1998
SPEYERIA IDALIA	REGAL FRITILLARY	G3	S1				1998
SPEYERIA IDALIA	REGAL FRITILLARY	G3	S1				1998
SPEYERIA IDALIA	REGAL FRITILLARY	G3	S1				1954-06
SPHALLOPLANA PRICEI	REPTON CAVE PLANARIAN	G1	S1				1936-05-23
STACHYS HYSSOPIFOLIA	HYSSOP HEDGE-NETTLE	G5	SH	TU	PX		1878-08-01
STYGOBROMUS ALLEGHENIENSIS	ALLEGHENY CAVE AMPHIPOD	G4	S2S3				1995-02-23
STYGOBROMUS ALLEGHENIENSIS	ALLEGHENY CAVE AMPHIPOD	G4	S2S3				1993-04-08
STYGOBROMUS ALLEGHENIENSIS	ALLEGHENY CAVE AMPHIPOD	G4	S2S3				1948-04-18
TACHOPTERYX THOREYI	THOREY'S GRAYBACK DRAGONFLY	G4	S2S3				1912-06-01
TRIOSTEUM ANGUSTIFOLIUM	YELLOW-LEAVED TINKER'S-WEED	G5	S1	TU	PE		1994-10-26
TRIOSTEUM ANGUSTIFOLIUM	YELLOW-LEAVED TINKER'S-WEED	G5	S1	TU	PE		1980-05-23
TRIOSTEUM ANGUSTIFOLIUM	YELLOW-LEAVED TINKER'S-WEED	G5	S1	TU	PE		1957-08-10
WOODWARDIA AREOLATA	NETTED CHAINFERN	G5	S2	N	PT		1994-07-12
XYRIS TORTA	TWISTED YELLOW-EYED GRASS	G5	S1	N	PT		1915-08-06

APPENDIX G
Summary Table of Management Options

Appendix G of this document presents the management options developed as part of the Conservation Plan for the Swatara Creek Watershed. The specific projects presented in the following table should not be construed as the comprehensive list of projects for the watershed; rather they are specific examples of the types of projects that are desired for implementation.

The projects listed are those that have already been recommended or are being developed. This watershed management plan is intended to be a living document; other projects that meet the goals of the general management options presented will continue to be developed over the lifetime of this document. As they are, they will also be presented for implementation.

Appendix G
Management Options Summary Table

Management Option	Specific Projects	Potential Funding Sources
A. Project Area Characteristics		
Utilize the Rivers Conservation Plan as a tool in protecting, managing, and preserving the Swatara Creek watershed.		DCNR RCP and Growing Greener, Farmland Trust, and Department of Community and Economic Development (DCED)
Work with local, county, and regional planning organizations to develop and carry out plans for the protection of environmental amenities in the watershed.	Revise weed laws to allow for riparian buffers Regional GIS Projects Contour layer for watershed GIS Snitz Creek rehabilitation in Cornwall Borough	DCNR RCP and Growing Greener, Farmland Trust, Conservation Districts, and DCED
Complete a comprehensive examination of traffic problems in the watershed and develop a strategy to address them, utilizing alternative forms of transportation (mass transit, car-pooling, bike lanes) when possible.	Lebanon Bridge Project Annville 422/934 Intersection Route 422, 72, and I - 81Corridors Coordinate County 10 year transportation plans	Municipal Planning Organizations (MPO's), PennDOT, TEA 21, and Counties
Work with MPO's to update comprehensive plans for the municipalities of the watershed that are over 10 years old. Complete multi-municipal/ multi-county plans where prudent and feasible.	TDR's Regional Comprehensive Plans	DCED - Growing Smarter, CDBG, SPAG, County and local governments
Support implementation of land conservation techniques in subdivision design.	Hold a workshop in the watershed to present these techniques to interested municipalities and developers	DCED - Growing Smarter, MPO's, Counties
Assess how increasing population is impacting the watershed. Explore establishing growth areas and rural areas within the municipalities of the watershed.	Protection of prime farmland during subdividion review	DCED - Growing Smarter & Farmland Trust

Appendix G
Management Options Summary Table

Management Option	Specific Projects	Potential Funding Sources
Update Act 537 sewage management plans that are over 10 years old. Replace on-lot septic systems in the established growth areas. Assist in upgrading older on lot systems in established rural areas.	Growing Smarter promotions	DCED, PENNVEST
Actively enforce land uses controls along waterways. Especially keeping development out of floodplains. Develop strategies to protect riparian zones.	Have a full time waterways patrolman in the watershed Chapter 105 permit review funding increase	DCED, Local COG's, Local Government, DEP
Partner with local universities to develop programs for student education and protection and enhancement of the watershed. Identify other volunteer and non-profit groups to coordinate activities and projects with to avoid duplication of effort.	Floating Lab (classroom) in the watershed/region Intern(s) for the SCWA Expanded water monitoring program in the watershed Develop a storing house for watershed monitoring information	Canaan Valley Institute
B. Land Resources		
Expand upon the partnership with Ft. Indiantown Gap (FIG) for environmental resource and endangered species protection.	Complete MOU with FIG Trout Unlimited project on Manada Creek Fritillary Butterfly habitat protection Chesapeake Bay Foundation FIG Project	Trout Unlimited, The Nature Conservancy, Chesapeake Bay Foundation, Chesapeake Bay Program
Continue/expand watershed wide cleanup days.		Local sponsoring organizations
Identify "Brownfield" areas within the watershed for possible assessment, cleanup, and redevelopment. Identify other potential hazard areas within the watershed.	Identify areas for urban forests/woodlands Inventory "Brownfields" in urban areas	PA Act 2 funding, Brownfields Inventory Grants, Federal Brownfield Clean Up Revolving Loan Fund

Management Option	Specific Projects	Potential Funding Sources
Develop an educational program for demonstrating and promoting riparian buffers, especially for use in FFA, 4H, scout groups, and secondary schools.		DEP Growing Greener, League of Women Voters WREN, Chesapeake Bay Small Watersheds Grants, Private foundations
Support pollution control legislation.	Bottle Bill Develop a "Tire Bill" for reducing tire trash	
Support expanded recycling programs within the watershed as an alternative to landfill development.	Develop a tire recycling program	DEP recycling initiatives
Encourage local farmers and landowners to enroll their property in agricultural security areas, set aside programs and conservation easements.	Develop county and regional conservancies	USDA Farmland preservation funds, Conservation Reserve Programs, County governments
c. ***Water Resources***		
Implement the remaining projects for reclaiming AMD impacted streams in the upper Swatara Creek watershed developed by Dan Koury in the Swatara Creek Reclamation Document.	Enhancements to the treatment wetlands in Ravine Additional treatment wetlands on Lorberry Creek, and Good Spring Creek for iron removal	DEP-BAMR, Mine Drainage set aswide program, EPA 104(b)(3) and Section 319 grants, NRCS PL-566 grants
Utilize the 1998 - Swatara Creek Watershed Rehabilitation Plan by Dan Koury as a model to develop rehabilitation plans for agricultural and urban runoff problems in each of the major drainages in the watershed.		DEP Growing Greener, EPA Section 319 grants

Appendix G
Management Options Summary Table

Management Option	Specific Projects	Potential Funding Sources
Develop a comprehensive plan to protect and monitor water quality and the results of improvements to streams in the major drainages of the watershed. Tailor the monitoring programs to sources of potential degradation in each drainage. Utilize this information to develop a database of information for the entire watershed.	Implement the source water protection partnership program Develop and implement monitoring program identified by Derry Twp.	DEP Growing Greener
Develop and implement streambank stabilization and habitat enhancement projects for the streams in the watershed.	Bachman Run and Quittapahilla and Killinger Creek projects Wengert Feeds farm project Upper little Swataratreambank fencing above Sweet Arrow Lake Rhein Farm on Upper Little Swatara	DCNR RCP implementation grants, DEP Growing Greener and streambank fencing programs, NRCS wildlife habitat program
Develop a comprehensive in stream management plan for the Quittapahilla Creek watershed.	Do in stream assessments	DCNR RCP implementation grants, DEP Growing Greener program
Develop a watershed wide conservation and education plan for the conservation of water. Coordinate drought task forces.	Make water conservation ideas video and ads	PA League of Woment Voter WREN program, DEP Growing Greener program
Develop an agreement for habitat and water quality improvement in Manada Creek with Ft. Indiantown Gap.	Complete MOU with FIG Complete tank training trail agreement Develop a habitat improvement plan in conjunction with Doc Fritchy Chapter of TU	Trout Unlimited, National Wildlife Foundation (NWF) habitat programs, NRCS wildlife habitat program
Develop a watershed organization for protection and enhancement of the Little Swatara Creek.	Formation process on going	DEP Growing Greener program, Canaan Valley Institute

Management Option	Specific Projects	Potential Funding Sources
Develop storm water management plans for developed areas in the major drainages of the watershed. Identify new technologies for enhancing infiltration and groundwater recharge, especially in areas of urban development.	Municipality or sub-basin focused efforts Address Palmyra Borough flooding	PENNVEST and EPA Section 319 programs
Make the stream corridor more user friendly.		DCNR RCP implementation grants, PFBC Water Trails Initiative
Develop a plan of action to preserve and rehabilitate the infrastructure of the publicly owned lakes in the watershed, especially Sweet Arrow Lake and Stoevers Dam.		DCNR RCP implementation and Parks and Recreation funds
Develop areas for handicap access to Swatara Creek or other tributaries in the watershed.	Sweet Arrow Lake Handicapped access Handicapped fishing areas at Swatara co-operatve nursery Handicapped access to Quittapahilla Creek on Carmuse property	DCNR RCP implementation funds, DEP Growing Greener, and PFBC funding
Continue work to restore the fishery on the northern section of the watershed. Expand these efforts to assist with reestablishing the migratory fish population in the watershed and development of a stream habitat enhancement plan for other stream sections in the watershed.	Expand Swatara cooperative nursery	PFBC cooperative nurseries, local sponsoring organizations, DCNR RCP implementation

Appendix G
Management Options Summary Table

Management Option	Specific Projects	Potential Funding Sources
Support the development of the shad and other native species populations in the watershed.	Develop initial parameters for reintroducing shad to the watershed	PFBC, Susquehanna River Basin Commission (SRBC), Susquehann Dam Operators, Chesapeake Bay Foundation, Chesapeake Bay Program
Develop an educational program for elementary and secondary schools on water quality and the responsible use of the watershed.	Develop an educational wetland at the Career and Technology center Implement Northern Lebanon High School's "Watersheds" education program	DEP Growing Greener program, Canaan Valley Institute, DCNR RCP implementation, local and national education and environmental foundations
Inventory existing riparian buffers in the watershed. Identify areas that need to have riparian buffers established.	Do updated aerial video and photography to set current baseline and identify changes from previous flight	DEP Growing Greener, EPA Section 319 grants, DCNR RCP Implementation funds
Inventory NPS pollution problems in the major drainages of the watershed, develop a hierarchy and implementation plan for addressing these problem areas.		DEP Growing Greener, EPA Section 319 grants
Promote the development of conservation landscaping and management practices to reduce sediment load.		DEP Growing Greener, EPA Section 319 grants
Expand sewage capacity in the areas with the highest projected growth rates.	Update and implement Act 537 plans	DEP Growing Greener, EPA Section 319 grants, PENNVEST Funding
Work to ensure that development does not occur in floodplain areas.	Analyze and follow up on repetitive loss data	Local MPO's and counties
Investigate possible uses for by-products of mining operations in the watershed.	Mine drainage element removal Culm pile material reuse	DEP BAMR, Private foundations

Management Option	Specific Projects	Potential Funding Sources
Support completion of a study to determine if a reservoir in Swatara State Park is a preferred option for a supplementary water supply for Lebanon County and flow augmentation for the Susquehanna River.		Local water authorities
D. Biological Resources		
Preserve ecological and visual amenities in the watershed. Utilize both voluntary protection and market purchase for preservation.	Protect important birding areas within the watershed	The Nature Conservancy, DCNR RCP implementation, local conservancies
Develop funding sources and a regional land trust organization to facilitate these actions.	Development of the Lebanon Valley Conservancy	National and local foundations
Identify areas of significant invasive species populations. Develop an integrative management plan to control these species.	Develop a purple loostrife control plan Educate the public to the dangers and modes of transport of the zebra mussel	DEP Growing Greener
Identify riparian buffers in major drainages of the watershed. Identify areas for further riparian buffers creation.	Complete aerial video or use FSA photography	DCNR RCP implementation, DEP Growing Greener
If appropriate, complete Natural Heritage Inventories for Lebanon and Schuylkill Counties.		The Nature Conservancy, DCNR RCP implementation, local conservancies
Inventory wetlands in the stream corridors and create projects for protection and possible enhancement.	Create the educational wetland at the Career and Technology Center	DEP Growing Greener, DCNR RCP implementation, and USDA Wetland Reserve Program

Appendix G
Management Options Summary Table

Management Option	Specific Projects	Potential Funding Sources
If appropriate, establish a local chapter of PA Cleanways.		
E. Cultural Resources		
Develop educational programs on the environment in the watershed and especially Swatara State Park.	Create the educational wetland at the Career and Technology Center Northern Lebanon High School "watersheds" environmental education program	DCNR Parks and Recreation funding, education/environmental based private foundations
Develop better access to Swatara Creek and its tributaries for recreational use.	Signing of Swatara Water trail Obtain access points through out the watershed Develop park and Access point on 29 acre property owned by Derry Twp.	DCNR RCP implementation grants, PFBC Water Trails Initiative
Develop rail trails from Swatara State Park Railroad Corridor to Lebanon and the Conewago Trail and in the Union Canal corridor from the Tulpehocken watershed boundary to Hershey and Middletown.	Complete feasibility study for converting the abandoned railroad from Union Canal Park to Lickdale Develop this section of trail if feasible Educate the public about the Swatara State Park portion of the trail system Build support to develop the missing link of the trail	DCNR Rails to Trails, Local Industries, Private foundations
Expand upon the recently developed Swatara Creek Water Trail.	Water Trail signage	DCNR RCP implementation grants, PFBC Water Trails Initiative
Increase recreational opportunities within the watershed, including park, recreational fields, stream accesses, etc.	Union Canal Park expansion at the Sunny May Farm Improvements to Colemans Park, Cleona Park, etc Improvements to The Sweet Arrow Lake Recreation Area and Stoevers Dam, Camp Central Improvements	The Nature Conservancy, Local conservancies
Increase passive recreational opportunities in the watershed.	Rail Trails Heritage/recreational areas Important bird areas	The Nature Conservancy, Local conservancies
Complete proposed enhancements to Quittie Creek Nature Park.	Quittie Creek Greenway Footbridge over Quittie Creek	DCNR RCP implementation and Parks and Recreation funds, TEA 21,

Management Option	Specific Projects	Potential Funding Sources
Develop a plan for the preservation of historic resources in the watershed.	Promote Big Trees program as a preservation effort	DCNR RCP implementation, Bureau of Historic Preservation, Local historical societies and foundations
Develop a watershed wide parks and recreation plan for the watershed. Include a handicapped accessability section in this document.	Develop Lebanon County Parks and Recreation Board	DCNR RCP implementaion funds
F. Swatara State Park		
Stay involved with the Swatara State Park Project.		
Maximize the recreational potential of the state park.		
Support any development of the state park to increase tourism as an economic presence in the region.		
G. Swatara Creek Greenway		
Implement management options developed in the greenways plan.		Described in Swatara Greenway plan
Develop a trail and greenway master plan for the entire watershed.	Conduct a feasibility study to develop scope for this project. Connect Derry Twp bike/pedestrian trail system with greenway	DCNR Rails to Trails, Trail Foundations
Create an overlay zone for stream buffers in the watershed.		DCED
Increase partnerships with public and private entities to foster land stewardship.	Establish and promote key conservancy groups	Local conservancies, conservation districts

Appendix G
Management Options Summary Table

Management Option	Specific Projects	Potential Funding Sources
Expand greenway initiatives into Lebanon, Berks, and Schuylkill Counties.	Quittie Creek Greenway & promote concept of Heritage Greenway along Union Canal route	DCNR RCP and greenways funding

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