Slippery Rock Creek Watershed Conservation Plan June 2011

Slippery Rock Watershed Coalition 434 Spring Street Ext., Mars, PA 16046 www.srwc.org

Major funders: Community Conservation Partnerships Program Keystone Recreation, Park & Conservation Fund Administered by:

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Foundation for Pennsylvania Watersheds

The Pennsylvania Rivers Conservation Program

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Foundation for Pennsylvania Watersheds

Location Slippery Rock Creek Watershed Ohio River Basin

Beaver, Butler, Lawrence, Mercer, Venango Counties Commonwealth of Pennsylvania



Project Sponsor:

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Disclaimer

The Slippery Rock Creek Watershed Conservation Plan has not been compiled for regulatory purposes. This plan represents an effort by many to compile existing information regarding the land, water, biological, and cultural resources in the watershed. This effort is on-going and significant changes to the information contained in this plan are expected.

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ATTACHMENTS

- I Public Meeting Minutes
- II Survey Monkey Summary
- III Metadata Summary
- IV SRCWCP Electronic Files (includes Comments)

PROJECT SUMMARY

The Slippery Rock Creek Watershed is located in the rolling hills of beautiful western Pennsylvania in portions of Beaver, Butler, Lawrence, Mercer, and Venango Counties. As identified as in the state water plan, the entire watershed is approximately 836-square-miles and is primarily a rural area consisting of forested and agricultural lands dotted with small towns such as Slippery Rock, Grove City, Ellwood City, Prospect, Boyers, and Harrisville. Major streams within the watershed include Slippery Rock Creek, Wolf Creek, Muddy Creek, Connoquenessing Creek, and Brush Creek. For the purposes of completing watershed conservation plans, however, the watershed was divided into the Connoquenessing Creek Watershed and the 408-square mile Slippery Rock Creek Watershed.

The character of the watershed has been largely shaped by its geologic, natural, and human history. The bedrock close to the surface consists of sedimentary rocks including sandstone, shale, claystone, coal, and limestone. These rock layers formed approximately 300-320 million years ago during the Carboniferous Period when the area went back-and-forth between swamp and ocean environments which determined the types of materials deposited. In very general terms, layers of sand became sandstone, calcareous material from chemical precipitation and marine animals became limestone, and organic matter in swamps became coal. Many of these rock layers have become major contributors to the local economy for the last two hundred years including those used in the production of fuels such as coal, oil, and natural gas. In addition, limestone and sandstone are valuable building materials. The historical extraction of these resources prior to the development of laws and practices sensitive to the environment resulted in a legacy of degradation to both the land and water which are still in need of being restored today. In addition, the presence of glaciers in the relatively recent geological past (Ice Age) also greatly influenced the characteristics of the watershed. Not only did glaciers create interesting and beautiful features such as the Slippery Rock Creek Gorge (part of the popular McConnells Mill State Park) and the Jacksonville Esker, but the glaciers influenced the type of soil, which in turn influences the plant communities that live there today. Some of these glacial deposits are also mined for sand and gravel.

Prior to "European" settlement, the watershed was utilized by various Upper Woodland Native American tribes for hunting-and-gathering as well as agriculture. Archaeological investigations have determined that some sites may be up to 12,000 years old. Even though Europeans began exploring the area around the time of the French and Indian War, the first permanent American settlements did not begin until the late 1700's, which led to clearing of the dense forests for farming. Today, over 25% of the watershed is used for agricultural purposes. Over time, various industries began to develop that utilized the rich natural resources of the watershed. Primarily in the early to mid-1800s, settlers harnessed the swift currents of the streams by building dams and constructing saw and grist mills. Some of these in-stream features, now called run-of-the-river dams, remain today; however, due to the hazardous conditions created, many have been or are to be removed. Discovery of shallow iron deposits also led to the building of several iron furnaces starting in the 1820s; those remaining are considered of historical significance. Drilling for oil began in the watershed in the 1860s just a few years after Colonel Drake drilled the first commercially-successful well in Oil City, PA in 1859. Today, there are over 300 small active oil and gas wells in the watershed. Many abandoned wells have been plugged; however, there are over 200 inactive or abandoned wells, some with drainage that negatively impact water resources. Recently, gas drilling has expanded due to the technological advances leading to natural gas production from the Marcellus Shale. Mining for coal and limestone also have historical roots which began around 1840 and continues today. The expansion of coal mining and the expansion of the railroad lines, especially the Bessemer and Lake Erie Railroad (B&LE), are interrelated. Both of which were largely in response to steel production in the region, resource needs of World War I & II, and the development of coal-fired power plants. While farming and mining are still conducted today, education is one of the largest employers in the area in response to multiple public school districts, Grove City College, and Slippery Rock University. Various service industries, governmental agencies, construction, and some light manufacturing and packaging are also major sources of employment in the watershed.

Today, in response to historical environmental impacts and concerns about current and future impacts, a variety of watershed, conservation, and environmental groups have formed within the Slippery Rock Creek Watershed. Established in 1982, the Bartramian Audubon Society is possibly the oldest active conservation-based organization. Their focus is on education and protecting wildlife, especially birds. The work of the Slippery Rock Watershed Coalition, formed in 1994, addresses the impacts of abandoned mines including land reclamation and the installation of environmentally-friendly, passive systems to treat polluted mine water as well as providing opportunities for environmental education. The Citizens Association of the Slippery Rock Area (CEASRA) has focused its efforts for over 15 years on their concerns of the expansion of the Tri-County Landfill located near Grove City. The Wolf Creek Watershed Association was formed to monitor, protect, and enhance the water quality and natural resources of the Wolf Creek subwatershed. The Friends of McConnells Mill State Park was formed in 1999 to aid in the protection of the facilities and the natural beauty of the area, while the Moraine Preservation Fund, a non-profit volunteer organization, promotes community stewardship of natural resources within Moraine State Park, McConnells Mill State Park, and the Jennings Environmental Education Center. The recently-formed Sustainable Slippery Rock is seeking to encourage approaches with long-term minimal environmental impact such as the use of locally grown food.

As the population continues to grow, even though agricultural and forest lands cover about 80% of the current watershed, these areas are being converted to industrial/commercial use and housing developments uses while, at the same time, the demand for natural resources continues to grow. Over the last several decades, there is an awareness developing that recognizes the need to create a more sustainable way of life to protect our valuable natural resources without sacrificing our economy and standard of living. This, of course, is a delicate balance to maintain. The first step towards this goal is to document the current state of the watershed.

Project Background

In 2007, grants were received from the Pennsylvania Department of Conservation and Natural Resources and the Foundation for Pennsylvania Watersheds to develop the Slippery Rock Creek Watershed Conservation Plan (SRCWCP) to focus on 408 square miles upstream of the confluence with the Connoquenessing Creek.

The mission or purpose of the plan was to provide the general public, municipalities, watershed community, and government agencies with a concise, easily-read and -used, repository of the natural, historical, cultural, and recreational resources while emphasizing opportunities for stewardship and economic growth within the watershed. To accomplish the purpose of the plan, five goals were established.

The goals were to:

- Create a user-friendly "one-stop-shop" for information by gathering and compiling existing data and mapping;
- Engage local residents, businesses, industries, municipalities in creating the SRCWCP to reflect their issues, interests, and concerns;
- Increase public awareness through a community outreach program that includes an interactive website for information gathering as well as posting the SRCWP;

- Identify economic growth opportunities based on the watershed resources; and
- Identify positive ways to encourage and to support stewardship of the watershed resources.

An advisory committee was formed consisting of stakeholders within the watershed who represented various interests including governmental agencies, nonprofits, business/industry, educational institutions, etc. To increase public awareness of the plan and to identify the issues and interests of people who live and/or work within the watershed, four public meetings, which were announced in local newspapers, were conducted. In addition, 20 municipal (township and borough) meetings were attended in order to communicate the purpose, request input, and seek support. In addition, survey forms were made available both online and at 12 local community events such as the Ellwood City Earth Day and Harrisville Community Day. Interviews were conducted with 29 individuals that included people from a local college and university, county conservation districts, state and federal agencies, and non-profit groups. Information gathered was utilized in development of the plan and copies of the survey have been included. The Stream Restoration Incorporated website was expanded to increase public awareness, to assist in gathering information and to provide a location for posting the SRCWP, which provides the goal of a "one-stop-shop" for information and mapping related to the watershed.

A draft of the plan was uploaded to the website and a series of public meetings were held in February 2011 in order to give citizens and other stakeholders an opportunity to review and comment on the plan. Comments were accepted for 30 days following the last public meeting. The comments were considered and incorporated into the final plan. Public meetings to unveil the final plan are scheduled to be held in June. A copy of the final plan is available for viewing on the Stream Restoration Incorporated website http://www.streamrestorationinc.org/srwcp/srwcp.php.

Watershed Plan Summary

The plan was divided into seven sections. The following provides a summary of each section:

Project Area Characteristics – Section 1 provides a generalized overview of the watershed.

- The Slippery Rock Creek Watershed, as identified by Pennsylvania State Water Plan 20-C, includes the Slippery Rock Creek, Connoquenessing Creek, and Brush Creek Watersheds.
- The SRCWCP covers only the portion of SWP 20-C upstream of the confluence with Connoquenessing Creek.
- The over 261,000-acre (408-sq. mile) watershed has seven major streams and is located in the Ohio River Basin in the western Pennsylvania.
- The watershed covers portions of 5 counties (Beaver, Butler, Lawrence, Mercer, and Venango) and 38 municipalities.
- The watershed is located in the Pittsburgh Low Plateau and Northwestern Glaciated Plateau sections of the Appalachian Plateau physiographic province.
- The existing land uses include about 105,000 acres of forestland and 63,000 acres of agricultural and range land which combined account for at least 64% of the land use in the watershed. (Land use information was not available for Mercer and Venango Counties.)
- Available census data indicate the two largest population centers are Slippery Rock with 5,251 residents and Grove City with 8,024 residents. There are, at most, about 80,000 total residents in the watershed (actual number lower as some municipalities extend beyond watershed).
- Between 1990 and 2000, the population of the watershed grew about 8%.

- Major employers include public & private educational institutions, hospitals, a trucking company, asphalt producer, federal government, document storage facility, food packing facility, etc.
- There are 4 private schools, 1 private college, 1 state university, and 14 public school districts.

<u>Issues, Concerns, and Constraints</u> – Section 2 describes and compiles the public outreach effort and the responses to survey questions focusing on general land use, water quality issues, recreation, watershed attributes, areas of improvement, natural conditions, and issues of concern.

- The 50 responses by the general public and 16 responses by county and municipal representatives indicated that most lived in a residential area.
- Abandoned mine drainage was the most prevalent water quality issue according to the surveys completed by both the general public and the municipal and county representatives.
- The general public listed water quality improvement as the most important watershed value followed by attractive natural settings while the municipal responses indicated a tie between the same selections.
- The general public rated visiting public land (parks, forests, game lands) as the most important recreational activity while municipal representatives selected fishing followed closely by hunting.
- The public survey respondents also provided written comments indicating flooding and stream bank erosion as issues.
- Rights of landowners and concerns about mining and gas drilling (particularly the Marcellus Shale play) were also expressed by the general public.
- People interviewed noted interest in low-head dam removal, development of a water trail, riparian protection, tourism, development of partnership efforts for restoration issues, etc.

<u>Land Resources</u> – Section 3 provides an overview with mapping that includes the physiography, ecoregions, geology, soils, and other related land resource information.

- About 170 square miles of the watershed was covered by glaciers. Various glacial features exist in the watershed including moraines, kames, terraces, and eskers.
- About 90,000 acres of prime farmland are present in the watershed.
- About 29,500 acres or roughly 11% of the watershed consists of public lands including 5 state game lands, 1 state forest, 3 state parks, and 14 other tracts owned by local agencies.
- There are 6 residual and municipal waste sites, 2 permitted sanitary landfills, 87 documented illegal dumpsites, and a superfund site.
- There are over 250 abandoned coal mines and over 200 abandoned & over 300 active oil & gas wells.
- Streambank erosion, flooding, illegal dumpsites, and the reclamation of abandoned mine lands are land resource issues that need to be addressed.

Water Resources – Section 4 provides an overview with mapping of the water resources.

- The "Watershed Address" discrepancy is noted between the PADEP and USGS on whether the entire 836 square-mile area is the Slippery Rock Creek or Connoquenessing Creek Watershed.
- Major subwatersheds and tributaries are identified and described.

- The PADEP stream designations for individual streams are listed and discussed with two streams given the two of the highest quality classifications: Hell Run (Exceptional Value) and Muddy Creek from the source to Moraine State Park (High Quality Cold Water Fishes).
- There are approximately 9,500 acres of wetlands which comprises about 4% of the watershed.
- There are approximately 4,733 acres of lakes and ponds or about 2% of the watershed.
- Lake Arthur is the largest lake at over 3,000 acres.
- There are 8 remaining run-of-the-river dams as well as 2 active stream gauging stations that provide data directly to accessible websites.
- There are 203 miles of impaired streams: over 130 miles (65%) impaired by abandoned mine drainage.
- There are 18 environmentally-friendly (passive) systems treating about 750 million gallons annually of abandoned mine drainage.
- Public water supplies are not described due to current Homeland Security limitations.

<u>Biological Resources</u> – Section 5 describes biodiversity including indigenous wildlife and vegetation along with the changes associated with glaciation and European settlement.

- Numerous hunting opportunities are documented for the watershed, where in 2009 to 2010 over 30 bear, about 8000 turkey, and about 40,000 deer were harvested. (Note that the data are for the five-county area or wildlife management units which extend outside the watershed.)
- Non-game animals like species of amphibians, reptiles, and birds are also discussed.
- Invasive plants such as Japanese Knotweed, Multiflora Rose, etc., and animals such as the Emerald Ash Borer, Red-Eared Slider Turtle are also listed and discussed.
- Species of special concern are noted like the Massasauga Rattlesnake, Indiana Bat, Bog Turtle, Hellbender, etc.
- Important habitats and conservation areas for birds and mammals and biologically diverse areas are identified by the National Audubon Society totaling over 65,000 acres.
- There are 50 Bartramian Audubon Society Wildlife Sanctuaries totaling over 4,000 acres.

<u>Cultural Resources</u> – Section 6 focuses on recreational and historical resources.

- Public lands cover about 11% of the watershed.
- There are 3 state parks that total almost 20,000 acres: Jennings Environmental Education Center, McConnells Mill State Park, and Moraine State Park.
- Portions or all of 5 State Game Lands (# 95, 130, 151, 216, and 284) total almost 9,000 acres.
- There are 17 municipal and county recreational parks totaling almost 600 acres.
- There are also over 400 acres of publically-accessible, privately-owned, parks.
- There are miles of trails for low-impact use by the public: over 50 miles for hiking/walking, over 50 miles for bicycling, over 30 miles for horseback riding, and over 25 miles for snowmobiling.
- There are also areas designated for off-road vehicles including the Slippery Rock Dunes Outdoor Park and Switchback Raceway.

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- Birding areas include Jennings Environmental Education Center, Moraine State Park, Glades Wildlife Area, Miller Woods Tract, Wolf Creek Narrows, and Bartramian Audubon Society Sanctuaries.
- There are eight campgrounds, seven golf courses, and opportunities for boating including Lake Arthur and Harbor Acres Lake.
- Public fishing lakes and streams are also described including six "PA Fishing Hot Spots" identified by the PA Fish & Boat Commission.
- Numerous Sportsmen's Clubs, scout troops, and recreational clubs also exist in the watershed.
- A brief history is discussed along with associated archaeological features including iron furnaces, railroads, the Elliott Mine Archaeological Complex, Miller Tract, and Old Stone House.
- Wendell August Forge and McConnells Mill Covered Bridge are listed on the National Register of Historic Places while 16 other features are eligible.

<u>Management Options</u> – Section 7 provides goals, objectives, and action items that focus on watershed restoration, maintenance, or enhancement. The options were identified using input from individuals and municipalities in addition to a review of available county and municipal plans and information. Goals and objectives along with specific action items are listed for all 4 resource categories (water, biological, cultural, land).

- Some of the action items include:
 - Reclaiming abandoned mine land sites
 - o Cleanup of illegal dumpsites;
 - Expand recycling programs;
 - Posting of GIS data on state websites;
 - Development of multi-municipal plans;
 - o Increasing acreage in preserved agricultural lands, PA Game Lands, and state parks;
 - Treatment of abandoned mine discharges;
 - Stream bank stabilization at the West Park Road Bridge site;
 - o Stream habitat improvement projects;
 - Removal of run-of-the-river dams;
 - Expansion of the North Country Trail;
 - Development of a water trail with put-in points, etc.
 - o Increase public awareness of land, water, biological and cultural resources.
- A ten-year general timeframe and preliminary estimated cost of over \$30 million+ was provided.
- Selected completed projects are listed including the reclamation of about 750 acres of abandoned mine lands by PA DEP; installation of 18 passive systems to treat abandoned mine drainage through public-private partnership efforts; the removal of 3 run-of-the-river dams, education and interpretive programs, etc.
- Projects underway, some of which were initiated by the process of completing the SRCWCP, include the Slippery Rock Creek Streambank Stabilization Project, McIntire Passive Treatment System, web-based version of <u>Accepting the Challenge</u>, Clean Creek Products for sustainability of abandoned mine water treatment, Ohio River Watershed Celebration, Slippery Rock University long-term stream recovery research program and "Weather Observatory", Act 167 County-Wide Watershed Stormwater Management Plans for Butler and Lawrence Counties, Butler County Hazardous Waste & Electronics Collections, etc.

PROJECT BACKGROUND

Work began in 2006 on the Slippery Rock Creek Watershed Conservation Plan **(SRCWCP)** with an application to the Pennsylvania Department of Conservation and Natural Resources **(DCNR)** for funding through the Community Conservation Partnerships Program **(C2P2)**. With receipt of the C2P2 grant in 2007 and with the generous support of the Foundation for Pennsylvania Watersheds, representatives from local communities, businesses, conservation groups, state agencies, and residents formed an Advisory Council to provide guidance in developing the SRCWCP with the following purpose:

Mission Statement

"The Slippery Rock Creek Watershed Conservation Plan is to be developed to provide the general public, municipalities, watershed community, and government agencies with a concise, easily read and used, repository of the natural, historical, cultural and recreational resources while emphasizing opportunities for stewardship and economic growth within the Slippery Rock Creek Watershed."

<u>Goals</u>

To accomplish the mission, the following five goals were established, all of which focus on the <u>natural</u>, <u>historical</u>, <u>cultural</u>, <u>and recreational resources</u> within the Slippery Rock Creek Watershed:

- <u>Create a user-friendly "one-stop-shop" for information</u> by gathering and compiling existing data and mapping.
- <u>Engage local residents, businesses, industries, municipalities</u> in creating the SRCWCP to reflect their issues, interests, and concerns.
- <u>Increase public awareness</u> through a community outreach program that includes an interactive website for information gathering as well as posting the SRCWP.
- Identify economic growth opportunities based on the watershed resources.
- <u>Identify positive ways to encourage and to support stewardship</u> of the watershed resources.

Another goal was to complement other plans completed throughout Pennsylvania which connect communities to their rivers and watersheds. If the DCNR concurs that the SRCWCP meets this goal and the standards of the C2P2, Slippery Rock Creek will be eligible for the River Registry along with the 87 rivers/streams currently listed (2007 data). (www.dcnr.state.pa.us/brc/rivers/riversconservation/registry)

The following map depicts the areas of the state covered by DCNR Rivers/Watershed Conservation Plans that have been completed or are in the process of being completed.



Rivers/Watershed Conservation Plan Coverage in Pennsylvania

(Source: Pennsylvania Water Atlas, 2010)

To meet the goals all interested stakeholders must be given the opportunity to contribute to the plan. A public involvement process was developed to encourage input through outreach activities such as public meetings, surveys, newsletters, interviews, and a website. This community outreach effort was essential in identifying watershed-specific problems, issues and concerns. An important part of the outreach effort was the public meetings held at the Grove City High School Auditorium (8/7/07), Plain Grove Township Municipal Building (8/8/07), Boyers Sportsmen's Association (8/14/07), and the Slippery Rock Township Municipal Building (8/15/07).

Stakeholders that could not attend public meetings were also able to provide input via surveys and website feedback. In addition, Tom Grote and Laurie Popeck, SRCWCP Project Facilitators, conducted key person interviews and received input from municipalities through questionnaires and follow-up phone interviews. As listed in the following table, information was also presented and input requested for plan development at township and borough meetings in 2007.

	County	Municipality (twp.; <i>borough</i>)	Date of Meeting
1	Beaver	Franklin	05/08/07
2		Brady	06/27/07
3		Center	06/18/07
4		Harrisville	05/29/07
5	Putlor	Marion	05/14/07
6	Dullei	Muddy Creek	06/25/07
7		Slippery Rock	06/19/07
8		Slippery Rock	06/25/07
9		West Sunbury	07/05/07
10		Plain Grove	04/09/07
11		Scott	04/02/07
12	Lawrence	Slippery Rock	05/14/07
13		Washington	04/09/07
14		Wayne	04/05/07
15		Findley	05/02/07
16		Pine	05/21/07
17	Mercer	Sandy Lake	05/01/07
18		Springfield	05/21/07
19		Worth	05/02/07
20	Venango	Clinton	05/07/07

2007 Presentations by SRCWCP Project Facilitator at Township & Borough Meetings

(Source: Advisory Council)

In turn, the information gathered was used to compile a list of specific issues of interest to the stakeholders. These issues included, but are not limited to, the following:

- Mitigation of historic impacts to water and land resources by abandoned coal mines,
- Identification of environmental stewardship goals relating to limestone, coal, sand & gravel, and oil & gas reserves,
- Development of boating, fishing, and other recreational opportunities while improving aquatic habitat by decreasing erosion, siltation, etc. for Slippery Rock Creek and major tributaries,
- Implementation of smart development along the Interstate 79 corridor, and
- Enhancement of unique natural and cultural resources such as McConnells Mill State Park, Moraine State Park, Jennings Environmental Education Center, and Pennsylvania Gamelands.

Based on the stakeholder input, the SRCWCP has focused on providing a coordinated plan for addressing challenges currently facing individual communities while providing a template for stewardship of the watershed as a whole. Successful completion of the SRCWCP goals provides critical data for stakeholders interested in the sustainability and viability of the watershed, which is vital towards integrating positive economic growth with conserving, improving, and maintaining the resources of the Slippery Rock Creek Watershed. With accessibility via the internet at <u>www.srwc.org</u>, the SRCWCP is readily available for use in support of future community-based projects by local groups,

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municipal officials, conservation organizations, government agencies, non-profit organizations, businesses, planners, and residents.

To develop a plan to successfully address the mission statement, the SRCWCP was divided into seven major sections, as listed in the following table:

Sec. #	Title	Brief Description
1	Project Characteristics	Watershed location, size, topography, streams, land use, social/economic profile, employment, unique features, etc.
2	Issues, Concerns, Constraints	Items of interest as developed from stakeholder input
3	Land Resources	Soil characteristics, ownership, critical areas, landfills, hazard areas including waste sites, abandoned mines, etc.
4	Water Resources	Major streams, wetlands, floodplains, lakes, water supplies, water quality, etc.
5	Biological Resources	Wildlife (terrestrial and aquatic), vegetation (native and exotic), PNDI Species, important habitats, etc.
6	Cultural Resources	Recreational, archaeological/historical, etc.
7	Management Options	Options complementing and integrating initiatives for natural resources stewardship & sustainable economic growth
8	Appendices	Basic data including individual surveys

SRCWCP Sections

Note that Section 2 was developed from stakeholder surveys, which were compiled under three categories:

- Citizen Survey: for any person living or working in the Slippery Rock Creek Watershed
- Key Person Survey: list of individuals developed by the Advisory Council
- Municipal Survey: staff of local municipalities and county planning commissions

In addition, Section 7 includes management options based on the surveys as well as management options being considered or implemented by the local and county planning agencies and state agencies.

SECTION 1—PROJECT AREA CHARACTERISTICS

A. LOCATION

The Slippery Rock Creek Watershed lies within the 154,185-sq. mi. Ohio River Basin which covers parts of five states --- Illinois, Indiana, Kentucky, Ohio, West Virginia, and Pennsylvania. The Ohio River Basin, which includes the Allegheny, Upper Ohio, and Monongahela Subbasins is the second largest of six drainage basins in Pennsylvania: the Ohio, the Genesee, the Susquehanna, the Delaware, the Erie, and the Potomac. The Slippery Rock Creek Watershed lies within the uppermost headwaters of the Upper Ohio River Subbasin.





The 3084-sq. mi. Upper Ohio River Subbasin (a.k.a. Subbasin #20) includes the Pennsylvania portion of the Ohio River from the beginning (at the confluence of the Allegheny and Monongahela Rivers in Pittsburgh) to the state border with Ohio and West Virginia. The Pennsylvania State Water Plan, originally developed in the 1970s, further divided the subbasin into watersheds. As depicted in the following figure, the 836-sq. mi. Slippery Rock Creek Watershed with major streams including Slippery Rock Creek, Connoquenessing Creek, and Brush Creek was designated as "Watershed C".



Figure 1.2: Slippery Rock Creek Watershed (PA State Water Plan 20C)¹

For planning purposes, however, a separate Watershed Conservation Plan was completed for the Connoquenessing Creek Watershed.² The Slippery Rock Creek Watershed Conservation Plan, therefore, includes only the area upstream of the confluence of the Connoquenessing Creek.

The Slippery Rock Creek Watershed boundary was identified by merging the subwatershed boundaries produced by the US Geological Service **(USGS)** and the Environmental Resources Research Institute at Penn State University. The surface water divide upstream of the confluence with Connoquenessing Creek was plotted using elevation data that depicts the "lay of the land". The surface water divide was defined by the highest elevations surrounding the Slippery Rock Creek and the tributaries. To illustrate the approach, a pictograph is provided below. Note that the watershed carries water "shed" from the land after rain falls and snow melts.

¹ Pennsylvania Department of Environmental Protection. *Watershed Notebook*. 2010 (accessed on May 24, 2010); available at www.dep.state.pa.us/dep/deputate/watermgt

² Western Pennsylvania Conservancy. *Connoquenessing Creek Watershed Conservation Plan.* 2008.



Figure 1.3: Pictograph of Example Watershed³

The Slippery Rock Creek Watershed **(SRCW)** can be further described as being located in western Pennsylvania about 40 miles north of Pittsburgh and about 30 miles east of the border with the State of Ohio. The SRCW encompasses portions of the following five counties: northeastern <u>Beaver</u>, northern <u>Butler</u>, eastern <u>Lawrence</u>, southeastern <u>Mercer</u>, and southwestern <u>Venango</u>.



³ Pennsylvania Department of Environmental Protection. *What is a Watershed?* 2000 (Accessed May 9, 2010); available from http://www.portal.state.pa.us/portal/server.pt?open=514&objlD=588795&mode=2

B. <u>SIZE</u>

The 408-sq. mi. SRCW is irregular in shape, extending northerly about 30 miles to the uppermost headwaters and having a maximum width of about 20 miles in the northeast that narrows to about 3 miles at the southwest boundary. The watershed includes all or portions of 38 municipalities.

County	Municipality	Drainage Area	Portion of Total SRCW
(# of municipalities)	(townsnip/ <i>borougn</i>)	(sq. mi.)	(percentage)
Beaver (1)	Franklin	1.913	0.47%
Deaver (1)	Total Area	1.913	0.47%
	Brady	17.278	4.23%
	Center	1.797	0.44%
	Cherry	26.253	6.43%
	Clay	23.386	5.73%
	Concord	8.208	2.01%
	Franklin	15.189	3.72%
	Harrisville	0.853	0.21%
	Marion	25.128	6.15%
	Mercer	12.745	3.12%
Putler (10)	Muddy Creek	13.099	3.21%
Duller (19)	Portersville	0.464	0.11%
	Prospect	0.538	0.13%
	Slippery Rock	1.667	0.41%
	Slippery Rock	25.908	6.34%
	Venango	15.626	3.83%
	Washington	19.527	4.78%
	West Liberty	3.677	0.90%
	West Sunbury	0.101	0.02%
	Worth	25.395	6.22%
	Total Area	236.839	57.99%
	Perry	11.290	2.76%
	Plain Grove	18.235	4.47%
	Shenango	0.468	0.11%
$L_{\rm outrop oo}$ (7)	Scott	11.210	2.75%
Lawrence (7)	Slippery Rock	22.435	5.49%
	Washington	4.470	1.09%
	Wayne	3.175	0.78%
	Total Area	71.283	17.45%
	Findley	0.381	0.09%
	Grove City	2.698	0.66%
	Jackson	0.213	0.05%
	Liberty	14.465	3.54%
Mana an (0)	Pine	25.260	6.19%
wercer (9)	Sandy Lake	1.011	0.25%
	Springfield	6.339	1.55%
	Wolf Creek	15.215	3.73%
	Worth	18.983	4.65%
	Total Area	84.565	20.71%
	Barkeyville	3.433	0.84%
N	Clinton	0.004	0.00%
venango (3)	Irwin	10.274	2.52%
	Total Area	13 711	3 36%
	Total Area	13.711	3.3070

Table 1.1: SRCW Drainage Area by Municipality⁴

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⁴ Geographic Information Systems complied from data collected by the Southwest Pennsylvania Commission and PASDA.



Figure 1.5: Counties and Municipalities in the SRCW⁵

As shown in the preceding table and as depicted in the above map, 58% or 237 square miles of the watershed lies in 19 municipalities of Butler County while less than 1% or 2 square miles lie in 1 municipality in Beaver County and about 3% or 14 square miles lie in 3 municipalities in Venango County. Lawrence County with 7 municipalities and Mercer County with 9 municipalities have similar-sized areas in the watershed, with 17% or 71 square miles and 21% or 85 square miles, respectively.

In order to more clearly depict general and unique conditions on a local scale, Slippery Rock Creek and the major tributaries were used to describe four focus areas or subwatersheds, which are listed in the table below. (Refer to Plate 1.1, USGS Topographic Map of the SRWC for location of focus areas.)

⁵ Geographic Information Systems complied from data collected by the Southwest Pennsylvania Commission and PASDA.

Subwatershed Focus Areas	Size (sq. mi.)	Major Streams (4 th order & higher)	County
Lower Slippery Rock Creek	88.7	Slippery Rock Creek	Beaver, Butler, Lawrence, Mercer
Muddy Creek	58.3	Muddy Creek	Beaver, Butler
Wolf Creek	101.4	Wolf Creek (incl. East Branch, Black Run)	Butler, Mercer, Venango
Upper Slippery Rock Creek	160.0	Slippery Rock Creek (incl. South & North Branches; McMurray Run)	Butler, Venango
Total	408.4		

Table 1.2: SRCW Major Subwatershed Focus Areas⁶

C. MAJOR TRIBUTARIES

Slippery Rock Creek with the major tributaries total 149.8 miles. For the purposes of this report, the streams in the Slippery Rock Creek Watershed have been classified according to stream order⁷ from small perennial headwater streams, identified as first-order streams, to the sixth-order Slippery Rock Creek. The following table lists the major streams which attain a minimum fourth-order classification at the mouth. Additional details of the major tributaries and headwaters streams are described in Section 4, Water Resources.

Major Streams	Stream Order (at mouth)	Length (miles)	County
Slippery Rock Creek	6 th	51.4	Lawrence, Butler
Muddy Creek	4 th	22.8	Lawrence, Butler
Wolf Creek	5 th	27.9	Butler, Mercer
East Branch Wolf Creek	4 th	7.9	Mercer, Venango
Black Run	4 th	6.8	Mercer
South Branch Slippery Rock Creek	4 th	14.5	Butler
McMurray Run	4 th	8.6	Butler
North Branch Slippery Rock Creek	4 th	9.9	Butler, Venango
	Total	149.8	

Table 1.3: SRCW Major Streams⁸

⁶ Geographic Information Systems complied from data collected by the Southwest Pennsylvania Commission and PASDA.

⁷ Strahler, A. N. "Hypsometric (Area Altitude) Analysis of Erosional Topology." Geological Society of America Bulletin. 63 (1952): 1117-1142.

⁸ Geographic Information Systems complied from data collected by the Southwest Pennsylvania Commission and PASDA.

D. TOPOGRAPHY AND PHYSIOGRAPHY

The USGS has constructed 7¹/₂-minute topographic quadrangle maps showing lines of equal elevation (contours), latitude & longitude, streams, buildings, roads, and other features at a scale of 1" equals 2000' on approximately 22" x 27" sheets that cover most, if not all, of the United States. Fourteen USGS 7¹/₂-minute topographic maps describe the general configuration and elevation of the land surface and the natural and man-made features within the Slippery Rock Creek Watershed. While these maps provide a general idea of the topography, more accurate topography exists today that can provide detailed basemapping for many local watershed restoration projects. This mapping is acquired using new technology called LiDAR, or Light Detection and Ranging. For the purposes of this plan, however, the historic topographic maps were used due to the computing requirements for the scale of the watershed. Not only is the general "lay of the land" depicted, but also specific information can be derived from the mapping. For instance, the range in elevation within the watershed is 800 feet with the highest point being 1610 feet (491 meters) in Mercer County, Worth Township in the headwaters of Wolf Creek and the lowest point being 810 feet (247 meters) at the confluence of Slippery Rock and Connoquenessing Creeks in Beaver County, Franklin Township. Attached to the end of this section are Plate 1.1 which depicts the SRCW (outlined with a red boundary) on a USGS topographic map (Scale: 1" = 1 mile) and Plate 1.2 which depicts the terrain of the SRCW utilizing shaded relief of a Digital Elevation Model and the National Elevation Dataset.

A description of the physiographic province in which the Slippery Rock Creek Watershed is located, was also reviewed in order to further characterize the physical features or landforms which were shaped by geologic history. The entire 408-sq. mi. Slippery Rock Creek Watershed is located in the Appalachian Plateau Province, which extends northeastward from Alabama into New York. This is the largest physiographic province in Pennsylvania, occupying more than 26,000 square miles, almost 60% of the state, including all or parts of 41 of the 67 counties.⁹

The Appalachian Plateau Province in Pennsylvania is further divided into 10 sections based on the distribution patterns of rock strata, glacial material, erosion, deformation, specific landforms as well as other geologic features. As depicted in Figure 1.6, the Slippery Rock Creek Watershed is located both in the Pittsburgh Low Plateau Section and in the Northwestern Glaciated Plateau Section.¹⁰ The Pittsburgh Low Plateau Section consists of a smooth undulating upland surface with numerous, narrow, relatively shallow valleys, in contrast to the broader, more rounded, uplands with more linear valleys in the Northwestern Glaciated Plateau Section, the valley floors are often wetlands and bedrock (solid rock) is typically covered by glacial deposits. The majority, 239 square miles, of the Slippery Rock Creek Watershed lies within the Pittsburgh Low Plateau Section of Beaver, Butler, and Venango Counties, while 169 square miles of the watershed lie within the Northwestern Glaciated Plateau Section in Lawrence, Mercer, and Butler Counties. Refer also to Section 3, Land Resources for additional description of physiographic provinces.

⁹ Shultz, Charles H. Pennsylvania Department of Conservation and Natural Resources. <u>Special Publication 1:The Geology of Pennsylvania</u>. 1999.

¹⁰ Pennsylvania Department of Conservation and Natural Resources. *Northwestern Glaciated Plateau Section Appalachian Plateaus Province*. n.d. (accessed on May 19, 2010); available at <u>http://www.dcnr.state.pa.us/topogeo/map13/13ngps.aspx</u>



Figure 1.6: Sections of the Appalachian Plateau Province in the SRCW

E. CLIMATE AND AIR QUALITY

The Slippery Rock Creek Watershed has a temperate climate with moderately hot summers and moderately cold winters. Typically, the summers are dry and have medium to high humidity, giving the region a growing season between 120 to 180 days. Precipitation (combined rain and snow) averages 35 to 45 inches per year. The average daily high temperature ranges from 34 to 85 degrees Fahrenheit, while the average daily low temperature ranges from 16 to 60 degrees Fahrenheit.¹¹ The coldest day on record was minus 28 degrees Fahrenheit in January 1994. The warmest day on record, 100 degrees Fahrenheit, occurred in July 1988 in the Borough of Slippery Rock.¹²

The PA Department of Environmental Protection **(DEP)** monitors air quality throughout the Commonwealth. Part of the data the DEP collects includes the six parameters regulated by the US Environmental Protection Agency **(USEPA)**. The parameters are lead (Pb), sulfur dioxide (SO₂), nitrogen dioxide (NO₂), ozone (O₃), carbon monoxide (CO), and particulate matter (PM). Ozone (O₃) and particulate matter (PM) continue to be a challenge in Pennsylvania.¹³ The parameters monitored are described in more detail in the following table:

¹¹ McNab, H., & Aver, P. U.S. Forest Service. *Ecological Subregions of the U.S. 1994* (accessed on May 7, 2010); available at <u>http://www.fs.fed.us/land/pubs/ecoregions</u>

¹² The Weather Channel. Average Weather for Slippery Rock. 2010 (accessed on May 10, 2010); available from

http://www.weather.com/outlook/travel/businesstraveler/wxclimatology/monthly/graph/USPA1518?from=36hr_bottomnav_business ¹³ Pennsylvania Department of Environmental Protection Bureau of Air Quality. *Ambient Air Quality Monitoring and Emissions Trends Report.* 2007 (accessed on May 10, 2010); available at <u>http://www.dep.state.pa.us/dep/deputate/airwaste/ag/agm/agreport/2007agreport.pdf</u>

Parameter	Description	EPA Limits
со	Colorless, odorless gas typically produced due to the incomplete burning of carbon based fuels; common sources include motor vehicle exhaust, furnaces, industrial processes, residential wood burning, and natural sources such as forest fire	9 ppm (8-hour avg.) 35 ppm (1-hour avg.)
O ₃	Gas typically forming from chemical reaction between oxides of nitrogen (NOx) and volatile organic compounds in the presence of sunlight	0.075 ppm (8-hour avg.) 0.12 ppm (1-hour avg.)
Particulate Matter _{2.5}	Complex mixture of extremely small particles and liquid droplets; can include acids, organic chemicals, metals, and soil or dust particles; serious health effects to heart and lungs when inhaled	15.0 μg/m³ (annual avg.) 35 μg/m³ (1-hour avg.)
SO2	Highly reactive gas forming mainly (66% of all SO ₂) from combustion of fossil fuels at power plants; linked to adverse respiratory system effects and acid rain	0.03 ppm (annual avg.) 0.14 ppm (1-hour avg.)
NO ₂	Highly reactive gas forming from emissions of cars, trucks/buses, power plants, off-road equipment; linked to adverse respiratory system effects	53 ppb (annual avg.) 100 ppb (1-hour avg.)
Lead	Historically from automotive emissions before removing lead from gasoline; current major contributors - lead smelters, waste incinerators, utilities, lead-acid battery manufacturers	0.15 μg/m ³ (rolling 3-mo. avg.) 1.5 μg/m ³ (quarterly avg.)

Table 1.4: Air Quality Parameters Regulated by the USEPA¹⁴

Slippery Rock University Weather & Air Quality Observatory

Slippery Rock University **(SRU)** has recently constructed a tower, 30 feet in height, to aid in the study of meteorology and air quality at the main campus. The Weather and Air Quality Observatory was built during the summer of 2009 and operates 24/7, providing real-time data on the following parameters:

- Particulate Matter (>2.5 micron)
- Sulfur Dioxide (SO₂)
- Ozone (O₃)
- Nitrogen Dioxide (NO₂)
- Carbon Dioxide (CO₂)
- Solar Radiation (SR)
- Air Temperature (AT)
- Wind Speed (WS)
- Wind Direction (WD)

Julie Snow, PhD, and Jack Livingston, Associate Professor of Geology, at SRU have been instrumental with the success of the Observatory. Snow and Livingston supervise students that collect the raw data, research possible terrestrial origins, and study the relationship between air quality and weather. Greenhouse gases are also a focus, so that students can research approaches to reduction. The air quality data will eventually be posted on a website hosted by SRU, which will provide the public valuable information about ozone levels and other air quality data.¹⁵

 ¹⁴ United States Environmental Protection Agency. *Air Trends: Basic Information* 2010 (accessed on May 13, 2010); available from http://www.epa.gov/airtrends/sixpoll.html
 ¹⁵ Slippery Rock University. *Rock Pride Enewsletter* 2010 (accessed on May 24, 2010); available at

¹⁵ Slippery Rock University. *Rock Pride Enewsletter* 2010 (accessed on May 24, 2010); available at <u>http://rockpride.sru.edu/2010/RP021210/air.php</u>

The second focus of the Observatory involves researching the relationship of air quality to meteorology and writing new computer code that will eventually be used by the National Oceanic and Atmospheric Administration **(NOAA)**, a federal agency that focuses on the conditions of the oceans and atmosphere. Additional information about the local air quality can be accessed at the Slippery Rock University website: <u>http://www.sru.edu/PublicRelations/newsInfo/archive/Pages/2-18-2010-12-56-01-PM.aspx</u>.

Southwest Pennsylvania Air Quality Partnership, Inc.

The Southwest Pennsylvania Air Quality Partnership, Inc. **(SPAQP)** consists of a public-private coalition of volunteers that focuses on improving the air quality in southwest Pennsylvania. This region includes the Slippery Rock Creek Watershed.

The goals of the SPAQP are to:

- Increase public understanding of impacts of air pollution,
- Provide alerts for days with high air pollution,
- Give health effect information and guidelines to prevent and reduce exposure,
- Encourage voluntary action to reduce air pollution emission.¹⁶

A "stop-light" color code is used by the SPAQP to identify health conditions based on the USEPA standard air quality index (AQI).

AQI Color Code Description		Outdoor Exposure Recommendations		
Green	Healthy or good conditions	None		
Yellow	Fairly good conditions	Limited for extremely sensitive		
Orange	Unhealthy for sensitive individuals	Limited especially for elderly and extremely young		
Red	Unhealthy for everyone	Limited for everyone		

Table 1.5: Air Quality Index Color Codes¹⁷

F. EXISTING LAND USE

Information available from the Southwestern Pennsylvania Commission **(SPC)**, current as of 2006, was used to develop the maps depicting existing land uses in Beaver, Butler, and Lawrence Counties. Recent mapping of land use in Mercer and Venango Counties was not available. Land cover mapping for all counties, however, is provided in Section 5, Biological Resources.

The SPC used a classification of existing land that closely resembles the USGS Anderson Level I Standards.¹⁸ The following table lists the land uses depicted on Plate 1.3, Land Use Map of the SRWC at end of this section. (Mapping depicting wetlands is provided in Section 4, Water Resources.)

¹⁶ Air Quality Partnership. Southwest Region. Welcome to the Pennsylvania Air Quality Partnership. n.d. (accessed on May 9, 2010); available from <u>http://www.ahs2.dep.state.pa.us/aq_apps/aqpartners/default.asp</u>
¹⁷ Ibid.

¹⁸ Anderson, James R. & Hardy Earnest E. et all. A Land Use and Land Cover Classification System For Use With Remote Sensor Data. 1976 (accessed on May 12, 2010); available at <u>http://landcover.usgs.gov/pdf/anderson.pdf</u>

Existing Land Uso	Area			
Existing Land Ose	ac.	sq. mi.	% of total	
Urban or Built-Up Land	20,700	32.4	10.5%	
Agricultural Land	51,000	79.7	25.7%	
Rangeland	11,900	18.7	6.0%	
Forest Land	104,900	163.8	52.9%	
Water	5,500	8.6	2.8%	
Barren Land	4,200	6.5	2.1%	
Total	198,200	309.7	100.0%	

Table 1.6: SRCW Existing Land Uses (2006)¹⁹

Description of Level I Land Uses

- <u>Urban or Built-up Land</u> Residential; Commercial and Services; Industrial, Transportation, Communications, and Utilities; Industrial and Commercial Complexes; Mixed
- <u>Agricultural Land</u> Cropland and Pasture; Orchards, Groves, Vineyards, Nurseries, Ornamental Horticultural Areas
- Rangeland Herbaceous; Scrub and Brush; Mixed
- Forestland Deciduous; Evergreen; Mixed
- <u>Water</u> Streams; Lakes; Reservoirs
- <u>Barren Land</u> Strip Mines, Quarries, Gravel Pits; Transitional Areas; Mixed

G. LAND USE REGULATIONS

Land use is currently regulated throughout much of the Slippery Rock Creek Watershed. In Pennsylvania, the Municipalities Planning Code (MPC) encourages local governments to establish land use goals with comprehensive plans and allows municipalities to regulate land use through subdivision and land development ordinances and zoning.

<u>Comprehensive Plans</u>: As part of the MPC, all counties in Pennsylvania are required to develop and to adopt a comprehensive plan which is to be updated every 10 years. The comprehensive plan is a general policy guide for future growth, development, land use, and community character. The intent is to provide an overall vision, set priorities, and provide implementation strategies to achieve future goals and objectives determined by stakeholders and experts.²⁰ Each of the five counties (100%) in the Slippery Rock Creek Watershed has a County Comprehensive Plan. In addition, 13 of the 38 (about 34%) municipalities have a comprehensive plan.

<u>Subdivision and Floodplain Ordinances:</u> Dividing a tract of land into parcels is generally called a subdivision and 14 of the municipalities in the SRCW have subdivision ordinances/regulations to ensure that improvements are built to standards, that street and traffic patterns are safe, that adequate utilities are available, and that other important elements have been considered. In addition, due to the presence of flood-prone areas associated with some streams in the Slippery Rock Creek Watershed, 8 municipalities have floodplain ordinances that restrict the construction of buildings and other structures.

¹⁹ Geographic Information Systems complied from data collected by the Southwest Pennsylvania Commission and PASDA.

²⁰ Allegheny Places. n.d. (accessed on May 14, 2010); available at <u>http://www.alleghenyplaces.com/docs/DraftPlan/Chapter1.pdf</u>
able 1.7: SRCW Municipal Comprehensive Plans & Ordinances (Zoning, Subdivision, Floodplain						
County (# of municipalities)	Municipality (township/borough)	Comprehensive Plan	Zoning	Subdivision	Floodplain	
Beaver (1)	Franklin	Yes	Yes	Yes	No	
	Brady	Yes	Yes	Yes	No	
	Center	Yes	Yes	Yes	No	
	Cherry	No	No	No	No	
	Clay	Yes	No	Yes	No	
	Concord	No	No	No	No	
	Franklin	Yes	Yes	Yes	Yes	
	Harrisville	No	No	No	Yes	
	Marion	No	No	Yes	No	
	Mercer	No	No	No	No	
Butler (19)	Muddy Creek	Yes	No	Yes	No	
	Portersville	Yes	Yes	No	No	
	Prospect	No	Yes	No	No	
	Slippery Rock	No	Yes	Yes	No	
	Slippery Rock	Yes	Yes	Yes	No	
	Venango	No	No	No	No	
	Washington	No	No	No	No	
	West Liberty	No	No	No	No	
	West Sunbury	No	No	No	No	
	Worth	Yes	No	Yes	Yes	
	Perry	No	No	No	Yes	
	Plain Grove	Yes	Yes	No	No	
	Shenango	Yes	Yes	Yes	No	
Lawrence (7)	Scott	No	No	Yes	No	
	Slippery Rock	No	No	Yes	Yes	
	Washington	No	No	No	Yes	
	Wayne	No	No	Yes	No	
	Findley	Yes	Yes	No	Yes	
	Grove City	Yes	Yes	No	No	
Mercer (9)	Jackson	No	Yes	No	No	
	Liberty	No	Yes	No	No	
	Pine	No	Yes	Yes	No	
	Sandy Lake	No	No	No	No	
	Springfield	No	Yes	Yes	No	
	Wolf Creek	No	Yes	No	Yes	
	Worth	No	No	No	No	
	Barkeyville	Yes	Yes	No	No	
Venango (3)	Clinton	No	Yes*	No	No	
0 ()	Irwin	No	Yes*	No	No	

* designates municipality using County Comprehensive Plan

²¹ Pennsylvania Department of Environmental Protection. Elibrary. Department of Community and Economic Development Zoning and Comprehensive Planning. 2010 (accessed on May 13, 2010); available at http://www.elibrary.state.pa.us/elibpub.asp Also Advisory Council Members contributed to the information within this table.

Zoning Ordinances: Of the 38 municipalities in or partially within the Slippery Rock Creek Watershed, 20 (about 53%) have zoning ordinances. Zoning is a system that restricts certain uses and development in designated areas of a municipality. A zoning ordinance "divides all land within a municipality into zones or districts, and creates regulations that apply generally to the municipality, as a whole, as well as specific individual districts."²² Examples of zones or districts include industrial, commercial, agricultural, single-family residential, multi-unit residential, parks, schools, etc. As the primary planning tool of municipalities, zoning guides future development of a community in order to sustain or enhance neighborhoods, concentrate retail business and industry, channel traffic, etc. Zoning also considers future growth and development relating to the adequacy of drainage and storm sewers, other infrastructure, population density, etc.²³ Regulations differ among zones and districts, but the use of individual parcels of land within each zone or district is subject to uniform regulation, which helps to ensure that future land use meets a consistent set of quality standards as defined by the community.

H. <u>SOCIAL/ECONOMIC PROFILE</u>

To characterize the residents in the Slippery Rock Creek Watershed, selected social, economic, and other factors (demographics) were reviewed, such as population density, income, employment, and educational opportunities. The following table and narrative provide a general description.

<u>Population Centers:</u> Identification of population centers was used to aid in the characterization of the population distribution in the Slippery Rock Creek Watershed. For the purpose of this plan, the requirement for a major population center was at least 5,000 residents. According to the 2000 census data, the most populated municipalities in the watershed are listed in the following table:

County	Municipality	Residents	
County	(township/ borough)	#	% total population
Butler	Slippery Rock	5,251	6.0%
Mercer	Grove City	8,024	9.1%
	Total	13,275	15.1%

Table 1.8: SRCW Population Centers (2000)²⁴

Note that even though the population centers in the above table are entirely within the Slippery Rock Creek Watershed, the percent of the total population is conservative as all residents in all of the municipalities are included in the total population count. As noted below, for some municipalities only portions are within the Slippery Rock Creek Watershed.

<u>Population:</u> To aid in identifying population density patterns, data were compiled from the 1990 and 2000 census. The previous table displays the population change in each municipality. Please note that not all municipalities are entirely contained within the Slippery Rock Creek Watershed. In other words, the watershed is less populated, as some municipalities extend into other watersheds.

The previous table allows for a comparison of the population by municipality and by county for 1990 with that of 2000. Note that the overall population increased by 6,301 to a total of 84,062 residents.

²² Governor's Center for Local Government Services, Local Land Use Controls in Pennsylvania, 2001 (accessed on May 20, 2010); available at http://www.co.armstrong.pa.us/files/cd/locallandusecontrols.pdf).

²³ Ibid.

²⁴ Geographic Information Systems complied from data collected by the Southwest Pennsylvania Commission and PASDA. United States Census Bureau. *Population and Economic Data* 2000 (accessed on May 15, 2010); available at. http://www.census.gov)

Not unexpectedly, 40% of the residents reside in Butler County, which comprises almost 60% of the area within the watershed boundaries.

0 constru		Residents					
(# of municipalities)	(township/ <i>borough</i>)	1990		2000		Change ("+/-")	
(# of municipalities)		(number)	(% of total)	(number)	(% of total)	(number)	(%)
D	Franklin	3,821	4.9%	4,307	4.9%	486	+12.7%
Beaver (1)	Total Residents	3,821	4.9%	4,307	4.9%	486	+12.7%
	Brady	834	1.1%	1,452	1.7%	618	+74.1%
	Center	6,239	8.0%	8,182	9.3%	1,943	+31.1%
	Cherry	814	1.1%	1,053	1.2%	239	+29.4%
	Clay	2,360	3.1%	2,628	3.0%	268	+11.4%
	Concord	1,336	1.8%	1,493	1.7%	157	+11.7%
	Franklin	2,156	2.8%	2,292	2.6%	136	+6.3%
	Harrisville	862	1.2%	883	1.0%	21	+2.4%
	Marion	1,113	1.4%	1,330	1.5%	217	+19.5%
	Mercer	1,110	1.4%	1,183	1.3%	73	+6.6%
Putlor (10)	Muddy Creek	2,139	2.8%	2,267	2.5%	128	+6.0%
Dutier (19)	Portersville	307	0.4%	268	0.3%	-39	-12.7%
	Prospect	1,122	1.4%	1,234	1.4%	112	+9.9%
	Slippery Rock	3,008	3.8%	3,068	3.5%	60	+2.0%
	Slippery Rock	4,638	6.0%	5,251	6.0%	613	+13.2%
	Venango	707	1.6%	732	0.8%	25	+3.5%
	Washington	1,280	1.7%	1,419	1.6%	139	+10.9%
	West Liberty	282	0.4%	325	0.4%	43	+15.2%
	West Sunbury	177	0.2%	104	0.1%	-73	-41.2%
	Worth	955	1.2%	1,331	0.2%	376	+16.1%
	Total Residents	31,439	40.4%	36,495	41.6%	5,056	+16.1%
	Perry	1,841	2.4%	1,930	2.2%	89	+4.8%
	Plain Grove	791	1.0%	854	1.0%	63	+8.0%
	Shenango	7,187	9.0%	7,633	8.7%	446	+6.2%
Lawrence (7)	Scott	2,200	2.9%	2,235	2.5%	35	+1.6%
	Slippery Rock	3,196	4.2%	3,179	3.6%	-17	-0.5%
	Washington	671	0.9%	714	0.8%	43	+6.4%
	Wayne	2,785	3.6%	2,328	2.7%	-457	-20.5%
	Total Residents	18,671	0.5%	22,512	25.7%	3,841	+20.6%
	Findley	2,284	3.0%	2,305	2.6%	21	+9.2%
	Grove City	8,240	10.6%	8,024	9.1%	-216	-2.6%
	Jackson	1,089	1.4%	1,206	1.4%	117	+10.7%
	Liberty	1,223	1.6%	1,276	1.5%	53	+4.3%
Mercer (9)	Pine	4,193	5.4%	4,493	5.1%	1,107	+32.7%
	Sandy Lake	1,161	1.5%	1,248	1.4%	87	+7.5%
	Springfield	1,892	2.5%	1,972	2.2%	80	+4.2%
	Wolf Creek	653	0.8%	729	0.8%	47	+6.9%
	Worth	906	1.2%	830	0.9%	-93	-10.1%
	Total Residents	21,641	27.8%	22,083	25.2%	442	+2.0%
	Barkeyville	274	0.4%	237	0.3%	-37	-13.5%
Venando (3)	Clinton	733	1.0%	758	0.9%	25	+3.4%
	Irwin	1,182	1.6%	1,309	1.5%	127	+10.7%
	Total Residents	2,189	2.9%	2,304	2.6%	115	+5.2%
Con	bined Total Residents	77,761	100%	84,062	100%	6,301	+8.1%

Table 1.9: SRCW Population of Counties & Municipalities (1990 & 2000)²⁵

²⁵ United States Census Bureau. *Population and Economic Data* 2000 (accessed on May 15, 2010); available at. <u>http://www.census.gov</u>

<u>Household Income</u>: Average household income was used to aid in the identification of economic conditions within the Slippery Rock Creek Watershed. The following table compares the average household income for municipalities that lie at least partially within the watershed to that of Pennsylvania and the Nation for 1990 and 2000. As can be seen, the average household income in the local area is significantly lower than both the state and national averages.

	Table 1.10: Comp	parison of SRCW, PA	A, and US Averag	e Household Incomes	(1990 & 2000) ²⁶
--	------------------	---------------------	------------------	---------------------	-----------------------------

Year	Watershed	Pennsylvania	National
1990	\$24,400	\$36,675	\$38,464
2000	\$35,600	\$52,682	\$56,643

The following table illustrates that the average income for the five-county area increased at least 70% from 1990 to 2000. When comparing household income by county in 2000, Butler County appears to be just above the state-wide average and just below the national average while Beaver, Lawrence, Mercer, and Venango Counties are below both the state and national average.

County	1990	2000	Change ("+/-")
Beaver	\$24,000	\$45,000	+\$21,000 (+88%)
Butler	\$29,000	\$53,000	+\$24,000 (+83%)
Lawrence	\$22,000	\$42,000	+\$20,000 (+91%)
Mercer	\$24,000	\$44,000	+\$20,000 (+91%)
Venango	\$23,000	\$39,000	+\$16,000 (+70%)

Table 1.11: SRCW Average Household Income by County (1990 & 2000)²⁷

<u>Major Employers:</u> Within the Slippery Rock Creek Watershed, the major employers include a college and a university, hospitals, and the Commonwealth of Pennsylvania. For this plan, the criterion for listing as a major employer is to have a minimum of 250 employees. The following table lists only the major employers that are located in the watershed. There were no major employers identified in Beaver, Lawrence, or Venango County, within the Slippery Rock Creek Watershed.

²⁶ *Free Demographics* US Census 2000 Demographic Snapshot Comparison 2010 (accessed on May 16, 2010); available at http://www.freedemographics.com/

United States Census Bureau. *Population and Economic Data* 2000 (accessed on May 15, 2010); available at. <u>http://www.census.gov</u>²⁷ lbid.

County	Business	Туре	
	McClymonds	Trucking Company	
	Glen O Hawbaker	Asphalt and Asphalt Products	
	Slippery Rock School District	Public School K-12	
Butler	Slippery Rock University	State University	
	United States Investigative Services	Federal Government	
	General Electric	Manufacturing	
	Iron Mountain	Document Storage Facility	
	Grove City Area School District	Public School K-12	
	Grove City College	Private College	
Mercer	George Junior Republic, Inc.	School for Adjudicated Youth	
	Grove City Medical Center	Medical Facility	
	Reynolds Food Packaging Corp.	Food Packaging Facility	

Table 1.12: SRCW Major Employers²⁸

<u>Unemployment</u>: Unemployment is extremely relevant relating to the economic health of an area. For counties of which a portion is in the Slippery Rock Creek Watershed, Mercer County has the highest unemployment rate followed by Lawrence and Venango Counties. Butler has the lowest unemployment rate. The following table identifies the change in unemployment from 1990 to 2000.

County	1990	2000	Change ("+/-")
Beaver	6.6%	8.2%	+1.6
Butler	5.6%	7.5%	+1.9
Lawrence	7.9%	9.7%	+1.8
Mercer	8.9%	11.9%	+3.0
Venango	7.0%	9.5%	+2.5

Table 1.13: SRCW Unemployment (1990 & 2000)²⁹

The following figure displays the unemployment rate in the Commonwealth of Pennsylvania on a county-by-county basis. Note that Mercer County has one of the highest unemployment rates in the state.

²⁸ Geographic Information Systems complied from data collected by the Southwest Pennsylvania Commission and PASDA., Center for Workforce Information & Analysis²⁹ United States Department of Labor. Unemployment Rates by County in Pennsylvania. 2010 (accessed on May 19, 2010); available at

http://www.bls.gov/ro3/palaus.htm



Figure 1.7: Unemployment Rate in Pennsylvania by County (March 2010)³⁰

<u>Schools:</u> In addition to 2 facilities for higher education, there are 14 public school districts and 4 private schools in the Slippery Rock Creek Watershed that furnish primary and/or secondary education. Beaver, Butler, Lawrence, and Mercer Counties also have county-wide vocational technical schools. The following tables identify schools located in, or are nearby, that serve the watershed.

Name	Total Enrollment	Grade Levels	County	Municipality (township/borough)
Portersville Christian School	262	PK-12	Butler	Portersville
Hillside Amish School	20	K-8	Butler	Harrisville
Meadow View School	29	1-7	Butler	Harrisville
Grove City Christian Academy	114	PK-8	Mercer	Grove City
Total	425			

Table 1.14: Private Schools (Primary & Secondary) within the SRCW 2009³¹

Name	Total Enrollment	County
Slippery Rock University	7,825	Butler
Grove City College	2,530	Mercer
Total	10,355	

³⁰ United States Department of Labor. Unemployment Rates by County in Pennsylvania 2010 (accessed on May 19, 2010); available at http://www.bls.gov/ro3/palaus.htm
³¹Great Schools *Find a School* 2010 (accessed May 21, 2010); available at http://www.greatschools.org/pennsylvania/ searched each school

³¹Great Schools *Find a School* 2010 (accessed May 21, 2010); available at http://www.greatschools.org/pennsylvania/ searched each school ³²U.S. News & World Report. *Best Colleges 2011: Slippery Rock University*. Fall 2009 (accessed on January 21, 2010); available at http://colleges.usnews.rankingsandreviews.com/best-colleges/slippery-rock-pa/slippery-rock-university-3327/@@lndex_SB.html and http://colleges.usnews.rankingsandreviews.com/best-colleges/grove-city-pa/grove-city-college-3269/@@lndex_SB.html and http://colleges.usnews.rankingsandreviews.com/best-colleges/grove-city-pa/grove-city-college-3269/@@lndex_SB.html

School District	Total Enrollment	County	Municipality (township/ <i>borough</i>)
Riverside	1,827	Beaver	Franklin
Butler Area	4,329	Butler	Center
Moniteau	2,416	Butler	Clay Cherry Concord Marion Venango Washington
Seneca Valley	4,883	Butler	Cranberry
Slippery Rock Area	2,383	Butler	Brady Franklin Harrisville Mercer Muddy Creek Portersville Prospect Slippery Rock Slippery Rock West Liberty West Sunbury Worth
Elwood City Area	2,024	Lawrence	Perry Wayne
Laurel	1,407	Lawrence	Scott Slippery Rock
Shenango	1,346	Lawrence	Shenango
Wilmington Area	1,492	Lawrence	Plain Grove Washington
Commodore Perry	620	Mercer	Sandy Creek Perry
Grove City Area	2,980	Mercer	Liberty Grove City Pine Springfield Wolf Creek
Lakeview	1,328	Mercer	Jackson Sandy Lake Worth
Mercer Area	1,385	Mercer	Findley
Franklin Area	1,606	Venango	Barkeyville Clinton Irwin
Total	30,026		

Table 1.15: Public Schools (K-12) Serving SRCW Communities 2009³³

³³ Great Schools *Find a School* 2010 (accessed May 21, 2010); available at <u>http://www.greatschools.org/pennsylvania/</u> searched each school

<u>Environmental Education Opportunities:</u> Within the Slippery Rock Creek Watershed are outstanding opportunities for environmental education. This is a critical asset that enables residents and others outside the watershed to acquire information and understanding about the natural world, which is necessary in order to be better stewards of the environment. Important to remember is that conservation and environmental stewardship principals extend beyond public lands—to cities and towns, houses, stores, offices, schools, etc. In other words, these principals extend to all facets of our lives. Each stakeholder is a vital part of the equation and learning is important at any age.³⁴

The PA Department of Conservation and Natural Resources (**DCNR**) maintains the largest education program for conservation and environmental stewardship throughout the Commonwealth of Pennsylvania.³⁵ Each year hundreds of thousands of students, teachers and visitors to state parks and forests learn about various environmental education topics. There are three Pennsylvania State Parks located within the Slippery Rock Creek Watershed: Jennings Environmental Education Center, Moraine State Park, and McConnells Mill State Park. All three state parks regularly offer a variety of environmental education programs. In addition, the Pennsylvania Center for Environmental Education (**PCEE**) www.pcee.org, which is hosted by Slippery Rock University, is located on Main Street in Slippery Rock Borough. There are also several community organizations within the watershed that conduct environmental education activities such as Girl Scouts, Boy Scouts, and the Slippery Rock Watershed Coalition.

I. INFRASTRUCTURE

For the Slippery Rock Creek Watershed Conservation Plan, the term infrastructure includes roads, railroads, airports, public transit, sewage, and public water supplies. This "hard" infrastructure is vital for the sustainability and development of vibrant communities.

<u>Public roads:</u> For the Slippery Rock Creek Watershed Conservation Plan, the public roads are categorized as follows---

- <u>Primary</u> typically four-lane roads linking larger towns or boroughs
- <u>Secondary</u> typically two-lane roads linking communities
- <u>Tertiary</u> two-lane roads within communities

Primary (major) roads in the Slippery Rock Creek Watershed include Interstates 79 and 80; U.S. Routes 19 and 422; and PA State Route 8.

Secondary roads include PA State Routes 38, 58, 173, 308, and 528.

There are numerous tertiary state and local roads in the watershed.

³⁴ Pennsylvania Department of Conservation and Natural Resources, *Education*, n.d. (accessed on May 21, 2010); available at http://www.dcnr.state.pa.us/education/

³⁵ Ibid.

Table 1.17: SRCW Major Roadways ³⁶					
Major Roads	Length (miles)	County	Municipality (township/ <i>borough</i>)		
		Butler	Muddy Creek		
Interstate 79	35.6	Battor	Worth		
		Lawrence	Plain Grove		
		Mercer	Findley		
Interstate 80	18.0		Wolf Creek		
	10.0	Venango	Clinton		
			Irwin		
	12.8 Butler Lawren	Butler	Muddy Creek		
LLC Doute 10		Lawrence	Scott		
0.5. Roule 19			Slippery Rock		
			Washington		
		Butler	Franklin		
			Muddy Creek		
U.S. Route 422	19.7		Prospect		
			Slippery Rock		
		Lawrence	Scott		
Total	86.1				

- -

Airport: The 150-acre Grove City Airport (GCA), owned by the Borough of Grove City, is the only airport within the Slippery Rock Creek Watershed. Helicopters, small private airplanes, and ultra-light aircraft fly out of the GCA. Skydiving is available through "Skydive Pennsylvania" and more information can be found on the website, http://www.skydivepa.com/. Military landing is permitted; however, there are no commercial flights.37



Figure 1.8: Skydiving in the SRCW³⁸

Railroads: The sole railroad in the Slippery Rock Creek Watershed is the Bessemer & Lake Erie Railroad (B&LE). The B&LE was a regional railroad line that connected Pittsburgh to the Lake Erie

³⁶ Geographic Information Systems complied from data collected by the Southwest Pennsylvania Commission and PASDA.

³⁷ Citydata, Information on Grove City Airport, 2010 (accessed on May 17, 2010); available at http://www.city-data.com/airports/Grove-City-Airport-Grove-City-Pennsylvania.html ³⁸ Skydive Pennsylvania. 2009 (accessed on May 24, 2010); available at <u>http://www.skydivepa.com</u>

docks at Conneaut, OH. The B&LE Railroad Company was founded in 1897 by Andrew Carnegie. Iron ore and other products were hauled by train from the port at Conneaut, Ohio on the Great Lakes to Carnegie Steel Company plants in Pittsburgh as well as the surrounding regional areas. On the return trip north, coal was hauled to Conneaut Harbor. The original B&LE company was created from a small group of predecessor companies which included the Pittsburgh, Shenango and Lake Erie Railroad, and the Butler and Pittsburgh Railroad Company (Wikipedia, 2010). In May 2004, the B&LE became the Bessemer Subdivision of the Canadian National Railway Company. Railroad lines were formerly much more extensive in the Slippery Rock Creek Watershed than at present with train depots in small towns and spurs to transport coal and other bulk materials.³⁹



Figure 1.9: B&LE Railroad⁴⁰

<u>Public Water Supplies:</u> Due to Homeland Security regulations, there are restrictions regarding the availability of information regarding public water supplies. Information is, therefore, not provided in the Slippery Rock Creek Watershed Conservation Plan.

<u>Sanitary Sewer Systems:</u> The Commonwealth of Pennsylvania requires municipalities to prepare a Sewage Facilities Plan (as authorized under Pennsylvania Act 537). The presence of public sewage treatment facilities can have a considerable effect relating to land development. The extension of sewer lines represents a substantial public investment which can have a considerable effect relating to land use. County Comprehensive Plans, therefore, may integrate public sewage treatment into land use policies.⁴¹

There are 15 public wastewater treatment systems that service stakeholders in the Slippery Rock Creek Watershed. The facility may be located outside of the watershed, but the service area includes municipalities in the watershed. In many rural areas, residents in the Slippery Rock Creek Watershed do not have access to public wastewater treatment facilities and on-lot septic systems are, therefore, used.

³⁹ Lundsten, Carter S. Western Pennsylvanian Railroads: Bessemer & Lake Erie 2006 (accessed on May 22, 2010); available at http://www.lundsten.dk/railfan_pa/ble/index.html

⁴⁰ Ibid.

⁴¹ Butler County Planning Commission, The County of *Butler Comprehensive Plan: Phase II—The Plan Recommendations.* 2002 (accessed on May 22, 2010); available at http://www.co.butler.pa.us/butler/lib/butler/planning/compplan.pdf

Table 1.10. DIVOW I ubile Wastewater Treatment Systems				
Facility	Daily Average (GPD)	County	Municipality (township/ <i>borough</i>)	
Franklin Township Municipal Sanitary Authority	3,510,000	Beaver	Franklin	
Butler Area Sewer Authority	10,000,000	Butler	Center	
Slippery Rock Municipal Authority	1,200,000	Butler	Slippery Rock	
West Sunbury Borough Municipal Authority		Butler	Clay West Sunbury	
Butler Township Area Water and Sewer Authority		Butler	Butler	
Perry Township Municipal Authority		Lawrence	Perry	
Jackson Center Borough Sewage Treatment Plant		Mercer	Jackson	
Lakeview Joint Sewage Authority		Mercer	Sandy Lake	
Moraine State Park	300,000	Butler	Brady Worth	
PA American Water Company Ellwood City	131,000	Lawrence	Wayne	
Aqua AP Lake Latonka Waste Water Treatment Plant		Mercer	Jackson	
Brent Water Association Water Treatment Plant	Permit in-process	Lawrence	Plain Grove	
Liberty Township Waterworks		Mercer	Liberty	
Grove City Treatment System		Mercer	Grove City Liberty Pine Springfield	
Barkeyville Municipal Authority	51,568	Venango	Barkeyville Clinton Irwin	

Table 1 18: SRCW Public Wastewater Treatment Systems⁴²

⁴²Pennsylvania Department of Environmental Protection, **information compiled during file review on June 14, 2010 at the Meadville Office

<u>Private Water Supplies</u>: In Pennsylvania, state regulations do not require maintenance or testing of private water supplies. Learning about proper maintenance of wells and springs used for private water supplies is the responsibility of the owner. Local offices of the Penn State Cooperative Extension and DEP provide information for long-term care of private water supply systems. For DEP offices, access http://www.dep.state.pa.us and for Extension offices.

Office	Address	Phone
Northwest Regional Office	230 Chestnut Street	814-332-6945
Northwest Regional Onloc	Meadville, PA 16335	014 002 0040
	White Memorial Building	
Knox District Office	310 Best Ave	814-797-1191
	Knox, PA 16232	
Now Costle Office	121 North Mill Street	724-656-3160
New Castle Ollice	New Castle, PA 16101	124-000-0100

Table 1.19: Local DEP Offices⁴³

Table 1.20: Local Penn State Cooperative Extension Offices⁴⁴

County Served	Address	Phone	
Boayor	2020 Beaver Avenue, Suite 200	724-774-3003	
Deaver	Monaca, PA 15061	724-774-3003	
Butler	101 Motor Pool Way	724-287-4761	
Dullel	Butler, PA 16001-3545	124-201-4101	
	430 Court Street	724-654-8370	
Lawrence	New Castle, PA 16101-3598	124-034-0310	
	PO Box 530		
Mercer	463 North Perry Highway 724-662-31		
	Mercer, PA 16137-0530		
Venando	867 Mercer Road		
Venango	Franklin, PA 16323	1001	

J. EMERGENCY SERVICES

Needless to say, emergency services are vital. Even though many emergency services tend to be located in the more populated areas within the Slippery Rock Creek Watershed, there are a total of 46 service providers including 9 police departments, 21 fire departments, 10 ambulance service centers, and 7 hospitals. Note that some facilities are located just outside of the Slippery Rock Creek Watershed with service areas that extend into the watershed. A map showing locations of emergency service providers is included at the end of this section on Plate 1.4, Emergency Services for the SRWC.

 ⁴³ Pennsylvania Department of Environmental Protection, *About DEP: Office Locations*,2010 (accessed on May 21, 2010); available at http://www.portal.state.pa.us/portal/server.pt/community/about_dep/13464/office_locations/585263
 ⁴⁴ Penn State Cooperative Extension, *Find Your County Office*, n.d. (accessed on May 22, 2010); available at

http://extension.psu.edu/counties

Table 1.21: SKUW Emergency Services					
Service	Facility	County	Service Area (township/ <i>borough</i>)		
	Franklin Township	Beaver	Franklin		
loted)	Slippery Rock	Butler	Slippery Rock		
rwise n	Harrisville	Butler	Harrisville		
lice , unless othe	PA State Police (Butler Barracks)	Beaver Butler Lawrence Mercer	(all) (all, except I-80) (all) (all)		
Po ments	Slippery Rock	Lawrence	Slippery Rock		
depart	Shenango Township	Lawrence	Shenango		
police	Wayne Township	Lawrence	Wayne		
(local	Grove City	Mercer	Grove City		
)	PA State Police (headquarters: Erie Co.)	Venango	Barkeyville Clinton Irwin		
	Heritage Valley Medical Center	Beaver	Franklin		
	Butler Veterans Hospital	Butler	(all)		
	Grove City	Butler	Slippery Rock Slippery Rock Harrisville Marion		
	Medical Center	Mercer	Grove City		
itals		Venango	Barkeyville Clinton		
Hosp	Butler Memorial Hospital	Butler	(all)		
-	Jamison Health Center	Lawrence	Perry Plain Grove Scott Shenango Slippery Rock Washington Wayne		
	UPMC Northwest	Venango	Barkeyville Clinton Irwin		

Table 1.21:	SRCW	Emergency	Services

Table 1.21: SRCW Emergency Services (con't.)					
Service	Facility	County	Service Area (township/ <i>borough</i>)		
	Franklin Township	Beaver	Franklin		
	Marion Township	Butler	Cherry Marion West Sunbury		
	Center Township - Unionville	Butler	Center		
	Oneida Valley	Butler	Center Concord		
	Portersville - Muddycreek Twp.	Butler	Muddy Creek Worth		
	West Sunbury	Butler	Cherry Clay Concord		
noted)	Slippery Rock	Butler	Cherry Slippery Rock Slippery Rock Worth		
ts or as	Unionville	Butler	Clay Franklin		
iire artment	North Washington	Butler	Concord Washington		
ire dep	Chicora	Butler	Concord		
unteer f	Prospect	Butler	Franklin		
(vol	Harrisville	Butler	Mercer		
	Eau Claire	Butler	Venango		
	Scott Township	Butler Lawrence	Worth Scott		
	Wurtemburg-Perry	Lawrence	Perry		
	Grove City	Mercer	Grove City		
	Grove City Rescue Squad	Mercer	Grove City		
	Pine Township	Mercer	Pine		
	Springfield	Mercer	Springfield		
	Clintonville	Venango	Barkeyville Clinton Irwin		

Service	Facility	County	Service Area (township/ <i>borough</i>)
	Butler Ambulance Service	Butler	Brady Butler Center Cherry Clay Concord
	Slippery Rock Rescue	Butler	Slippery Rock Worth
	Petrolia EMS	Butler	Washington
e,	Portersville EMS	Butler	Portersville Worth Muddy Creek
nbulanc	Superior Ambulance Service	Butler Mercer	Marion Mercer Grove City
A	Noga Ambulance	Lawrence	
	Medevac Ambulance	Lawrence	
	New Wilmington Volunteer Ambulance	Lawrence	
	Life Force Ambulance	Venango	Barkeyville Clinton Irwin
	Emlenton Ambulance Service	Venango	Barkeyville Clinton Irwin

http://www.mcc.co.mercer.pa.us/DPS/mcpolice.htm

Venango County, Venango County Government, 2010 (accessed on May 20, 2010); available at http://www.co.venango.pa.us/Home/Index.htm

⁴⁵ ButlerWebs, Emergency Services: Fire Departments, Police Services, Ambulances in Butler County PA, 2008 (accessed on May 20, 2010); available at <u>http://www.butlerwebs.com/butlercounty/fire.htm#Ambulance Services</u> Mercer County, Mercer County Police Departments. 2010 (accessed on May 18, 2010); available at

Butler County of Pennsylvania, Other Links, 2006 (accessed on May 18, 2010); available at http://www.co.butler.pa.us/butler/taxonomy/taxonomy.asp?DLN=34293

Beaver County, Government Phone Listings, n.d. (accessed May 19, 2010); available at http://www.beavercounty.net/governmt.html#34 Lawrence County Department of Public Safety, Emergency Management, 2010 (accessed on May 19, 2010) available at http://www.co.lawrence.pa.us/emergency/index.html

K. UNIQUE FEATURES

Unique features of the Slippery Rock Creek Watershed will be further described in Section 6—Cultural Resources Section. A basic overview of some of these special places is described below:



Figure 1.10: Jennings Environmental Education Center⁴⁶

The 300-acre Jennings Environmental Education Center **(JEEC)**, a PA State Park, offers programs for people of all ages and interest levels. Located in Brady Township, Butler County, JEEC includes a 20-acre relict prairie from the last ice age which is home to two endangered species: the blazing star and the Massasauga rattlesnake.⁴⁷ The general public and students may also visit some of the first, full-and pilot-scale, environmentally-friendly, internationally-recognized, innovative, approaches to treating abandoned coal mine drainage. To learn more about the programs and activities available throughout the year, visit <u>http://www.dcnr.state.pa.us/stateparks/parks/jennings.aspx</u>.



Figure 1.11: Jacksville Esker⁴⁸

Present on the landscape as a long, narrow, steep-sided ridge of coarse sand and gravel, an esker is formed by a stream flowing in or under a melting sheet of glacial ice. The Jacksville Esker (also known as the Miller Esker Natural Area and West Liberty Hogback) is located about 2.5 miles north of Moraine State Park. The Western Pennsylvania Conservancy **(WPC)** owns and manages about 33 acres in Worth Township, Butler County that includes a portion of the ester. The WPC operates and maintains the site which is open to the general public for "low-impact" activities such as hiking, wildlife viewing and photography. For additional information regarding WPC visitor guidelines, please see http://www.paconserve.org/assets/2010_WPC_Property_Visitor_Guidelines.pdf.

⁴⁶ Stream Restoration Inc. Photo taken by Clifford Denholm, IV. 2009.

 ⁴⁷ Pennsylvania Department of Conservation and Natural Resources, *Jennings Environmental Education Center*. n.d. (accessed on May 21, 2010); available at http://www.dcnr.state.pa.us/stateparks/parks/jennings.aspx
 ⁴⁸ Pennsylvania Department of Conservation and Natural Resources, *Jacksville Esker*. n.d. (accessed on May 22, 2010); available at

⁴⁸ Pennsylvania Department of Conservation and Natural Resources, *Jacksville Esker*. n.d. (accessed on May 22, 2010); available at http://www.dcnr.state.pa.us/topogeo/parkguides/pg4_9/Esker.aspx



Figure 1.12: McConnells Mill State Park⁴⁹

Encompassing 2,546 acres in Lawrence County, the state park includes the first gristmill (built in 1852) on Slippery Rock Creek. After a fire in 1868, the waterwheel was replaced with a water turbine and the grindstones were replaced with rolling mills, creating one of the first rolling mills in the country. McConnells Mill became a state park in 1957 and offers hiking trails, whitewater rafting, hunting, and fishing.⁵⁰ Visit <u>http://www.dcnr.state.pa.us/STATEPARKS/parks/mcconnellsmill.aspx</u>.



Figure 1.13: Moraine State Park⁵¹

Located in parts of Brady, Clay, Franklin, Muddy Creek, and Worth Townships, in Butler County, the 16,725-acre park offers numerous recreational activities, including boating, sailing, swimming, and windsurfing. The Park has two swimming beaches, 10 boat launches, several fishing piers and numerous picnic areas. A paved, seven-mile bike trail winds along the shoreline and bike rentals are available. Moraine also has many miles of trails for hiking, mountain biking, and horseback riding.

The 3,225-acre Lake Arthur supports warm water species of fish. Common species are northern pike, largemouth bass, channel catfish, black crappie, and bluegill. Muskellunge, walleye, channel catfish and hybrid striped bass are stocked by the PA Fish and Boat Commission **(PFBC)**. Park and PFBC employees and volunteers have also installed fish habitat and maps of these areas are available.⁵²

Also headquartered at the Park is the Moraine Preservation Fund **(MPF)**. Members and volunteers of the MPF provide services to the Park and community. Additional information can be found on their website: <u>http://www.morainepreservationfund.org/index.html</u>.

⁴⁹ Stream Restoration Inc. Photo taken by Clifford Denholm, IV. 2009.

⁵⁰ Pennsylvania Department of Conservation and Natural Resources. *McConnells Mill State Park.* n.d., (accessed on May 20, 2010); available at <u>http://www.dcnr.state.pa.us/stateparks/parks/mcconnellsmill.aspx</u>

⁵¹ Stream Restoration Inc. Photo taken by Clifford Denholm, IV. 2009.

⁵² Pennsylvania Department of Conservation and Natural Resources. *Moraine State Park.* n.d. (accessed on May 20, 2010); available at http://www.dcnr.state.pa.us/stateparks/parks/moraine.aspx



Figure 1.14: Wolf Creek Narrows⁵³

Approximately 2 miles west of the Borough of Slippery Rock in northwestern Butler County is Wolf Creek Narrows. The 100-acre site, owned by the Western Pennsylvania Conservancy, includes a trout stream and is believed to have been created by glacial impacts during the last ice age. Wolf Creek Narrows is known for biodiversity.⁵⁴ More information can be found at the Butler County website http://www.visitbutlercountv.com/outdoors/hiking-biking/wolf-creek-narrows-natural-area.



Figure 1.15: Glades Wildlife Area (State Gamelands #95)⁵⁵

Located within Pennsylvania State Gamelands #95, the Glades in Cherry, Washington and Concord Townships in Butler County provide a unique wildlife area with diverse habitat. Glade Dam Lake is the largest and most recognizable feature. Measuring about 2.5 miles in length, Glade Dam Lake is located in the headwaters of the South Branch Slippery Rock Creek. As part of the diverse and thriving habitat that includes exceptional wetlands, the Glades are an excellent birding area that includes not only nesting Bald Eagles but also migrating fowl⁵⁶. Additional information is available at the following website: http://www.visitbutlercounty.com/outdoors/birding/state-game-lands-95.

Stream Restoration Inc. Photo taken by Clifford Denholm, IV. 2009.

⁵⁴ Butler County of Pennsylvania, Wolf Creek Narrows Natural Area. 2009 (accessed on May 20, 2010); available at http://www.visitbutlercounty.com/outdoors/hiking-biking/wolf-creek-narrows-natural-area 55 Stream Restoration Inc. Photo taken by Clifford Denholm, IV. 2009.

⁵⁶ Butler County of Pennsylvania, Amazing Adventures Abound in Butler County's Great Outdoors. 2009 (accessed on May 21, 2010); available at http://www.visitbutlercounty.com/about-us/press-room/history-outdoor-adventures/amazing-adventures-abound-in-butler-countysgreat-outdoors



Figure 1.16: North Country Trail⁵⁷

Created by Congress in 1980, the North Country Trail extends over 4,600 miles and crosses seven states from western North Dakota to eastern New York. The longest of the eleven National Scenic Trails, the North Country Trail provides opportunities for hiking, biking, camping, and snowshoeing, as well as providing great views of the wilderness for birding and photography⁵⁸.

There are five chapters of the North Country Trail Association **(NCTA)** in Pennsylvania: Allegheny National Forest Chapter, Clarion Chapter, the Butler Chapter, and the Wampum Chapter. With the help of outstanding partners such as the Baker Trail (stewarded by the Rachel Carson Trails Conservancy) and the Butler Outdoor Club, these chapters build and maintain the NCTA with the ultimate goal of completing the section through Pennsylvania. To read more about each chapter and the North Country Trail, please visit <u>http://www.northcountrytrail.org/explore/ex_pa/pa.htm</u>.



Figure 1.17: Old Stone House⁵⁹

The Old Stone House was built in 1822 by John Brown as a stagecoach stop and tavern for travelers on the newly-built Pittsburgh to Erie Pike. The Old Stone House also served as a local post office and muster point during the Civil War. Special events are held at the site throughout the year, including a Civil War weekend with reenactments and a cherry pie hike to commemorate George Washington's 1753 expedition through what is now Butler County. The property is owned by the Commonwealth of Pennsylvania⁶⁰ and Slippery Rock University operates the facility. For information, please visit http://www.sru.edu/academics/colleges/chfpa/Pages/OldStoneHouse.aspx.

⁵⁷ Stream Restoration Inc. Photo taken by Clifford Denholm, IV. 2009.

⁵⁸ North Country Trail Association, *Pennsylvania: Keystone of the North Country Trail.* n.d. (accessed on May 21, 2010); available at http://www.northcountrytrail.org/explore/ex_pa/pa.htm ⁵⁹ Stroom Postcration Inc. Boot taken by Olifferd Darbeirs, IV, 2000

⁵⁹ Stream Restoration Inc. Photo taken by Clifford Denholm, IV. 2009.

⁶⁰ Butler County parcel information 030-3F-88-17B & -18P; available at <u>http://maps.co.butler.pa.us</u>









SECTION 2—ISSUES, CONCERNS, and CONSTRAINTS

A. INTRODUCTION

The Issues, Concerns, and Constraints Section consists of the input from stakeholders in the Slippery Rock Creek Watershed **(SRCW)**. During the course of the plan's development, information was obtained through the following sources to identify issues of concern to the watershed stakeholders:

- Research conducted by the Slippery Rock Watershed Coalition and Stream Restoration Inc. (non-profit) through the Advisory Council
- Distribution of surveys at community events
- Meetings with organizations and individuals
- Coordination and meetings with municipalities
- Coordination with regulatory agencies
- Email communications to local groups, notices in local newspapers and the Slippery Rock Creek Watershed Conservation Plan website
- Online survey provided on Survey Monkey.

In addition, an extensive effort to seek public input for plan preparation was made by the Slippery Rock Creek Watershed Conservation Plan **(SRCWCP)** Project Facilitator, including:

- Coordinating Advisory Council meetings
- Coordination and meetings with municipalities
- Conducting personal interviews
- Coordination and meetings with local organizations
- Exhibiting informational displays at community events
- Media coordination
- Publishing information in newsletters of local organizations
- Placing information and updates on the SRCWCP website

Stakeholder input was key to the development of the Slippery Rock Creek Watershed Conservation Plan. The time that local residents and businesses provided to complete a survey was greatly much appreciated.

B. PUBLIC OUTREACH

The media and meetings relating to the public outreach effort are briefly described below. Also refer to the display opportunities and survey efforts described later in this section.

<u>Initial Meetings with Municipalities:</u> The Pennsylvania Department of Conservation and Natural Resources **(DNCR)** application for the Watershed Conservation Plan required that each county and municipality in the Slippery Rock Creek Watershed be notified about the plan in writing by the Project Facilitator. Support was received from each of the following 5 county planning commissions: Beaver, Butler, Lawrence, Mercer, and Venango. In addition, twenty of the 43 municipalities requested meetings. Table 2.1 lists the municipalities in the watershed that conducted initial meetings to consider supporting the SRCWCP.

County	Municipality (township/borough)	Date
Beaver	Franklin	05/08/2007
	Brady	06/20/2007
	Center	06/11/2007
	Cherry	N/A
	Clay	N/A
	Franklin	N/A
	Harrisville	05/16/2007
	Marion	05/14/2007
	Mercer	N/A
Butler	Muddy Creek	06/25/2007
Butter	Portersville	N/A
	Prospect	N/A
	Slippery Rock	06/19/2007
	Slippery Rock	06/25/2007
	Venango	N/A
	Washington	N/A
	West Liberty	N/A
	West Sunbury	07/02/2007
	Worth	N/A
	Perry	N/A
	Plain Grove	04/09/2007
	Scott	04/02/2007
Lawrence	Shenango	N/A
	Slippery Rock	05/14/2007
	Washington	04/09/2007
	Wayne	04/05/2007
	Findley	05/02/2007
	Grove City	N/A
	Jackson	N/A
	Liberty	N/A
Mercer	Pine	05/21/2007
	Sandy Lake	05/01/2007
	Springfield	05/21/2007
	Wolf Creek	N/A
	Worth	05/02/2007
	Barkeyville	N/A
Venango	Clinton	05/07/2007
	Irwin	N/A

Table 2.1: SRCWCP Support Requests at Municipal Meetings

(Source: SRCWCP Project Facilitator/Advisory Council,)
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The following table lists the municipalities, including county planning commissions, providing letters of support.

County	Municipality (township/borough)	Phone	Address	RCVD
Beaver	Beaver Co. Plan. Comm.	724-728-5700	810 Third St., Courthouse Beaver, PA 15009	04/13/07
	Butler Co. Plan. Comm.	724-284-5300	124 W. Diamond St., Box 1208 Butler, PA 16003	04/13/06
	Brady Township	724-738-1588	141 West Liberty Road Slippery Rock, PA 16057	06/27/07
	Center Township	724-282-7805	419 Sunset Drive Butler, PA 16001	06/18/07
	Clay Township	724-637-2638	1115 Euclid School Road Butler, PA 16	03/28/06
	Franklin Township	724-865-2412	191 Election House Road Prospect, PA 16052	03/06/06
Butler	Harrisville Borough	724-735-2222	PO Box 382 Harrisville, PA 16038	05/29/07
	Mercer Township	724-735-2705	152 Boomerang Rd., Box 380 Harrisville, PA 16038	04/10/06
	Prospect Borough	724-865-3010	159 Monroe Street Prospect, PA 16052	03/09/06
	Slippery Rock Borough	724-794-6391	306 East Water Street Slippery Rock, PA 16057	07/11/07
	Venango Township	724-791-2794	332 Eau Claire Road Boyers, PA 16020	04/06/06
	West Sunbury Borough	724-637-2607	PO Box 202 West Sunbury, PA 16061	07/05/07
	Lawrence Co. Plan. Comm.	724-656-2144	430 Court Street New Castle, PA 16101	04/13/06
Lawrence	Perry Township	724-368-8230	284 Reno Road Portersville, PA 16051	03/10/06
	Plain Grove Township	724-530-7276	327 Burns Road Slippery Rock, PA 16057	04/09/07
	Mercer Co. Plan. Comm.	724-981-2412	2491 Highland Road Hermitage, PA 16148	04/07/06
	Findley Township	724-748-4808	369 McClelland Road Mercer, PA 16137	05/19/07
Mercer	Grove City Borough	724-458-7060	123 W. Main St., Box 110 Grove City, PA 16127	03/17/06
	Liberty Township	724-794-1773	2873 Mercer-Butler Pike Grove City, PA 16127	03/07/06
	Wolf Creek Township	814-786-7186	566 Stoneboro Road Grove City, PA 16127	03/13/06
	Venango Co. Reg. Plan. Comm.	814-432-4555	1168 Liberty St., Box 831 Franklin, PA 16323	04/17/06
Venango	Clinton Township	814-385-6894	123 Donaldson Road Kennerdell, PA 16374	05/07/07
	Irwin Township	814-786-9718	132 Irwin Road Harrisville, PA 16038	03/08/06

Table 2.2: Municipalities Providing Letters of Support for the SRCWCP

<u>Public Meetings:</u> To provide stakeholders with the opportunity to provide input, public meetings were conducted by the Project Facilitator at three different times during the development of the SRCWP: at the beginning of the project, after completion of the draft plan, and upon completion of the final plan.

Table 2.3: SRCWCP Public Meeting Locations and Dates

Location	Project Start	Draft Plan Completion	Final Plan Completion
Grove City High School Auditorium	August 07, 2007	February 09, 2011	(unavailable)
Plain Grove Township Municipal Building	August 08, 2007	February 08, 2011	**
Boyers Sportsmen's Association	August 14, 2007	February 15, 2011	June 29, 2011
Slippery Rock Twp. Municipal Building	August 15, 2007	February 10, 2011	June 30, 2011

**All attendees of the "Draft Plan Completion" meetings at Plain Grove Twp. Municipal Bldg. and Grove City High School Auditorium are to be notified regarding combining the "Final Plan Completion" meetings with those held at the Slippery Rock Twp. Municipal Building and the Boyers Sportsmen's Assn. Note: Grove City High School Auditorium was not available for June 2011 meeting.

<u>Newsletter</u>: The Slippery Rock Watershed Coalition distributes a monthly newsletter called *The Catalyst* with a mailing to over 1000 individuals. Articles were written for *The Catalyst* to update stakeholders on the progress of the plan, invite participation and inform readers how to obtain further information. The following list provides the issue dates and titles:

- "Slippery Rock Creek Watershed Conservation Plan: Public Informational Meetings" August 2007
- "SRWC Had a Blast at Harrisville Community Day" August 2008
- "Update on The Slippery Rock Creek Watershed Conservation Plan" May 2010
- "Lake Arthur Regatta was "Naturally" Fun for Everyone!" August 2010
- "Slippery Rock Creek Watershed Conservation Plan: Informational Meetings" February 2011
- "Slippery Rock Creek Watershed Conservation Plan Public Meetings In February" 1/30/11 PA Environment Digest http://www.paenvironmentdigest.com/newsletter/default.asp?NewsletterArticleID=17958&SubjectID

<u>Website</u>: A website (http://www.streamrestorationinc.org/srwcp/srwcp.php) was launched concurrently with the initial round of public meetings. The SRCWCP website contains information on the Slippery Rock Creek Watershed, the planning process, downloadable copies of the current version of the watershed conservation plan, materials distributed, and public meetings and events including survey forms, informational flyers, and details on outdoor activities and conservation efforts in the watershed.

<u>Newspaper Articles</u>: Articles in local newspapers for the SRCWCP was coordinated by the Project Facilitator as listed below.

- "Slippery Rock Creek Watershed Conservation Plan" printed in The Progress News 8/7/2007
- "Slippery Rock Creek Watershed Conservation Plan" printed in Tri-County News 8/3/2007
- "Watershed Meetings Planned" printed in The Butler Eagle 8/5/2007
- "Slippery Rock Creek Watershed Conservation plans public meetings" Allied News 2/2/2011

C. SURVEYS AND INTERVIEWS

Residents, municipalities, and "key persons" completed surveys. The purpose was to identify how stakeholders use and perceive the watershed and the resources. Surveys were provided and collected at public events (Refer to Table 2.4.), advertised in local papers and newsletters, emailed with a link to the website (http://www.streamrestorationinc.org/srwcp/srwcp.php) for completion of the form on Survey Monkey, and mailed by request. Survey participants had the option to complete the survey as "anonymous." Results were tabulated and included in this section. The expressed views and opinions represent those of the stakeholders, and do not necessarily reflect the views and opinions of the Slippery Rock Creek Watershed Coalition, Advisory Council, or other contributors to the SRCWCP.

County	Event	Date		
Lawrence	Ellwood City/Wayne Township Presentation	04/05/2007		
Mercer	Wolf creek watershed meeting, Grove City	04/05/2007		
Lawrence	Lawrence County	04/09/2007		
Lawrence	Ellwood City Earth Day	04/18/2009		
Mercer	Mercer County	05/21/2007		
Butler	Harrisville Community Days	07/04/2007		
Butler	Butler County Township Supervisors Presentation	07/10/2007		
Butler	Allegheny Minerals meeting and WPCAMR	10/08/2007		
Butler	Harrisville Community Day	07/04/2009		
Allegheny	8 th Annual Ohio River Watershed Celebration	10/01/2009		
Lawrence	Ellwood City Earth Day	04/24/2010		
Allegheny	National Joint Mining & Reclamation Conference	6/7-9/2010		
Butler	Harrisville Community Day	07/03/2010		
Butler	Moraine State Park Regatta	8/7-8/2010		
Allegheny	9 th Annual Ohio River Watershed Celebration	09/15/2010		
Butler	Butler Outdoor Club Annual Dinner	11/13/2010		
Lawrence	Westminster College Student Symposium	12/02/2010		
Butler	3MJC Meeting	12/15/2010		

Table 2.4: SRCWCP Displays & Survey Forms Available at Public Events

The results of the Citizen, Key Person, and Municipal surveys are summarized below.

<u>Citizen Surveys</u>: Citizen Surveys were offered to watershed stakeholders at each public event and municipal meeting attended. A list of meetings and events are provided in Tables 2.1 & 2.3. A total of 50 surveys were collected. As noted in Section 1, Project Characteristics, in order to more clearly depict general and unique conditions on a local scale, the Slippery Rock Creek Watershed was divided into 4 focus areas based on the major subwatersheds. (Refer to Plate 2.1: Focus Area Map.)

Slippery Rock Creek Watershed Focus Areas



Figure 2.1: Citizen Surveys for Slippery Rock Creek Focus Areas

The Citizen Surveys indicated that a majority (about 50%) of the respondents as being a stakeholder in the Lower Slippery Rock Creek Focus Area which covers portions of 4 of the 5 counties: Beaver, Butler, Lawrence, and Mercer, or about 90 square miles or 22% of the watershed.

<u>Compiled Citizen Survey Results:</u> Survey questions were developed relating to land use, recreation, water quality, values, etc. The following bar charts illustrate the interests of the participants:

Land Use

Of the surveys collected, a majority of the people felt that the two most common land uses were residential and agriculture as viewed in Figure 2.2. Interestingly, even though over 50% of the watershed is forestland, covering a total of over 160 square miles, the surveys indicated that forestland was the least common land use. (Refer to Section 1, Project Area Characteristics.) This may indicate a "disconnect" between how people perceive the use of land in the watershed and how the land is actually used. The result may also indicate confusion with the question. People may have interpreted the question to be about the area of their residence as opposed to the land use of the focus area or entire watershed. Most people in the watershed do live in either a residential or agricultural area.



What do you think are the two most common land uses in the Slippery Rock Creek Watershed area in which you reside?

Figure 2.2: Citizen Survey Results: Most Common Land Uses in the SRCW

Water Quality

The most prevalent water quality issues identified in the survey were abandoned mine drainage **(AMD)**, followed by agricultural runoff and land development. The results are seen in Figure 2.3. While these results may indicate a natural awareness of AMD in the watershed, the results may also indicate the effectiveness of the educational/outreach activities of the Jennings Environmental Education Center, Slippery Rock Watershed Coalition, local colleges/university, or may indicate a bias in the survey related to the types of respondents. Through public-private partnership efforts the Slippery Rock Watershed Coalition has been involved in the installation of over 15 passive systems that treat about 750 million gallons of abandoned mine drainage annually in the headwaters of the Slippery Rock Creek.



What do you think are the most prevalent water quality issues in the Slippery Rock Creek Watershed?

Figure 2.3: Citizen Survey Results: Most Prevalent Water Quality Issues in the SRCW

Opportunities and Issues of Concern

Citizens were asked to rank the importance of the opportunities and issues of concern within the watershed. Each item was rated on a scale of 1 (lowest priority) to 5 (highest priority). Based on the results of the survey, water quality improvement was the first priority, attractive natural settings was rated second followed by preserving historic sites. Figure 2.4 provides the ranks for all categories.



Please indicate how you feel about the importance of the following watershed values as they relate to the Slippery Rock Creek Watershed?

Figure 2.4: Citizen Survey Results: Opportunities and Issues of Concern in the SRCW

Recreation

Recreational activities were also rated by the stakeholders on a scale of 1 (lowest priority) to 5 (highest priority). Visiting public lands was rated the highest, followed by hiking and visiting scenic vistas. Section 6, Cultural Resources, describes the recreational opportunities in the watershed. Note that even though only about 11% or about 29,000 acres of public land are available in the Slippery Rock Creek Watershed, the importance of the outdoor activities is above average (2.5 being average) to high on all 16 listed activities except for ATV Riding.



Please indicate your feelings about the importance of the following recreational activities in the Slippery Rock Creek Watershed.



<u>Individual Comments:</u> A list of comments received for individual questions further aids in describing the interests of stakeholders in the watershed. <u>Please note that duplicate answers are not included in the list; however, all answers are available for public viewing through the following link: http://www.surveymonkey.com/sr.aspx?sm=DScHOBE34_2f_2fSTYsIOJPIDDu3TuhZZR_2bZ_2bLI_2fct97vp4_3d</u>

Watershed Attributes

Question:

List three things you like about the area of the Slippery Rock Creek Watershed in which you live.

Comments:

onse	The beauty	Quiet
	Open land area not heavy populated	Abundant wildlife
	Scenic value	Lake Arthur
	Natural surroundings	Low population density
	McConnell's Mills	Support of wildlife and waterfowl
spc	Nearness of creek	Very quiet
First Re	Scenic Moraine State Park close by	Generally rural with relatively small towns
	Scenic, attractive areas	Numerous state parks for recreation
	It is getting cleaned up	Privacy
	Open space	Birds
	Very pretty	State Parks
	Mills/climbing opportunities	Rural
0	Privacy	Possible human resource—clean water
	Bird watching	Lots of land and trees
	Natural setting	It's nice seeing people canoeing
suc	Generally controlled growth	Easy access to interstate highways
spc	Fishing	Access to public lands for outdoor recreation
Re	Access to the University and its outdoor events	The North Country Brewery
pu	Recreation	Diverse habitat for wildlife and native plants
ecc	Historical significance	Forest
Ō	Hell's Hollow	Moraine State Park
	Variety of scenic choices	Hiking
	A lot of different wildlife	Access to creeks/lake
	Peace	Nice neighbors
	Scenic	Diverse wildlife
	Beautiful	Nice to observe
d)	Local municipal and state parks	Not too densely populated
) USE	Environmental awareness—especially at Slippery	Proximity to higher education and the
spc	Rock University	opportunities they bring
Re	Canoeing and kayaking on the Sippery Rock Creek	Wildlife
Third I		
	Public access	
	Rural scenery	Fishing
	Recreational opportunities	
	Fishing in the stream	Hiking and nature trails
	Rural atmosphere	Natural history

Areas of Improvement

Question:

Please list three things that you think would improve your quality of life in the Slippery Rock Creek Watershed.

Comments:

First Response	Strict rules on sewer systems that end up in the creek	More educational opportunities to teach me what is available
	Bike trails	Road improvements
	Sewage	Less mining and gas drilling, especially near the SR Gorge
	More recreational areas	Steering residential development to specific areas
	Improved transportation corridors (bicycle paths, Route 8)	Erosion control (one comment listedat the housing plan Phase II Weathervane Hill Development site)
	Trash that is being dumped	Abandoned Mine Treatment
	Less pollution land/water	Less mining activity
	Water Trails	City water
	Reduce number of housing developments	Guarantee against development
	Education Programs	Less mineral extraction
	AMD Treatment	More public lands or preserved green space
nse	Enhance state park trails, facilities, programs, etc.	Better enforcement of water and air pollution laws
Iod	Improve quality of the water	Clean up from abandoned mines
Ses	Preservation of wildlife	Remediate sewage systems
and R	Install curbs on Route 108 to prevent rain runoff into individual's property	Install sidewalks where needed for pedestrian safety
)ec	City sewers	Help with restoration of land lost to erosion.
S	Reduce mining efforts	Protection against pollution
	Better maintenance of the roads (infrastructure)	More recreation areas
	Clean ups	Better transportation
Third Response	Create public access zones so no exclusive private usage	More environmental educational programs for local residents
	Multi-municipal planning for development and services	Acquire land and preserve for future generations/preserve open space/Biologically Diverse Areas
	Preservation of land/trees	Stream restoration
	Better maintenance	More hiking trails
	Official access to the creek—connected by trails	No strip mining
	Protect state lands and waterways	Less commercial development

Natural Conditions

Question:

Please list three things that you think would help improve natural conditions in the Slippery Rock Creek Watershed.

Comments:

First Response	Clean ups	Control use of ATV's
	Abandoned mine drainage (AMD) treatment	Less impact on wetlands
	Address water quality issues such as AMD,	Plant more trees; Ban on burning garbage and
	sedimentation, etc.	plastic
	Litter control	Buffer zones along streams
	Remediate agricultural drainage	Remove debris
	Community awareness events	Clean up fallen trees and litter in the creek
	Less mining activities	Cleanup trash and debris along roads
	Greater enforcement of polluters/pollution	Controlling water runoff from the roads
sponse	Have more farmers put their land into the CRP program	Public awareness and outreach for action/involvement to live more sustainably
	Stream restoration	Education
	Control runoff	Less mining and gas drilling
	Regulations & enforcement of them—concerning pollution	Halt development and steer towards specific areas
Ц К С	Controlling water runoff from agriculture	Air quality improvements at the University
ри	Restoration of land after mining	Installation of riprap to slow erosion
CO	Limit mining	No burning of garbage & plastic
Se	No dumping of waste	More educational resources
	Stream cleanups	Water trail routes around dams for canoein
	Education—get local school students out taking samples and monitoring stream	Remove streamwater and stormwater blockages
	Citizen volunteers	Conduct roadside cleanups
	Native plants	Less fertilizers used on farms
se	Reclaim and replant	Better advertisement of community programs
noc	Reforestation and preservation of old growth forests	More public education towards land stewardship
Third Resp	More recreational areas	Water access/Muddy Creek Falls
	Install sidewalks where needed for pedestrian safety	Less development around streams and headwaters
	Less salt on the roads during winter	Limit mining
	Zoning implementation	Enforcing illegal dumping laws
	Create more green spaces	More outdoor recreations

Flooding

Question:

Is flooding an issue in your area of the Slippery Rock Creek Watershed?

<u>Comments:</u> (25 out of 37 answered "No" and 10 people skipped the question)

"High water has been rapidly eroding stream banks since the construction of the bridge on West Park Road. The piers narrowed the flow of water and changed the direction of the creek."

"Flooding is an issue in various areas around the watershed such as: near the confluence of Wolf Creek and Slippery Rock Creek, along Slippery Rock Creek near Slippery Rock Park, parts of Hilliards and Boyers at times have had flooding issues as well."

"Only when there is a combination of a snow melt plus rain."

"Yes, the creek floods often with just a little bit of rain."

"Yes, spring thaw."

"Generally not, other than local stormwater blockages."

"Runoff killed fish 3 years."

"Yes, I live in the valley of Slippery Rock."

Additional Comments

Question:

Other comments do you have about the Slippery Rock Creek Watershed of the Slippery Rock Creek Watershed Conservation Plan not previously addressed.

Comments:

"Encouraged by the interest and contributions of youth to the stewardship and future of the natural attractions remaining throughout the watershed."

"We depend on a spring for our household water supply. Our property (42 acres, borders the creek) is very near to three mining/blasting operations. We have noticed that the mining seems to be affecting our water supply, perhaps there have been shifts in the underground topography b/c of blasting? We now cannot depend on the spring to flow reliably and sometimes experience water shortages or stoppages."

"Respect land owners and don't force unwanted restrictions on their property"

"I'd like to see Slippery Rock University become more sustainable and reduce it rate of development of its properties. Also I'd like to see the SRU property and other properties, which borders the Wolf Creek Narrows property owned by the Western PA Conservancy to be purchased and preserved."

"Just getting things under control."

"Mining and drilling are also concerns."

"Would like to see more natural areas open to public along the waterways."
<u>Municipal Surveys</u>: The SRCWCP Project Facilitator submitted a survey form with introductory letter to each municipality and planning commission within the Slippery Rock Creek Watershed. Of the 38 municipalities and 5 planning commissions in the watershed, 16 participated in the survey. Follow-up letters and emails were sent, but no additional responses were received.



Figure 2.6: Municipal Surveys by Slippery Rock Creek Watershed Focus Areas

The questions included on the municipal survey forms were similar to that of the citizen survey and included questions relating to land use, recreation, water quality, values, etc. The following bar charts illustrate the interests of the municipal representatives:

Land Use

Of the surveys completed, the most common land uses identified were residential and agricultural. These results are similar to the citizen survey. As previously noted, however, forestland covers more than 50% of the watershed. Agricultural land use was considered the second most common by both citizen survey respondents and municipal survey respondents.

What are the two most common land uses in the Slippery Rock Creek Watershed area you represent?



Figure 2.7: Municipal Survey Results: Most Common Land Uses in the SRCW

Water Quality

The most prevalent water quality issues in the SRCW were identified as abandoned mine drainage, while failing sewage systems and stormwater runoff/flooding were tied for second. Compilation of the citizen surveys also placed AMD as the most recognized water quality issue.

What do you think are the most prevalent water quality issues in the Slippery Rock Creek Watershed area you represent?



Figure 2.8: Municipal Survey Results: Most Prevalent Water Quality Issues in the SRCW

Opportunities and Issues of Concern

The municipalities were asked to rate watershed values on a scale of 1 (lowest priority) to 5 (highest priority). Water Quality Improvement and Attractive Natural Settings tied as the most important values, followed by businesses and jobs. Interesting to note is that the municipalities identified water quality as having more importance than businesses and jobs. As previously noted, Water Quality Improvement also received the highest rating from the citizen surveys.

Please indicate how you feel about the importance of the following watershed values as they relate to your municipality.



Figure 2.9: Municipal Survey Results: Opportunities and Issues of Concern in the SRCW

Recreation

Recreational activities were also rated on a scale of 1 (lowest priority) to 5 (highest priority). Fishing was the most important followed closely by hunting. The municipal survey results were significantly different from that of the citizen survey which ranked visiting public land (parks, forests, game lands) as the highest priority. Interestingly, both citizen and municipal surveys ranked ATV Riding as the lowest priority.

Please indicate your feelings about the importance of the following recreational activities for your municipality.



Figure 2.10: Municipal Survey Results: Recreational Opportunities in the SRCW

Comprehensive Plans and Ordinances

The municipal survey that was sent to the county planning commissions and municipalities included questions relating to the existence of comprehensive plans and zoning, subdivision, and flooding ordinances. Out of 38 municipalities and 5 counties, there were 16 responses.

As stated in Section 1, Project Characteristics, all 5 counties and 13 of the 38 municipalities have comprehensive plans. In addition, of the 38 municipalities 20 had zoning ordinances, 15 had subdivision ordinances, and 8 had floodplain ordinances. This information is provided for all municipalities in Section 1, Project Area Characteristics, on Table 1.7: SRWC Municipal Comprehensive Plans & Ordinances (Zoning, Subdivision, Floodplain).

Public Water Service

Of the respondents to the municipal survey, the majority indicated that public water was available at least to a limited extent. As mentioned in Section 1, due to Homeland Security issues the location of service areas, etc. is not available.



Figure 2.11: Municipal Survey Results: Public Water Service in the SRCW

Interest in Future Public Water Supplies

Of the respondents that did not currently have public water supplies, over 90% did not see a future need within the next decade.



Figure 2.12: Municipal Survey Results: Future Need of SRWC Municipalities without Public Water

Public Sewer Systems

Almost 67% of the municipal survey respondents indicated that public sewerage was not available.



Figure 2.13: Municipal Survey Results: Public Sewer Systems in the SRWC

Interest in Future Public Sewage Systems

Of the respondents that did not currently have public sewerage, almost 70% do not anticipate a need within the next decade.



Figure 2.14: Municipal Survey Results: Future Need of SRWC Municipalities without Public Sewers

<u>Key Person Surveys</u>: The SRCWCP Advisory Council compiled a list of "key persons" to be interviewed. The Project Facilitator then contacted each person identified and conducted the survey via phone or email. A total of 29 Key Person Surveys were completed and the results follow.

Slippery Rock Creek Watershed 20 Years Ago

More baitfish, more benthic life and much less developed by both commercial and residential occupants.

Changes in the past 10 years

Bank erosion and sloughing seems to be on the increase. Water clarity also seems to have decreased. Sediment has become much more of a problem as is evident by the embeddedness of the substrate now, compared to 10 years ago. Some sediment problems stem directly from the management of water levels at the Glades Wildlife Area by the PA Game commission. Control events are often conducted during busy fishing seasons degrading water conditions.

Vision for Slippery Rock Creek Watershed in the next 5 – 10 years

I would like to see a comprehensive GIS database that could be used by grantees to find feasible project areas to apply for. I would also like to see a comprehensive stormwater management plan combined with enforcement of such and existing septic regulations.

"Big" Issues in the Slippery Rock Creek Watershed

Development, specifically sand & gravel extraction, deforestation of the watershed; AMD; Discharge issues, both by municipalities and private landowners.

Opportunities for programs or projects that would be advantageous to the future of the SRCW

The programs and projects will have to be done on a small scale with defined goals rather than trying to look at the watershed in it's entirety.

Suggestions on how to manage the Slippery Rock Creek Watershed in the Future

The programs and projects will have to be done on a small scale with defined goals rather than trying to look at the watershed in it's entirety.

Get more landowners enrolled in CREP and other buffer programs

Portions of Slippery Rock Creek could be improved by instream devices for improvement of water quality. The area of the upper dam could be improved as woodcock habitat.

Help the DEP to protect our air, water, and soil by putting in some guidelines on how to deal with the energy exploration issues in the watershed

Public-private partnerships among industry, residents and visitors to the watershed as well as government and academia to address the legacy of the past while working for a sustainable future. People working together for the benefit of all. Continue to encourage the mining industry to address the mining legacy, promote cooperation among public agencies and private industry to provide sustainable economic and environmental development.

Possible riparian protection on farmland through FSA, Growing Greener (if reestablished)

PA CleanWays has programs to work with interested individuals and groups to clean up illegal dump areas. Both Butler and Lawrence Counties have Recycling Departments that offer technical assistance. Friends of McConnells Mill SP offers programming that focuses on the Slippery Rock in and around the state park.

Low head dam removal - Streambank restoration - Stream Habitat Improvement - Removal of invasive Species

Dam removal projects, citizen monitoring programs; PA CleanWays clean ups; Creek Sojourns.

SRU has a new air quality tower that measures meteorological and chemical characteristics. It would be great to see the two entities become involved.

PA Water Trails Program - There is potential to develop Slippery Rock Creek as a water trail.

Conservation groups should be engaged to the extent possible to ramp up efforts to protect more of the drainage and especially riparian / floodplain areas. AMD should be targeted in some subbasins.

Act 167 stormwater management plan is near completion for Lawrence County. All municipalities will have to adopt stormwater ordinances. Butler County Recreation and Greenways Plan development.

American Rivers provides technical and financial assistance with dam removal and green infrastructure, as well as our Blue Trails program to establish water trails to improve access and recreation.

What do you want to see in the SRCWCP?

Enforcement of current regulations. Also realizing that the newest wave of oil and gas development, specifically exploration of the Marcellus shale, is coming in the near future and a reality in portions of the watershed already. It would be nice to develop a pre-emptive plan rather than being reactive once development has hit full swing.

Tourism plans

Historical components, demographical information, a biological inventory, and a matrix of problems/issues and ways to address them

I would like to see a coordinated effort on the part of all entities to clean up the waterway, improving it's condition to the state it was in the 1950's. Among these would include farmers, sand and gravel mines, well-drilling operations, limestone mines, residential occupants, Fish and Boat Commission, Game Commission, and sportsmen.

A section on the methods to improve fishery and wildlife habitat written by a qualified and certified wildlife biologist.

A compilation of all the historical data that can be found. An accurate analysis of that data. Identification of data needed to accurately assess the condition of the watershed. An achievable plan for improving and protecting the quality of resources in the watershed. A plan for coordinating with municipalities in the watershed. Guidance for DEP on how to protect and improve the quality of resources in the watershed.

A realistic approach to planning that acknowledges the benefit of conservation without sacrificing the use of natural resources we all depend on

Goals and objectives based on sound science, data analysis and citizen input

As a specialist in waste management I would like to see a section that recommends best management practices for waste management and recycling and addressing illegal dumping. These things have a direct impact on the health of a watershed.

Address more agricultural conservation practices/incentives to do so...and the quarries/mines in the area need to be held more accountable for their impact.

Plans for wastewater treatment - Plans for maintaining riparian buffer zones - Increased access to the creek for recreation

Detailed information about the demographics, history, water quality, natural resources and issues facing the watershed.

Community education events. I think the community holds the key to a sustainable approach. Without their buy in, a sustainable plan will not come to fruition. They must be educated about their watershed so they can make smart choices

Solid management recommendations including public awareness efforts

Plans to get buildings out of the flood plain, so it can go back to a more natural condition Strong clear based upon science, as well as goals, objectives and actions and defined outcomes

Innovative opportunities for reforesting mine lands, Marcellus Shale active drilling operations, special protection recommendations for the Creek and Hell Run in Lawrence County

I would like to see more treatment systems where needed, dedicated funding for maintenance of systems, and especially more science to understand how the ecosystem is responding/recovering to treatment. While the efforts since 1995 to build treatment systems have been very impressive, there has been much less funding and emphasis on whether those systems are actually having an effect on biological recovery. Yes the loading of acid and metals is greatly reduced, but has it had an effect? One thing that I think is really needed is a very detailed hydrologic model of the headwaters. Hard to improve water quality unless you have a very good understanding of flow through mine pools, ground and surface water.

Some recommendations that involve municipalities and could be implemented fairly quickly in order to develop and sustain partnerships and support throughout the watershed

Absolutely protection and conservation for the environment, but in such a way that does not negatively impact someone's business or way of making a living

What do you think might prevent the SRCWCP from being successful?

The largest obstacle in my opinion is the rural nature of many of the municipalities that make up the watershed. Many of these municipalities do not have effective plans to protect the watershed or the resources to enforce the regulations they currently have in place. Additionally the rural nature of these communities often carries an individualized type approach, rather than cooperating with other municipalities within the watershed to accomplish goals. The last problem is money. Many of the most talented people in the watershed will not get involved with the project because it is not a cost productive use of their time.

Lack of interest.

Negative press

If it is too complex and "unreadable". Ultimately, it comes down to reminding municipalities and others to actually consult the document when making plans or decisions. A plan is no good unless it's used (and updated periodically to account for changes in the watershed).

I have been led to believe that much of the reason the creek is so silty is because the stream is constantly changing its course in its upper section. Banks are continually being broken down, causing silt to gather in the creek bed. Thus, with any rise in water, this silt gets worked up and is carried downstream. I have witnessed this from rain and also from the discharge of water from the Glades near Moniteau. A thundershower moving through the area may cause the Neshannock Creek to be dirty for 3 or 4 days, but the same storm will leave the Slippery Rock Creek dirty for 8 to 12 days. One only needs to observe the junction of Wolfe Creek and the Slippery Rock Creek to see the difference in water quality.

Apathy on the part of the public and landowners, developers and mineral extractions interests exerting influence for short term gain and profits over long term environmental quality concerns.

Lack of land owner cooperation.

If it is based on inaccurate information. If it is unrealistic. If it does not provide helpful, achievable guidance and goals for the watershed.

Unrealistic unreasonable goals.

Lack of citizen buy-in.

Lack of follow through with the recommendations as well it being forgotten about. These seem to be common ends to many plans.

Lack of educational outreach.

Local politics - backward thinking - The thought that environmental improvements may raise taxes and sewage rates and change the look of the community.

A lack of understanding within the community for what the Conservation Plan is and how it can be beneficial.

Lack of communication between relevant stake holders. You need to hear everyone's voice before a plan can be made and implemented and I think this is by far, one of the hardest things to do- communicate within a community about a topic most individuals don't even think about. But without good communication, success will be difficult.

Lack of cooperation and funding for projects.

Lack of consensus on what needs to be done.

Limited implementation. Public input that pulls the focus off of what actually needs to be accomplished because people might look for 100% consensus and unsustainable development entities will voice objections, e.g. including interests that do not support attention being paid to climate change adaptation. Plan will also need to be updated over time to be successful.

Lack of awareness and accessibility to the final plan. Municipal input for management recommendations.

Political issues.

What advice do you have for us as we go through the process of preparing the SRCWCP?

Do the legwork to find the key people in the municipalities that will be able to involve the correct persons and organizations.

Try to obtain people who live along the watershed to be part of the plan.

Bring the plan to the public through a good marketing plan.

Try to get municipalities to understand its value and to encourage them to consult the document, so the communities can make decisions holistically.

I hope that a concerted effort will be made to determine the problem spots of the upper section of the creek. Once the determination is made as to the origin of the silt, then perhaps steps can be taken to prevent this erosion. Banks can be secured with limestone. I would also like to see the continuation of the treatment of acid mine seeps in the Boyers area.

Be sure it is reviewed by outside experts

There are a few things that I have noticed working in our local watershed group that I would like to address. Within the environmental community, I have noticed two different prominent attitudes regarding environmental issues, they are, for lack of better terms, idealists and realists. The

idealists focus on the ideal; zero pollution, 100 percent clean up, etc. The realists focus on the best of what is achievable. For example, the idealist might say "do not drill in the Marcellus Shale" while the realist might say "let's make sure we are doing all we can to protect our resources". I think it is much more helpful to accept the reality (for example, that drilling will likely happen in our watershed) and try to minimize the environmental impacts. I would like the see the realists approach used in the watershed plan. Furthermore, regarding the collection and use of data, I am continually frustrated by the amount of resources that are used to collect and analyze environmental samples, only to have the data be set aside somewhere and become basically inaccessible to other researchers or to the public. The compilation and storage of data collected, both historic and in the future, should be addressed in the plan. I would also like to see GIS layers used in the report made available to the public.

Keep up the good work.

Transparency.

Continue to involve a variety of stakeholders.

Let everyone have a voice and OWN the plan...create a collective vision...negotiate...have movers and shakers on the team...and don't forget student leaders! They will be carrying on the vision for the future!

Involve community leaders, land developers, mineral extraction companies, conservationists, and educators in the planning group.

Public outreach and municipality buy-in. Make public meetings informative and interpretive to try and dispel misconception and rumors concerning the plan. Be very well prepared for potential confrontation.

Think broadly and be all inclusive. And really try to plan for the future. The world is changing very quickly and the plan must include ways to adapt to that change

Continued efforts to involve as many diverse interests as possible. (I think you've already done a good job of this but it's an ongoing battle to get people engaged.)

Lots of public participation.

Make all parts of the plan useful, e.g. some plans make lists of watershed resources, e.g. lists of species of wildlife, but these are often not incorporated into the plan in any meaningful way.

Seek as much feedback as possible from municipalities and residents on what they want to see in the watershed.

Make no small plans--take a holistic look at the watersheds, its needs and opportunities. Prepare a realistic and accountable strategy that results in actions. To the extent that you can, monetize the benefits of watershed impacts and improvements so that you can show decision-makers what poor water quality really costs everyone.

Don't use poorly conducted studies or the sighting of 1 or 2 fish as evidence of recovery. Need rigorous monitoring and experiments to see understand biological recovery.

Make sure the groups that can use the plan to advantage know about it and provide suggestions related to their needs.

Get lots of input from residents, business owners, agencies, landowners, etc. Stay focused on the benefits to both environment and residents.

Do you have any other comments you would like to make for the record before you conclude this interview?

There is a definite need for a comprehensive GIS and informational database for the watershed. Years of data currently exists collected in pockets, by SRU, Grove City College and many public agencies and private companies and individuals. If compiled there would be a baseline to work from in future events rather than wasting money on repetitive exercises. Additionally public awareness about regulations regarding the watershed seems to be poor. It is my experience that stricter regulation is the fastest way to "get the word out" about the do's and do not's regarding resource protection.

We are happy to help with this project.

The watershed is a beautiful place that needs to be preserved!

I have been raising trout in the Fish and Boat Commission's Cooperative Nursery Program for over 20 years. During this time, our Conservation Club has stocked approximately 4,000 trout in the Slippery Rock Creek annually. Many of these fish are left in the creek at the end of each season. Amazingly, very few trout remain in the section of the stream we stock. This is apparent, because catching a holdover in the section of the Slippery Rock Creek between the town of Slippery Rock and Route 19 is practically unheard of. Some say the water gets too warm, but I hear stories of big holdover trout being caught back in the 50's. Others say that these fish starve. I am more likely to believe this theory. I am basing this on the fact that nice, heavy trout stocked in May are often caught in mid-July. By this time they are much thinner than they were when stocked. By August, it is very difficult to catch a trout in this section of the creek. My dream as a conservationist would be to see the Slippery Rock Creek return to its form and be able to sustain trout throughout the year. Perhaps this plan will help accomplish this dream.

PR campaign. A series of informational articles published in local media about the benefit of the plan and the resources within the watershed, editorials in the papers about the plans. Radio interviews (WBUT, WISR) etc. Facebook page and maybe twitter account following the development of the plan.

I am concerned only with the technical aspects of AMD occurrence and treatment. I know little about the conservation plan at this time. Is there a web site for more information? The only thing I can say for sure is, if it would not have been for Margaret Dunn none of the work in the watershed would have been started.

The WCP is an important piece of work that I'll refer to often as I develop future river restoration projects.

While I appreciate the inclusiveness of the watershed coalition, in my opinion at times there have been too many voices, and this has distracted the focus away from the big problems in water quality that still need to be addressed.

I'm certain you will hear from people that want to "dredge" the stream and I think it's important to use those opportunities to explain natural stream channel remediation techniques to them and the general public so they know there are other methods/ways to deal with stormwater issues.



SECTION 3—LAND RESOURCES

A. INTRODUCTION

The Land Resources Section of the SRCWCP consists of a compilation and general overview of available information relating to the geology, soils, ecoregions, property ownership and hazardous areas within the 408-sq. mi. Slippery Rock Creek Watershed **(SRCW)**. The land resources have historically provided and continue to provide opportunities for successful agricultural activities and for extraction of coal, limestone, sand & gravel, and petroleum (gas & oil). Much of the economy and overall sustainability of the communities in the SRWC continues to be based on the land resources. Abandoned mines and oil & gas wells from historical extraction and early agricultural and land development practices have resulted, however, in significant degradation of both the land and water resources in much of the Slippery Rock Creek Watershed.

B. OVERVIEW OF GEOLOGY

Geology is the science and study of the rocks that comprise the Earth and the processes which cause the formation, movement, and changes in the rocks. The landscape in western Pennsylvania today is a reflection of the natural processes that have been occurring for millions of years and the impacts of man primarily in the last three centuries.

<u>Physiographic Province and Sections:</u> As noted in Section 1, Project Area Characteristics, Pennsylvania has six physiographic provinces which display distinctive landscapes and geologic features, which have been divided into 23 sections that have similar geologic features and climate on a smaller regional scale. According to the DCNR classification system, the Slippery Rock Creek Watershed is located in the Appalachian Plateau Province and covers two sections, the Pittsburgh Low Plateau Section and Northwestern Glaciated Plateau Section. (Refer to Figure 3.1)

<u>Pittsburgh Low Plateau Section</u>: The majority (239 square miles) of the SRCW lies in the Pittsburgh Low Plateau Section. This physiographic section has not been glaciated and is characterized by rounded hills, narrow valleys, and fluvial (stream) terraces. The local relief of the area is 200-600 feet with hilltop elevations commonly ranging from 600 to 1700 feet. The most common soils are Gilpin, Ernest, Wharton, Hazleton, Weikert, Cavode, and Rayne. These soils are primarily derived from sandstone, shale, and coal of the Conemaugh and Allegheny Groups.¹

<u>Northwestern Glaciated Plateau Section</u>: The remaining 169 square miles of the SRCW lie within the Northwestern Glaciated Plateau Section, which is characterized by broad, rounded uplands that are cut by valleys with steep slopes. Valley floors, typically underlain by thick deposits of unconsolidated glacial and stream deposited material, often support wetlands. Local relief ranges from 100-600 feet with elevations ranging from 900-2200 feet. The bedrock (solid rock) in this area is largely covered by glacial deposits.²

 ¹ Sevon, W., Pennsylvania Department of Conservation and Natural Resources, Landforms of Pennsylvania – From Map 13, Physiographic Provinces of Pennsylvania, 2000 (accessed June 14, 2010); available from http://www.dcnr.state.pa.us/topogeo/map13/map13.aspx
² Ibid.



Figure 3.1: Physiographic Sections of Pennsylvania³

<u>Ecoregions:</u> The USEPA developed the ecoregion classification to denote areas with similar ecosystems (living and nonliving elements) and with similar types, qualities, and quantities of environmental resources. Compared to the physiographic provinces the ecoregions use more than regional geology in determining the section divisions which means the divisions can be vary significantly in size and shape. The Class IV ecoregions in the Slippery Rock Creek Watershed, however, are similar to the physiographic sections discussed above. For instance, the Pittsburgh Low Plateau Section based on physiography is similar in location to the Class IV ecoregion of the same name. The physiographic section known as the Northwestern Glaciated Plateau is similar in location to the Low Lime Drift Plain ecoregion. (Figure 3.2) Below is a map showing the Level III and IV ecoregions of Pennsylvania.⁴

<u>Pittsburgh Low Plateau:</u> The Level IV Pittsburgh Low Plateau (70c), part of the larger Level III Western Allegheny Plateau (70) ecoregion⁵, was mostly unglaciated and bedrock is typically present

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³ Ibid.

 ⁴ Omernik, J. M., Woods, A. J., & Brown, D. D., US Environmental Protection Agency, *Western Ecology Division*, 1998 (accessed June 14, 2010); available from http://www.epa.gov/wed/pages/ecoregions.htm
⁵ Buss, Rose, US Environmental Protection Agency, *Ecoregions of EPA Region 3: Delaware, Maryland, Pennsylvania, Virginia, and West*

⁵ Buss, Rose, US Environmental Protection Agency, *Ecoregions of EPA Region 3: Delaware, Maryland, Pennsylvania, Virginia, and West Virginia,* 2008 (accessed January 25, 2011); available from

http://www.eoearth.org/article/Ecoregions_of_Delaware%2C_Maryland%2C_Pennsylvania%2C_Virginia%2C_and_West_Virginia_(EPA)

below the soil horizon. A physiographic section mentioned above has the same name, location and the landscape is characterized similarly: rounded hills, narrow valleys, and fluvial terraces. This ecoregion supports general farming, dairy operations, and wood lots and includes significant historic and current bituminous coal mining in addition to oil and gas extraction.

<u>Low Lime Drift Plain</u>: The Level IV Low Lime Drift Plain (61c) is part of the larger Level III Erie/Ontario Hills and Lake Plain (61) ecoregion⁶, which is characterized by nearly level to rolling terrain formed by the glacial deposits. Dairy farms are common in the Low Lime Drift Plain. The crops best adapted to this ecoregion are hay, oats, silage corn, and pasture. As discussed in Section 5, Biological Resources, endangered plants and animals have been identified due to the presence of alkaline wet meadows and stream habitat.



Figure 3.2: Level III & IV Ecoregions of Pennsylvania 7

⁶ Ibid.

⁷ Ibid.

Bedrock: The material which forms the near-surface bedrock in the watershed was deposited about 300 to 320 million years ago during the Pennsylvanian and Mississippian Subperiods (a.k.a. Epochs) (Figure 3.3) of the Carboniferous Period.⁸ The associated sedimentary rock types are cyclic sequences of sandstone, siltstone, shale, conglomerate, claystone, coal, and limestone.



Figure 3.3: Geologic Map of Pennsylvania ⁹

The valuable limestone reserves in the watershed were the result of an "ocean" being present at one time during the Carboniferous Period. At other times during the Carboniferous Period, large (hundreds of square miles) wetlands formed. As what is now western Pennsylvania was situated approximately 5-10 degrees south of the equator, the warm, moist, tropical climate provided ideal conditions for vigorous plant growth which produced an enormous amount of biomass. With much of the area supporting wetlands (swamps, bogs, and fens) because of poorly drained soils, plant matter (which became peat) accumulated, up to tens of feet in thickness, in an anoxic (essentially no oxygen) environment. With

⁸Orndorff, Randall C., U.S. Geological Survey, Divisions of Geologic Time—Major Chronostratigraphic and Geochronologic Units: Fact Sheet, 2010 (accessed August 23, 2010); available from http://pubs.usgs.gov/fs/2010/3059/pdf/FS10-3059.pdf ⁹ Pennsylvania Department of Conservation and Natural Resources, Map 7, Geologic Map of Pennsylvania, 2000. (accessed June 28, 2010);

available from http://www.dcnr.state.pa.us/topogeo/maps/map7.pdf

time and with pressure from the subsequent layers of sand, silt, and clay, volatile compounds were vaporized. As the process continued, the carbon was, therefore, concentrated forming the rich coal reserves present in the watershed today.¹⁰ (Refer to Plate 3.1: Bedrock Geology Map.)

In order to identify the locations of coal, road building materials, and other resources in the subsurface, geologists described the layers of rock. Sequences of rock layers that were distinctive, that extended over a substantial area, and that could be mapped were called formations. Depending on the elevation and orientation of the rocks, one of four geologic formations lies just below the soil, glacial material, etc., or is exposed (crops out) at the ground surface in the SRCW. Each formation was typically named for the geographic area with the best exposure or where the formation was first described. The four geologic formations in the watershed have been named the following: Glenshaw, Allegheny (sometimes divided into the Freeport, Kittanning, and Clarion Formations), Pottsville, and Shenango. Due to the bedrock dipping (being "tilted") very generally to the southwest, the youngest formation (Glenshaw Fm.) crops out in the northernmost portions of the watershed and the oldest formation (Shenango Fm.) crops out in the northernmost portion. (Refer to Plate 3.1: Bedrock Geology.)

Glenshaw Formation

Located at the surface near the southern portion of the SRWC is the youngest of the bedrock formations known as the Glenshaw Formation. This formation is characterized by a cyclic sequence of shale, sandstone, red beds, with thin limestone and coal which covers about 7% of the watershed. The base of the formation is at the top of Upper Freeport coalbed.¹¹

Allegheny Formation

Lying directly below the Glenshaw Formation is the Allegheny Formation (sometimes called Allegheny Group) which is the dominant formation in the watershed, covering nearly 70% of the area. This geologic formation is characterized by repetitive cycles of sandstone, shale, claystone, and coal with occasional limestone. The Allegheny Formation is home to six major coalbeds including the Freeport (Upper and Lower), Kittanning (Upper, Middle, and Lower), and Brookville-Clarion. In addition to the valuable coalbeds, the formation contains valuable claystones (which are mined for clay needed to make bricks, etc.) and the Vanport limestone. The base of the formation is at bottom of Brookville-Clarion coalbed.¹²

Pottsville Formation

The Allegheny Formation is underlain by the Pottsville Formation, which covers about 21% of the SRCW, and is located in the northern portion of the watershed. The Pottsville Formation is predominately comprised of gray sandstone and conglomerate, but also contains thin beds of shale, claystone, limestone, and coal. The Homewood sandstone is mined locally.¹³

Shenango Formation

Below the Pottsville Formation is the Shenango Formation which covers only about 2% of the total area in the watershed and is the oldest of the four formations which formed during the Mississippian Subperiod. The formation is characterized by light-gray sandstone and some beds of medium-gray

¹⁰ Barnes, John H. & Sevon, W.D., *The Geological Story of PA, 4th Series,* 2002 (accessed June 14, 2010); available from: <u>www.dcnr.state.pa.us/topogeo/education/es4.pdf</u>

¹¹ Berg, T. M., et. al., Pennsylvania Department of Conservation and Natural Resources, *Pennsylvania Geological Survey: Digital Bedrock Geology*, 1980 (accessed June 14, 2010); available from http://www.dcnr.state.pa.us/topogeo/map1/bedmap.aspx

¹² Ibid. ¹³ Ibid.

shale and siltstone. The Shenango Formation is exposed along Wolf Creek in the northernmost potion of the watershed.¹⁴

<u>Surficial Material:</u> Much of the bedrock in the westerly and northerly portions of the watershed has been covered by a blanket of rock fragments and sediment that were transported by glaciers. In addition, throughout the watershed, there are areas where bedrock has been covered by loose material deposited by streams (alluvial material) and by loose material that has "rolled down" a hill due to weathering of bedrock and gravity (colluvial material). The colluvial deposits are very minor compared to the extensive glacial and alluvial material, which will be discussed further. (Refer to Plate 3.2: Surficial Geology.)

<u>Glacial Material:</u> As noted previously, glaciers covered about 169 square miles of what is now the Slippery Rock Creek Watershed and essentially defines the physiographic section known as the Northwestern Glaciated Plateau or the Low Lime Drift Plain Class IV ecoregion. The thickness of the glacial debris covering the bedrock ranges from a few feet to over 100 feet. A description of the glacial material that can be distinguished in the watershed is briefly described below.

Ground Moraine

Ground moraine is widespread in the watershed covering an estimated 100 square miles. Ground moraine, characterized by rolling hills (essentially no ridges), is typically a mixture of sand, silt, clay, gravel, and boulders.

Kames, Kame Terraces, Kame Moraines, Eskers

Kames, kame terraces, kame moraines and eskers, which cover an estimated 16 square miles in the Slippery Rock Creek Watershed, are features that were formed by streams flowing in the glaciers or which were formed as the ice melted. The glacial material in these features typically contains layers (stratified) of sand and gravel. Kames, kame terraces, and kame moraines are characterize by the presences of low mounds, while eskers form long, narrow, sinuous, steep-sided ridges which, in some cases, are mined for sand and gravel and at other times preserved as relics depicting earth history.

Kent End Moraine

First mapped in Kent OH, the Kent end moraine covers about 103 square miles in the SRCW. The Kent end moraine is currently thought not to be a true moraine associated with active ice but a set of complex landforms relating to ice stagnation and by processes associated with the melting or otherwise disintegration of the glacier. This feature is characterized by boulders and gravel forming small mounds, kettles (bowl-shaped depressions), and kames in the valleys.¹⁵

Outwash

Outwash, which is not distinguished from river terraces on Plate 3.2, Surficial Geology, is also found within the SRCW. Outwash, a layered glacial material, is chiefly sand and gravel removed or "washed out" of a glacier by meltwater. Outwash covers an estimated 2 square miles in the Slippery Rock Creek Watershed.

<u>Alluvial Material:</u> Alluvium is a general term for clay, silt, sand, gravel, cobbles, etc. that was deposited relatively recently, in respect to geologic time, by flowing water (streams). Alluvial material is typically found lining stream beds and in floodplains of the SRCW. Loose rocks, rounded cobbles, and

¹⁴ Ibid.

¹⁵ Straffin, Eric C., Grote, Todd and Jones, Kyle, "Late Quaternary Terrains of the Sugar Lake Quadrangle, Northwestern Pennsylvania,

Geologic Society of America, NE Section and SE Section Joint Meeting, Paper 81-6, March 2010 (accessed January 25, 2011) available from http://gsa.confex.com/gsa/2010NE/finalprogram/abstract_169600.htm.

clay along the banks and in the beds of the Slippery Rock Creek and the tributaries are examples of alluvial material. Note on Plate 3.2, Surficial Geology, that alluvial material is present not only in the unglaciated Pittsburgh Low Plateau but also in the Northwestern Glaciated Plateau or Low Lime Drift Plain Class IV ecoregion along the streams. The dams constructed in the streams of the watershed capture and are eventually filled with alluvial material.

C. OVERVIEW OF SOILS

Soils are developed from the bedrock and from the glacial, alluvial, abandoned mine spoil, and other surficial material in the SCRW. According to the Soil Society of America, soil is, "The unconsolidated mineral or organic material on the immediate surface of the earth that serves as a natural medium for the growth of land plants."¹⁶ Soils are classified and named based on their physical and chemical properties. There are five major factors in the soil formation process: parent material (bedrock, glacial material, etc.), climate, biota, topography, and time. Each plays an important role in soil formation. Soil, therefore, is site or region specific as each variable will change from one area to the next.¹⁷

Soils determine the types of plants that can develop, which in turn determine the types of insects and animals that the environment can support. Soils play five key roles in any ecosystem. First, soils support plant growth by providing a medium and a source of essential elements. Second, soil properties affect the loss, utilization, contamination, and purification of water. Third, soils act like a recycling center by assimilating dead plant and animal matter and making the nutrients available to other organisms. Fourth, soils provide a habitat for a wide range of organisms, from microscopic bacteria to large mammals. Fifth, soils are an important engineering medium for humans, supporting activities like the construction of roads, buildings, ponds, and other structures. As soils play a key role in the ecosystem function, soils can be utilized to help determine the appropriate land use.¹⁸

<u>General Soils Associations:</u> A soil association is a group of two or more major soil units occurring in the same geographic region. The U.S. General Soil Map is produced by the federal Natural Resources Conservation Service and the information is readily available online through the State Soil Geographic (STATSGO2) Database. The General Soils Associations Map displays soils of similar characteristics that have been grouped together in order to show trends and patterns in soils characteristics over a broad area. The SRCW has 13 different soils associations which are displayed in Plate 3.2: General Soil Associations Map. A short description of the individual units is not currently available through the STATSGO2 Database. (Refer to Plate 3.3: General Soil Associations Map.)

Agricultural Lands: Soils are used in the determination of lands most suitable for agricultural activities.

<u>Prime Farmland:</u> According to the USDA National Soil Survey Handbook, prime agricultural land is "land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and that is available for these uses. It has the combination of soil properties, growing season, and moisture supply needed to produce sustained high yields of crops in an economic manner if it is treated and managed according to acceptable farming methods."¹⁹ Prime agricultural soils play an important role in the economy of the Slippery Rock Creek Watershed as agriculture is one of the leading industries in western Pennsylvania. There are 69 prime agricultural soils in the watershed that total 91,447 acres or 35.0% the watershed. (Refer to Plate 3.4: Prime Farmland & Farmland of Statewide Importance.)

¹⁶ Soil Science Society of America, *Glossary of Soil Science Terms*, n.d. (accessed on June 14, 2010); available from https://www.soils.org/publications/soils-glossary#

¹⁷Brady, Nile C., & Weil, Ray R., *The Nature and Properties of Soils* (Alexandria, VA: Prentice Hall, 2001).

¹⁸ Ibid.

¹⁹ Soil Data Mart, Natural Resources Conservation Service, n.d. (accessed June 14, 2010); available from http://soildatamart.nrcs.usda.gov

Farmland of Statewide Importance: These areas, designated by NRCS district conservationists, can be very productive under the right conditions, but the soils do not meet the physical and chemical auidelines needed to be recognized as a prime agricultural soil. These areas may also include tracts of land that have been designated for agriculture by local or state law.²⁰ There are 93 soils that have been designated as supporting farmland of statewide importance in the SRCW, totaling 92,450 acres or 35.4% of the watershed. (Refer to Plate 3.4: Prime Farmland & Farmland of Statewide Importance.)

Agricultural Security Area: Agricultural security areas (ASA) are lands that are enrolled in a statewide program to conserve agricultural lands and the farming community. This program helps protect agricultural land from development and urbanization. This designates an area for agricultural use and the right to farm. Areas must be at least 250 acres in size, but need not be contiguous tracts of land. The minimum parcel size to be included is 10 acres and at least 50% of the land should be classified in Capability Classes I-IV for soils as defined by the USDA. Property designated as an ASA must be viable agricultural land. A local governing body reviews the ASAs every seven years.²¹ The benefits that come with designating lands as an ASA are that municipalities agree not to pass nuisance ordinances which would restrict normal farming operations. Restrictions are also placed on government agencies to limit use of eminent domain on these designated areas. Landowners who are part of a collective of over 500 acres may sell a perpetual agricultural conservation easement through their local Agricultural Land Preservation Program.²² There are approximately 24,817 acres designated as agricultural security areas within the watershed. (Refer to Plate 3.5: Agricultural Security Areas.)

Soil Limitations and Suitabilities: Soils play an important role in determining the function of a landscape and how that landscape can be used. Every soil type has a different set of chemical and physical properties that can help determine the most suitable function relating not only to farming but also to land development such as residential subdivisions, industrial parks, etc. By examining the limitations and suitabilities, a more informed decision can be reached regarding the usage of the land provided by the NRCS²³ and GIS data. (Refer to Plate 3.6: Building Suitability.)

Unstable Soils: Soil stability is dependent on a number of factors including gradient, antecedent moisture, vegetation cover, and soil texture. Organic matter in the soil acts as a "glue" and helps enhance the stability, while clay in the soil reduces the stability due to the natural properties of expansion and contraction, which breaks the soil aggregates. The two factors that have the greatest effect on the stability of a soil is the slope or gradient and antecedent moisture content. Generally speaking, the more water present and the greater the slope, the less stable the soil. As rainfall and soil moisture vary spatially, the slope can provide a quick determination of soil stability; however, other variables are critical in the determination of the overall stability. In addition, there are some indicators that are observable in the field, which will point to soil instability including pistol-butted trees, tipped trees, or tension cracks in the soil.²⁴ (Refer to Plate 3.7: Erodible Land.)

Soil pH: Soil pH is a measure of acidity or alkalinity present within the soil. Soil pH is one of the soil characteristics that are important in selecting crops and other plants, evaluating soil amendments for fertility and stabilization, and determining the risk of corrosion to certain materials.²⁵ (Refer to Plate 3.8: Soil pH.)

²⁰ Ibid.

²¹ US Department of Agriculture, National Soil Survey Handbook (Washington, D.C.: 2009).

²² Ibid.

²³ Soil Data Mart, Natural Resources Conservation Service, n.d. (accessed June 14, 2010); available from http://soildatamart.nrcs.usda.gov ²⁴ Rossiter, D. G. University of Twente - The Netherlands: Dept. of Geo-Information Science and Earth Observation, Chapter 10 - Slope Stabilization, n.d. (accessed June 14, 2010); available from http://www.itc.nl/~rossiter/Docs/FM5-410/FM5-410_Ch10.pdf

Soil Data Mart . Natural Resources Conservation Service, n.d. (accessed June 14, 2010); available from http://soildatamart.nrcs.usda.gov

<u>Hydric Soils:</u> Hydric soils are defined by the National Technical Committee for Hydric Soils as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic (essentially no oxygen) conditions in the upper part. These soils, under natural conditions, are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation. The three categories of Hydric Soils are Major, Minor and None. The major category indicates that the major component of the soil is prime for the formation of wetlands. The minor category indicates that neither the major nor the minor component of the soil are good for the formation of wetlands.²⁶ (Refer to Plate 3.9: Hydric Soils.)

<u>Drainage Class</u>: Drainage class refers to the frequency and duration of wet periods. Alterations of the water cycle by human activities, either through drainage or irrigation, are not a consideration unless the morphology of the soil has been significantly changed. There are seven drainage classes recognized that range from excessively drained to very poorly drained.²⁷ (Refer to Plate 3.10: Drainage Class.)

D. LAND OWNERSHIP

About 88.7% (about 231,700 acres or over 360 square miles) of the 261,200-acre (408-square mile) Slippery Rock Creek Watershed is privately owned with about 11.3% (about 29,500 acres or about 46 square miles) held as public lands primarily for recreational purposes. The total area of the public lands in the watershed could be significantly larger since some of the data associated with public lands is currently unavailable from Mercer and Lawrence Counties.

<u>Public Lands:</u> There are 5 state gamelands, 1 state forest, 3 state parks, and 14 tracts owned by local agencies. In addition, Slippery Rock University, a state school, has over 650 acres. There are no known tracts held by the federal government in the SRCW. For the purposes of the plan, public lands do not reflect public property that is for non-recreational purposes, such as township buildings, schools, etc. (Refer to Section 6, Cultural Resources.)

<u>Private Lands:</u> A cursory review of property ownership indicates that private lands are typically owned by individuals, families, and local businesses. Parcel sizes typically range from less than an acre to a few hundred acres. Except where streams flow through state lands (for example, the North Branch Slippery Rock Creek crosses State Gamelands #95 in the headwaters) tracts along the Slippery Rock Creek and other major tributaries are privately owned.

E. <u>CRITICAL AREAS</u>

For the purposes of the Slippery Rock Creek Watershed Conservation Plan, critical areas associated with land resources include not only problematic areas, such as areas prone to flooding, but also areas of economic value due to agricultural soils and geologic resources. Even though no specific landslide prone areas have been identified, unstable soils have been discussed earlier in this section. (Refer to Plate 3.7: Erodible Land.) Refer to important habitat areas in Section 5, Biological Resources.

<u>Floodplains:</u> Even though other areas in the watershed may be problematic, flooding of bridges, roads, buildings, and property in floodplains has been documented. Floodplains offer critical buffers for flood events. As noted in Section 1, Project Characteristics, floodplain ordinances have been developed by 8 of the 38 municipalities in the watershed. (Refer to Plate 4.1: Water Resource for depiction of

²⁶ Ibid.

²⁷ Ibid.

floodplain locations.) The following photograph documents a particularly dramatic flood event associated with Hurricane Francis in September 2004:



Figure 3.4: Slippery Rock Creek Flooding after Hurricane Francis, Boyers, PA²⁸

<u>Streambank Erosion:</u> Streambank erosion has also been documented as an issue along floodplains with landowners loosing significant property. Note the mature trees and portion of the stream bank eroded by Slippery Rock Creek.



Figure 3.5: Slippery Rock Creek Streambank Erosion near Slippery Rock, PA²⁹

²⁸ Slippery Rock Watershed Coalition photo archives 2004.

²⁹ Carney, Sandy. Streambank Restoration Project. Slippery Rock Watershed Coalition. Picture taken on March 18, 2009.

Farmlands: Noted in Section 1, Project Area Characteristics, active farming occurs on about 51,000 acres (about 25%) of the watershed. Farming is conducted not only on prime agricultural soils which cover about 91,000 acres (about 35%) of the watershed but also on other suitable soils. Needless to say, farmland, the second largest land use in the watershed, is critical to the sustainability of agricultural activities.



Figure 3.6: "Belties in field"³⁰

Geologic Resources: As previously mentioned, there are significant coal, limestone, sand & gravel, and oil & gas reserves remaining in the Slippery Rock Creek Watershed.



Figure 3.7: Bituminous Surface Coal Mine, Marion Twp., Butler Co.³¹

³⁰ Geible, Beverly, Butler County Photo Contest: "Belties in field", 2009 (accessed June 29, 2010); available from http://photos.visitbutlercounty.com/v/contests/2010/august/Belties+in+field.JPG.html ³¹ Slippery Rock Watershed Coalition photo archives November 15, 2001.

F. <u>PERMITTED LANDFILLS</u>

Currently in the watershed there are two permitted landfills, but only one is operational. Northwest Sanitary Landfill is located nearby West Sunbury in Butler County and is the only operational landfill in the SRCW. The Tri County Landfill, located near Grove City in Mercer County is a permitted landfill, but has not been in operation for over two decades. The landfill was closed in 1988 due to new environmental regulations. Sanitary landfills are sites where municipal solid waste is buried in a manner to reduce the environmental impacts.



Figure 3.8: Approximate Locations of Permitted Landfills in the SRCW³²

³²Geographic Information Systems complied from data collected by the Southwest Pennsylvania Commission and PASDA.

G. <u>HAZARDOUS AREAS</u>

A variety of hazardous areas exist within the Slippery Rock Creek Watershed. Most if not all of these areas have the potential to be restored to a valuable land use. In some cases, funding is available to help reclaim these sites.

<u>Waste Sites:</u> For the purposes of the Slippery Rock Watershed Conservation Plan, the following are considered waste sites: municipal waste sites, residual waste sites, illegal dumpsites, brownfields, and superfund sites. (Refer to Plate 3.11: Waste Sites.)

Municipal Waste Sites: A Municipal Waste Operation is a DEP-designated primary facility type related to the Waste Management Municipal Waste Program. The facility types related to Municipal Waste Operations that are included are: Municipal Composting Sites, Land Applications, Abandoned Landfills, Landfills, Processing Facilities, Resource Recovery Sites, and Transfer Stations. Municipal Composting Sites are facilities where is a biological process is used to decompose organic waste under controlled anaerobic or aerobic conditions to yield a humus-like product (compost). Land application sites are areas where sewage sludge of an acceptable quality is applied at a specified rate to agricultural land for the nutrient value. Abandoned landfills refer landfills in the Abandoned Landfill Inventory Project which collects geospatial and descriptive data for closed and abandoned landfills throughout Pennsylvania. A permitted landfill is a facility with a DEP-approved permit that uses land for the disposal of municipal waste. A processing facility is a transfer station, composting facility, resource recovery facility, or a facility that reduces the volume or bulk of municipal waste for offsite reuse. A resource recovery facility provides for the extraction and utilization of materials or energy from municipal waste. The resource recovery facility can be a mechanical extraction facility or a combustion facility. A transfer station is a processing facility that receives and processes or temporarily stores municipal waste at a location other than the generation site.

<u>Residual Waste Sites:</u> A Residual Waste Operation is a DEP-designated primary facility type related to the Waste Management Residual Waste Program. Residual waste is waste generated at an industrial, mining, or wastewater treatment facility. The facility types related to Residual Waste include: Generator, Impoundment, Land Application, Landfill, Processing Facility, and Transfer Station. A generator is a person, company, institution, or municipality that produces or creates residual waste. An impoundment is a facility designed to hold an accumulation of liquid wastes. An incinerator is an enclosed device using controlled combustion to thermally break down residual waste. Land application sites are areas where residual waste of an acceptable quality is applied at a specified rate to agricultural land for the nutrient value or as a soil conditioner. A landfill is a facility that uses land for the disposal of residual waste. A processing facility is a transfer station, compost facility, resource recovery facility, or a facility that reduces the volume or bulk of residual waste for off-site reuse. A transfer station is a processing facility that receives and processes or temporarily stores residual waste at a location other than the generation site.

<u>Illegal Dumpsites:</u> In the SRCW, illegal dumping mostly occurs in remote places, rural areas, and the roads that are less traveled. Many times these sites will continuously expand as once started others appear to regard the dump sites as acceptable places to discard unwanted items. In other words, trash collects trash. PA Cleanways, a non-profit organization, conducts county-wide surveys in Pennsylvania to identify illegal sites that need clean-up efforts. PA Cleanways has a Chapter or an Affiliate in each county within the SRCW. Please visit: <u>http://www.pacleanways.org</u> for contact information.

During the survey, the PA Cleanways staff identified only illegal dumps visible from a road. Table 3.3 lists the number of dumpsites in each municipality by county and Plate 3.11, Waste Sites, shows the dumpsite locations. Overall, there are 87 illegal dumpsites within the watershed.³³

MUNICIPALITY	# of	MUNICIPALITY	# of
(township/ <i>borough</i>)	Dumpsites	(township/ <i>borough</i>)	Dumpsites
Beaver County		Lawrence County	
Franklin	0	Perry 4	
Butler Cou	nty	Plain Grove	1
Brady	1	Shenango	0
Center	0	Scott	0
Cherry	9	Slippery Rock	0
Clay	4	Washington	0
Concord	1	Wayne	0
Franklin	0	Mercer County	
Harrisville	0	Findley	0
Marion	11	Grove City	0
Mercer	2	Jackson	0
Muddy Creek	0	Liberty	7
Portersville	0	Pine	1
Prospect	0	Sandy Lake	0
Slippery Rock	0	Springfield	3
Slippery Rock	4	Wolf Creek	5
Venango	9	Worth	3
Washington	5	Venango County	
West Liberty	6	Barkeyville	0
West Sunbury	0	Clinton	0
Worth	10	Irwin	1

Table 3.1: Illegal Dumpsites Identified in the Slippery Rock Creek Watershed³⁴

<u>Brownfields:</u> According to the USEPA, brownfields are "real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant."³⁵ Many times these sites are abandoned industrial sites that may have some contamination from wastes or chemicals used by the businesses. Although brownfields are a problem across Pennsylvania, there are no brownfields located within the watershed according to a DEP 2009 study.³⁶

<u>Superfund Sites:</u> Superfund is the name given to the environmental program established to address abandoned hazardous waste sites. Superfund is also the name of the fund established by the Comprehensive Environmental Response, Compensation and Liability Act **(CERCLA)** of 1980. These sites are regulated under Section 111 of CERCLA. Under this legislation, the USEPA identifies potential hazardous waste sites, which pose a threat of release of hazardous substances, pollutants, or contaminants.

³³ PA CleanWays, PA CleanWays Website, n.d. (accessed June 14, 2010); available from http://www.pacleanways.org/

 ³⁴ PA Cleanways, *Illegal Dump Surveys for Beaver, Butler, Mercer, and Venango Counties*, (accessed June 14, 2010); available from http://www.pacleanways.org/
³⁵ U.S. Environmental Protection Agency, *Brownfields*, n.d. (accessed June 14, 2010); available from http://www.epa.gov/brownfields/

 ³⁵ U.S. Environmental Protection Agency, *Brownfields*, n.d. (accessed June 14, 2010); available from http://www.epa.gov/brownfields/36
³⁶ Pennsylvania Spatial Data Access (PASDA), *Metadata Summary - Brownfields*, 2009 (accessed June 15, 2010); available from http://www.pasda.psu.edu/uci/MetadataDisplay.aspx?entry=PASDA&file=Brownfields2009_04.xml&dataset=253

There is currently one Superfund site located within the Slippery Rock Creek Watershed as identified by the National Priorities List maintained by the USEPA.³⁷ The site is known as the Osborne Landfill and is located just east of the town of Grove City in Mercer County. The Osborne Landfill was closed in 1978 for accepting industrial wastes without a permit. This site is on the National Priorities List (NPL) and cleanup was completed in 1997, with subsequent reviews to ensure the contamination has been remediated. The latest review completed in September 2010 available online and can be found at <u>http://www.epa.gov/superfund/sites/fiveyear/f2010030003544.pdf</u>. A detailed report of the site and actions taken by the USEPA can be found in Appendix 3.1.³⁸ (Refer to Plate 3.11: Waste Sites.)

Hazardous Sites Cleanup Act: The DEP also has a separate hazardous site program called the Hazardous Sites Cleanup Act (HSCA) which provides the DEP with:

- Funding and authority to conduct cleanup actions at sites where hazardous substances have been released.
- Enforcement authorities to force the persons responsible for releases of hazardous substances to conduct cleanup actions or to repay public funds spent on a DEP-funded cleanup action.
- Funding to pay the state share of costs of cleanup actions at Pennsylvania sites in the Federal Superfund Program.

Additional information about HSCA is provided at the DEP website: http://www.portal.state.pa.us/portal/server.pt?open=514&objID=589565&mode=2.

Abandoned Geologic Resource Extraction Sites: Due to the presence of economically-viable coalbeds, aggregate, and oil & gas, extraction activities have been conducted in the Slippery Rock Creek Watershed for about 150 years. Until environmental practices were implemented, however, there was wide-spread significant degradation to the land and water resources in the watershed. Substantial degradation continues to this day as a result of these early extraction efforts.

Abandoned Oil & Gas Wells: Abandoned oil and gas wells can pose a hazard to human health and the environment if the well casings become compromised and degraded water or fluids leak into or out of the well into the groundwater. The DEP regulates the oil and gas industry via the Bureau of Oil and Gas Management (BOGM). BOGM has records of active, inactive, and abandoned oil and gas wells drilled in PA. These records are currently incomplete, having just over 140,500 records of the estimated 325,000 oil and gas wells drilled in PA since 1859. Table 3.2, BOGM Reported Oil and Gas Wells in SRCW, lists the number of the active, inactive, abandoned and proposed oil and gas wells. Plate 3.13, Oil and Gas Wells, depicts the general location of the wells.

Well Status	Count
Abandoned	64
Active	348
Inactive	138
Proposed, but never installed	110
Tot	tal 660

³⁷ US Environmental Protection Agency, *Pennsylvania Superfund Sites*, n.d. (accessed June 14, 2010); available from http://www.epa.gov/reg3hwmd/super/pa.htm 38 lbid.

<u>Abandoned Coal Mines:</u> The DEP Bureau of Abandoned Mine Reclamation continues to be a nationally-recognized leader in the restoration of land and water resources damaged by historical coal mining activities. In addition, DEP partnerships with stakeholders, such as the Slippery Rock Watershed Coalition for over 15 years, has led to the implementation of over 18 environmentally-friendly systems at abandoned sites in the watershed that treat an estimated total of about 750,000,000 gallons annually of abandoned mine drainage. (Refer to <u>www.datashed.org.</u>)

Development of Environmental Regulations for Coal Mining and Reclamation Efforts in PA Citizens of Pennsylvania have long recognized the impact of early mining practices on the environment. Interestingly, during World War II (1941 to 1945) the demand for coal was high and due to the need for diesel fuel for the war effort, mine land reclamation was discouraged. A brief overview, therefore, of the laws, regulations, and programs relating to the initiation of environmental practices is provided.

Year	Description
1945	PA Clean Streams Law (passed in 1937) amended to include acid mine drainage
1945	PA Surface Mining Conservation and Reclamation Act passed to regulate surface coal mining
1965	PA Clean Streams Law amended to define acid mine drainage as industrial waste, requiring all mines to treat drainage to specified standards
1968	Operation Scarlift with \$200 million (from \$500 million bond issue) to finance abandoned mine land reclamation
1968	PA Coal Refuse Disposal Control Act passed to help control pollution from coal refuse piles
1977	Federal Surface Mining Control and Reclamation Act passed to require active coal mines to restore lands, in most instances, to approximate original contour and to treat drainage to specified standards for perpetuity, if necessary
1980	PA Surface Mining Conservation and Reclamation Act amended to be equal to or more stringent than the Federal Surface Mining Control and Reclamation Act
1984	PA Noncoal Surface Mining and Conservation Act passed to regulate quarries and other industrial mineral mines
1992	PA Surface Mining Conservation and Reclamation Act amended to better protect water supplies and to provide incentives for remaining previously abandoned areas
1994	PA Mine Subsidence and Land Conservation Act amended to include better protection of water supplies affected by underground coal mining
1994	PA Coal Refuse Disposal Control Act passed to include siting of coal refuse disposal areas on previously affected mine lands
1996	PA Surface Mining Conservation and Reclamation Act amended to encourage private reclamation of abandoned mine lands through remining
1998	Reclaim PA initiated to form partnerships with stakeholders to reclaim abandoned mine lands and to treat abandoned mine drainage
1999	PA Growing Greener initiated to provide grants to stakeholders that included reclamation of abandoned mine lands and treatment of abandoned mine drainage

Table 3.3:	Timeline of	Selected	Minina	Regulations	& Reclamation	on Efforts in PA ^{39 40}

http://www.portal.state.pa.us/portal/server.pt/community/pa's comprehensive plan for abandoned mine reclamation/13964

³⁹ Lehigh Earth Observatory and Lehigh University. *EnviroSci Inquiry: Laws and regulations Concerning Coal Mining*, 2004 (accessed January 27, 2011); available from http://www.leo.lehigh.edu/envirosci/enviroissue/amd/links/laws1.html ⁴⁰ Pennsylvania Department of Environmental Protection, *Pennsylvania's Comprehensive Plan for Abandoned Mine Reclamation*, 1998

⁴⁰ Pennsylvania Department of Environmental Protection, *Pennsylvania's Comprehensive Plan for Abandoned Mine Reclamation*, 1998 (accessed January 27, 2011): available from

Numerous abandoned mine sites, however, remain in the Slippery Rock Creek Watershed and the US Department of Interior, Office of Surface Mining Reclamation and Enforcement **(OSM)** has classified about 200 additional abandoned sites in the watershed according to the potential danger to public health and safety and impacts to the environment, public facilities, etc. In addition to the following table, Appendix 3.2 provides a description of each problem type listed in the priority designations.

Priority	/ Description	
1	Poses the most serious threat to health, safety, and general welfare of people	5
2	Poses a threat to health, safety, and general welfare of people	13
3	Causes environmental impact	243
4	Adversely impacts public facilities like utilities, roads, and recreation & conservation facilities	0
5	Adversely impacts development of publicly-owned land for historic, conservation, reclamation, and open space benefits	0

Table 3.4: OSM Abandoned Mine Land Reclamation Priority Sites in the SRCW⁴¹

As noted in the above table, there are 5 abandoned mine sites which have been given the highest priority for reclamation, 13 that also pose a threat to the health, safety, and general welfare, and 243 that cause environmental problems within the Slippery Rock Creek Watershed. Depicted on Plate 3.13, OSM Abandoned Mine Land Priority Areas, are the locations of the priority areas identified by OSM and problem area sites identified in the SRCW. Note that 13.5% or 55.1 square miles (35,264 acres) within the SRCW have been impacted by abandoned mining activities and are in need of reclamation. (Refer to Section 7, Management Options.)

<u>Sinkholes:</u> A sinkhole is a feature of the landscape in which there is downward movement of surface material due to physical and chemical weathering of carbonate bedrock. With most carbonate rock forming in the central and eastern parts of the state, there is little natural subsidence from the carbonate rock in the SRCW. Some minor, occasional sinkholes have been noticed in areas where the Vanport limestone is at or near the surface.

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⁴¹ US Department of Interior—Office of Surface Mining, *Reclamation and Enforcement*, n.d. (accessed January 27, 2011); available from http://www.osmre.gov/aml/

Osborne Landfill (OSM, n.d.)

Current Site Information EPA Region 3 (Mid-Atlantic) Pennsylvania Mercer County ½ mile east of Grove City

EPA ID# PAD980712673 3rd Congressional District Other Names Cooper Bessemer Landfill

Current Site Status

Under a Consent Order with the U.S. Environmental Protection Agency (EPA), Cooper Industries installed a line of deep wells between the site and the Grove City wells to protect the water supplies. Earlier studies indicated that the deep groundwater under the site was flowing towards the Grove City municipal wells. These wells have tested clean to date. EPA also conducted additional studies of site wetlands and completed a Remedial Investigation and Feasibility Study (RI/FS) for groundwater. A ROD for groundwater and the wetlands was signed on December 30, 1997. The ROD selected No Action for the wetlands, and Natural Attenuation with monitoring for groundwater. The site is a "Construction Complete", with groundwater monitoring. The second Five Year Review was completed August of 2005. As determined during the previous Five Year Review, the remedial actions constructed for this site remain protective of human health and the environment. The constructed remedies are functioning as intended and there are no current exposure pathways. The remedies, which included the landfill leachate collection system, the landfill cap and slurry wall, groundwater monitoring and institutional controls which are in place and include prohibitions on the use or disturbance of groundwater until cleanup levels are achieved and prohibitions on new wells within the property containing the landfill continue to achieve the Remedial Action Objective for the Site. The responsible parties came to discuss streamlining the groundwater monitoring program with monitoring wells which have reached the performance standards. EPA asked the responsible parties to provide more hydrological information with the various water aquifers and will evaluate the information once it is submitted to determine if any streamlining of the monitoring program can occur. A Five Year Review is due September 2010.

Site Description

The 15-acre Osborne Landfill is located on an abandoned strip mine in Pine Township, Pennsylvania. The landfill was used for waste disposal from the 1950s until 1978, when the State closed it for accepting industrial wastes without a permit. These waste materials included spent paint, asbestos, solvents, waste coolants, waste sand, waste acid, scrap metal, cooling system sludge, slag, and waste oils. More than 500 drums had been left at the site; many were crushed, rusted, or bulging. Site contaminants in the fill included high levels of lead, benzene, trichloroethene, PCBs and carcinogenic polyaromatic hydrocarbons. Nearby Grove City has approximately 8,100 residents. Site ground water contained vinyl chloride, a very carcinogenic organic compound, at over twenty times the drinking water standard. Municipal wells are within one mile of the site. One resident was drinking water contaminated with vinyl chloride at about 15 parts per billion, while the drinking water standard only allows 2 parts per billion. The property is surrounded by woods, wetlands, light residential development, and farmland.

Site Responsibility

This site is being addressed through federal, state, and potentially responsible parties' actions.

NPL Listing History

This site was proposed to the National Priorities List of the most serious uncontrolled or abandoned hazardous waste sites requiring long-term remedial action on December 30, 1982. The site was formally added to the list September 8, 1983, making it eligible for federal cleanup funds.

Threats and Contaminants

On-site ground water and leachate were contaminated with various heavy metals, volatile organic compounds (VOCs), and pentachlorophenol (PCP) from the former waste disposal practices. The soil contained heavy metals including arsenic and lead, VOCs, and polychlorinated biphenyls (PCBs). Onsite surface water was contaminated with VOCs. Possible health hazards included accidental ingestion or coming in direct contact with contaminated groundwater, soil, or surface water. Wetlands and a swamp near the site were contaminated with very low levels of PCBs.

Contaminant descriptions and risk factors are available from the <u>Agency for Toxic Substances and</u> <u>Disease Registry</u>, an arm of the CDC.

Cleanup Progress

Cooper Industries, a potentially responsible party, built a security fence around the site and posted it with warnings to prevent unauthorized access in 1983. They also removed and disposed of 83 filled drums, 460 empty drums, and 45 cubic yards of contaminated soil. In 1994, Cooper Industries extended a public water line on the east side of the site in reaction to high levels of contamination found in a resident's well. This virtually completed a loop which now supplies residents at risk near the perimeter of the site with municipal water.

Under a Consent Order with Pennsylvania, Cooper Industries conducted a Remedial Investigation of the site, but was unwilling to comply with all of the conditions required by the state. In 1988, at the request of the State, the EPA took over the investigation and completed an intensive study of site conditions and other required reports. On September 28, 1990, the EPA chose a remedy (Record of Decision) for the fill material, the on-site water table, and the shallow aquifer. After long negotiations, EPA was unable to obtain an agreement with the Responsible Parties. EPA issued a Unilateral Order to Cooper Industries in March 1991 to install a slurry wall, clay cap, and leachate treatment system. General Electric contributed a cash settlement to reimburse EPA for past costs. A slurry wall has been installed over the fill to reduce leaching of contaminants. In addition, leachate is being extracted from the fill area, treated, and reinjected into the on-site mine pool. The construction of the remedy for the fill area was completed during the summer of 1997. The leachate treatment system has operated for several years.

The second Five Year Review was completed August of 2005. As determined during the previous Five Year Review, the remedial actions constructed for this site remain protective of human health and the environment. The constructed remedies are functioning as intended and there are no current exposure pathways.

APPENDIX 3.2

Descriptions of OSM Abandoned Mine Lands Priorities 1, 2, 3, 4, 5 Problem Types⁴²

Problem Type	Symbol	Measured As
Clogged Stream Lands	CSL	Acres
Clogged Streams	CS	Miles
Dangerous Highwall	DH	Linear Feet
Dangerous Impoundments	DI	Count
Dangerous Pile and Embankment	DPE	Acres
Dangerous Slides	DS	Acres
Gases: Hazardous/Explosive	GHE	Count
Hazardous Equipment & Facilities	HEF	Count
Hazardous Water Body	HWB	Count
Industrial/Residential Waste	IRW	Acres
Polluted Water: Ag, and Industrial	PWAI	Count
Polluted Water: Human Consumption	PWHC	Count
Portals	Р	Count
Subsidence	S	Acres
Surface Burning	SB	Acres
Underground Mine Fire	UMF	Acres
Vertical Opening	VO	Count

<u>CS - Clogged Stream</u>: Any filling of a stream bed, usually in a narrow valley, with AML-originated silt and debris sedimentation carried downstream by surface runoff. The sedimentation causes temporary blocking of the stream and flooding, posing a danger to improved property and human health, safety and welfare. Clogged streams are measured in miles of stream that will be dredged to abate the problem. Those problems related to saturated ground caused by mine drainage water adversely impacting domestic water supply, human health condition or the structural integrity of an occupied dwelling shall not be assigned to the CS or CSL keyword. Rather, problems associated with domestic water supply or human health condition can be considered as a Polluted Water Human Consumption (PWHC); problems associated with structural integrity can be considered as a Dangerous Slide (DS).

<u>CSL</u> - <u>Clogged Stream Lands</u>: Any filling of a stream bed, usually in a narrow valley, with AML-originated silt and debris sedimentation carried downstream by surface runoff. The sedimentation causes temporary blocking of the stream and flooding, posing a danger to improved property and human health, safety and welfare. Clogged streams are measured in miles of stream that will be dredged to abate the problem. Any AML-related surface mining spoil pile and bank, mine waste and earth material disturbed by mining activity which would be eroded and carried downstream by surface runoff, and deposited in a stream bed (thus causing a clogged stream). This silt erosion contributes to stream sedimentation and causes local flooding resulting in property damage and a human health, safety and general welfare threat. Clogged stream lands are measured in acres of land affected by spoil, mine waste and earth material that are directly contributing to the clogged stream. Those piles and banks which are identified and included in DH (dangerous highwall), DS (dangerous slide) and DI (dangerous impoundment) shall not be repeated for CSL problems.

<u>DPE - Dangerous Pile or Embankment:</u> Any filling of a stream bed, usually in a narrow valley, with AML-originated silt and debris sedimentation carried downstream by surface runoff. The sedimentation causes temporary blocking of the stream and flooding, posing a danger to improved property and human health, safety and welfare. Clogged streams are measured in miles of stream that will be dredged to abate the problem. An AML-related mine waste pile or bank located within close distance to a populated area, public road, or other area of intense visitation, and posing a danger to public health, safety and general welfare by adverse effect resulting from an unstable steep slope or wind-blown particulate matter.

<u>DH - Dangerous Highwall:</u> Any filling of a stream bed, usually in a narrow valley, with AML-originated silt and debris sedimentation carried downstream by surface runoff. The sedimentation causes temporary blocking of the stream and

⁴² US Department of Interior—Office of Surface Mining Reclamation, *Priority 1 and 2 Problem Types*, n.d. (accessed January 17, 2011); available from http://www.osmre.gov/aml/priority1_2.shtm.

flooding, posing a danger to improved property and human health, safety and welfare. Clogged streams are measured in miles of stream that will be dredged to abate the problem. Any AML-related unprotected unreclaimed highwall located in close proximity to a populated area, public road, or other area of intense visitation, and posing a threat to public health, safety and general welfare by falling from a highwall or for being hit by falling rock.

DI - Dangerous Impoundment: Any AML-related large-volume water impoundment such as a mine waste embankment, sedimentation pond, or underground mine water pool which poses a threat of flooding and catastrophic destruction to downstream property and human health, safety, and general welfare in the event of rupture or breach of the water retention structure. The description of a DI must give evidence of a weak, unstable, or otherwise inadequate impounding structure, such as lack of an emergency spillway or improper primary spillway.

DS - Dangerous Slide: Any AML-related land mass slide of surface-subsurface soil, mine waste pile or bank, or surface mine spoil due to instability of its own weight or lubricating effects of mine drainage water, that endangers human health, safety and general welfare and destruction of improved property located uphill or downhill from the land mass.

GHE - Hazardous or Explosive Gases: AML-related dilapidated hazardous equipment or facilities located within close proximity to populated areas, along public roads, or other areas of intense visitation.

HEF - Hazardous Equipment or Facilities: Any AML-related dilapidated hazardous equipment or facilities located within close proximity to populated areas, along public roads, or other areas of intense visitation.

HWB - Hazardous Recreational Water Body: Any nonpolluted, impounded water, regardless of depth or surface area, that is considered an attractive nuisance and is located within close proximity to a populated area, public road, or other areas of intense visitation. The hazard must result from some AML-related feature(s) such as steep or unstable banks, hidden underwater ledges, or rocks or debris on the bottom. The fact that a pond is present is not sufficient evidence of a hazard.

IRW - Industrial or Residential Waste: Unauthorized use of AML-impacted areas for residential or industrial waste disposal that poses a danger to public health, safety and general welfare from unsanitary conditions or from the toxic emissions from the burning refuse.

P - Portal: Any AML-related surface entrance to a drift, tunnel, adit or entry which is not sealed or barricaded, and is located within close proximity to a populated area, public road or other area of intense visitation, posing a threat to public safety and general welfare.

PWAI - Polluted Water: Agricultural/Industrial: Any surface or subsurface water used for agricultural or industrial purposes which does not meet standards (especially those for suspended solids, acid or alkaline conditions, heavy metals concentrations, or radioactivity) because of AML-related impact. (Note: the water must currently be in use, and current test results demonstrating pollution are recommended to be submitted with the Form OSM-76.)

PWHC - Polluted Water: Human Consumption: Any surface or subsurface water used for human consumption or recreational waters used for swimming that does not meet standards (especially those for suspended solids, acid or alkaline conditions, heavy metals concentrations, or radioactivity) because of AML-related impact. (Note: the water must currently be in use, and current test results demonstrating pollution are recommended to be submitted with the Form OSM-76.)

S - Subsidence-Prone Area: Any surface expression of AML-related subsidence such as tension cracks, potholes, troughs, shearing faults, or caving caused by AML-related underground mine voids which damages property and poses danger to human safety, health and general welfare. The age of the subsidence occurrence is limited to the past 5 years.

SB - Surface Burning: Any AML-related continuous combustion of mine waste material resulting in smoke, haze, heat, or venting of hazardous gases located within close distance to a populated area, public road or other public use area and posing a danger to public health, safety and general welfare. Burning must currently be occurring or be demonstrated to occur on a regular basis. Burning in a mine dump, even if beneath the surface of the material, is surface burning.

UMF - Underground Mine Fire: Any AML-related continuous smoke, haze, heat, or venting of hazardous gases from underground mine coal combustion posing a danger to public health, safety and general welfare.

VO - Vertical Opening: Any AML-related vertical or steeply-inclined shaft or opening which is not sealed or barricaded, or a subsidence-caused opening that is more than 5 years old and has become a hazard, regardless of proximity to populated areas, public road or other area of intense visitation, posing a threat to the public health, safety and general welfare.

Problem Type	Symbol	Measured As
Bench	BE	Acres
Industrial/Residential Waste	DP	Acres
Equipment/Facilities	EF	Count
GOB Piles	GO	Acres
Highwall	H	Feet
Haul Road	HR	Acres
Mine Openings	МО	Count
Other	0	
Pits	PI	Acres
Spoil Area	SA	Acres
Slurry	SL	Acres
Slump	SP	Acres
Water Problems	WA	Ga./Minute

OSM Abandoned Mine Lands Priority 3 Problem Types⁴³

<u>BE</u> - <u>Bench</u>: A ledge that forms a single level operation along which mineral or waste materials are excavated. A solid bench is that portion of a bench formed on a solid unexcavated material. A fill bench is that portion of a bench usually consisting of unconsolidated spoil material extending outward from the solid bench. Those problems related to saturated ground caused by mine drainage water adversely impacting domestic water supply, human health condition or the structural integrity of an occupied dwelling shall not be assigned to the CS or CSL keyword. Rather, problems associated with domestic water supply or human health condition can be considered as a Polluted Water Human Consumption (PWHC); problems associated with structural integrity can be considered as a Dangerous Slide (DS).

<u>DP - Industrial or Residential Waste Dumps:</u> An area used to dispose of any kind of industrial or residential waste not related to mining or processing.

EF - Equipment and Facilities: Any equipment or buildings used to mine, process or transport coal or mineral ores.

<u>GO - Gob:</u> The refuse or waste removed from an underground mine. This includes mine waste, rock, pyrites, slate or other unmarketable materials which are separated during the cleaning process.

<u>H - Highwall:</u> The face of exposed overburden or the face or bank on the uphill side of a contour strip mine excavation. The vertical wall consisting or the deposit being mined and the overlying rock and soil strata of the mining site.

<u>HR - Haul Road:</u> A road built to carry loaded trucks from mine heads. A road from pit to loading dock, tipple, ramp or preparation plant, used for transporting mined material by truck.

<u>MO - Mine Opening</u>: Any surface entrance or opening related to an underground mine excavation.

O - Other: An area causing an environmental impact that does not fit one of the other Priority 3 definitions.

<u>PI - Pit, Open Pit, Strip Pit:</u> The last uncovered cut adjacent to the highwall. In surface mining the working area may be known as strip pit. Mine workings or excavations open to the surface are also termed pit.

SA - Spoil, Spoil Bank: The overburden material removed in gaining access to the coal seam or mineral deposit.

<u>SL - Slurry:</u> Fine particle-size material from coal or mineral processing stored in a pond. Solid must be separated from the water in order to have clear effluent for reuse or discharge.

<u>SP - Slump:</u> Any surface expression resulting from the caving in of underground mine voids.

<u>WA - Water</u>: Water leaving the AML Problem Area and causing environmental impacts because of its pH (acidity), sediment load, or other pollutants or because of its effect on other lands due to poor drainage conditions (e.g. agricultural flooding).

⁴³ Ibid.
OSM Abandoned Mine Lands Priority 4 and 5 Problem Types⁴⁴

Priority 4

The protection, repair, replacement, construction, or enhancement of public facilities such as utilities, roads, recreation, and conservation facilities adversely affected by coal mining practices.

Priority 5

The development of publicly owned land adversely affected by coal mining practices including land acquired as provided in SMCRA for recreation and historic purposes, conservation, and reclamation purposes and open space benefits.

⁴⁴ Ibid.



























SECTION 4—WATER RESOURCES

A. INTRODUCTION

Good water quality is essential to the health and productivity of humans, plants, and animals. Water provides support for a variety of human needs such as drinking water, supplies for industry and local businesses, agriculture, and recreation. Throughout the Slippery Rock Creek Watershed **(SRCW)**, the creeks and streams are vital to the stakeholders. This chapter of the Slippery Rock Creek Watershed Conservation Plan will briefly address water resources:

Basic elements

Function

Purpose

• Future challenges

B. <u>"WATERSHED ADDRESS"</u>

<u>Pennsylvania Watershed Information</u>: The Pennsylvania Department of Environmental Protection **(DEP)** uses a cataloging system consisting of six drainage basins that are then divided into watersheds named for the receiving stream within the drainage basin. The Slippery Rock Creek Watershed is located in the Ohio sub-basin (listed by the DEP as sub-basin number 20). The Ohio River begins at the confluence of the Allegheny and Monongahela Rivers in Pittsburgh. The sub-basin has a total drainage area of 3084 square miles and encompasses all of Beaver and Lawrence Counties, much of Mercer, Butler, Allegheny, and Washington Counties, and small portions of Crawford, Venango and Greene Counties.¹

Within sub-basin number 20 is the Slippery Rock Creek Watershed, which is referred to as 20C.² Major streams include Slippery Rock Creek, Brush Creek, and Connoquenessing Creek with a total drainage area of 836 square miles. For the purposes of state watershed conservation plans, however, 20C has been further divided into the 428-sq. mi. Connoquenessing Creek Watershed and the 408-sq. mi. Slippery Rock Creek Watershed.

<u>US Geological Survey Hydrologic Unit Code</u>: The US Geological Survey **(USGS)** has developed a system for cataloging as well as describing the location of surface water resources in the United States. Eighteen Water Resource Regions are recognized nationally by the USGS, which further divides these regions into subregions, then accounting units, and finally into cataloging units, which results in a specific Hydrologic Unit Code **(HUC)** also referred to as a watershed's "address."³ Pennsylvania has three regions: Great Lakes, Ohio, and Mid-Atlantic. The USGS designates the Slippery Rock Creek Watershed to be part of the Connoquenessing Creek Watershed. HUC code **05030105** is depicted in Figure 4.1 and is described as follows:

Region 05: All waterways draining into the Ohio River Basin (excludes Tennessee River Basin)

Subregion 03: Upper Ohio

Accounting Unit 01: Upper Ohio-Beaver

Cataloging Unit 05: Connoquenessing

¹ Pennsylvania Department of Environmental Protection. *Watershed Notebook*. 2009 (accessed May 27, 2010); available at <u>http://www.dep.state.pa.us/redirector/?varURL=http://www.epa.gov/surf2/hucs/05030105/</u>

² Ibid.

³U.S. Geological Survey . *Hydrologic Unit Maps: What are Hydrologic Units*? 2010 (accessed on May 25, 2010); available at http://water.usgs.gov/GIS/huc.html



Figure 4.1: Pennsylvania Hydrologic Unit Codes (HUC)

C. MAJOR TRIBUTARIES

Within the 408-sq. mi. Slippery Rock Creek Watershed are the following major streams: Slippery Rock Creek, Muddy Creek, Wolf Creek, Black Run, South Branch Slippery Rock Creek, McMurray Run, and North Branch Slippery Rock Creek. Details of the major tributaries, also provided in Section 1, Project Characteristics, are listed in Table 4.1 and depicted on Plate 4.1: Water Resources.

Major Streams	Stream Order (at mouth)	Length (miles)	County		
Slippery Rock Creek	6 th	51.4	Lawrence, Butler		
Muddy Creek	4 th	22.8	Lawrence, Butler		
Wolf Creek	5 th	27.9	Butler, Mercer		
East Branch Wolf Creek	4 th	7.9	Mercer, Venango		
Black Run	4 th	6.8	Mercer		
South Branch Slippery Rock Creek	4 th	14.5	Butler		
McMurray Run	4 th	8.6	Butler		
North Branch Slippery Rock Creek	4 th	9.9	Butler, Venango		
	Total	149.8			

Table 4.1:	SRCW	Major	Streams ⁴
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 $^{^{\}rm 4}$ GIS compiled from data collected by the Southwest Pennsylvania Commission and PASDA.

D. SUBWATERSHEDS

The Slippery Rock Creek Watershed may locally be divided into 30 subwatersheds as listed in the table below and on Plate 4.2:

County	Subwatershed
Beaver	Slippery Rock Creek
	Cheeseman Run
	Bear Run
	Muddy Creek
	Big Run
	Shannon Run
	Swamp Run
	Black Run
Butlor	Hogue Run
Duller	Big Run
	Glade Run
	Findlay Run
	South Branch Slippery Rock Creek
	Christy Run
	Seaton Creek
	McMurray Run
	Swamp Run
Butler Venenge	Blacks Creek
Butter, venango	North Branch Slippery Rock Creek
Moreor Venenge	Wolf Creek
wercer, venango	East Branch Wolf Creek
Morcor	Black Run
Wercer	Barmore Run
	Jamison Run
	Taylor Run
Lawronco	Brush Run
Lawrence	Hell Run
	Skunk Run
	Grindstone Run

Table 4.2: Subwatersheds in the SRWC⁵

E. STREAM EVALUATIONS

DEP has established water quality standards for all surface waters in the Commonwealth of Pennsylvania. These standards, which are designed to safeguard streams, rivers, and lakes, consist of use designations and criteria necessary to protect the uses⁶.

Water quality standards in Pennsylvania, which are provided in PA Code Title 25, Chapters 92 and 93, are designed to implement the requirements of the PA Clean Streams Law (Sections 5 and 402) and the Federal Clean Water Act (Section 303-33 U.S.C.A. §1313). The water quality standards are developed to identify:

- Designated uses of the surface waters of the Commonwealth of Pennsylvania.
- Specific numerical narrative criteria necessary to achieve and maintain those uses.
- Antidegradation policy.

 ⁵ GIS compiled from data collected by the Southwest Pennsylvania Commission and PASDA.
 ⁶ Pennsylvania Department of Environmental Protection. 2010 (accessed on May 27, 2010); available at http://www.portal.state.pa.us/portal/server.pt/community/water_quality_standards/10556/stream_redesignations/553982

The PA Code Title 25, Chapter 93 provides a list of the designated water uses and water quality criteria. Water quality standards are in-stream water quality goals that are implemented by specific regulatory requirements, such as effluent limits on individual sources of potential pollution⁷. Designated water uses for streams in the Slippery Rock Creek Watershed are briefly described below:

Protected Use: Aquatic Life

- <u>Cold Water Fishes (CWF)</u> supports maintenance and propagation of fish species and additional flora and fauna which are indigenous to a cold water habitat.
- <u>Warm Water Fishes (WWF)</u> supports maintenance and propagation of fish species and additional flora and fauna which are indigenous to a warm water habitat.
- <u>Trout Stocking Fishes (TSF)</u> supports maintenance of stocked trout from February 15 to July 31 and maintenance and propagation of fish species and additional flora and fauna which are indigenous to a warm water habitat.

Protected Use: Special Protection

- <u>High Quality Waters (HQ)</u> are excellent quality and have environmental or other features that require special water quality protection. Based on at least 1 year of data, the surface waters exceed levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water.
- <u>Exceptional Value Waters (EV)</u> are high quality and meet additional conditions described in <u>http://www.pacode.com/secure/data/025/chapter93/s93.4b.html</u>.

In the Slippery Rock Creek Watershed, ninety streams have been assigned water quality standards under Chapter 93. The only EV stream in the watershed is Hell Run, which is also a natural trout stream. The majority of the streams are designated for the protection of CWF. Muddy Creek (from Source to Moraine State Park Dam) is a cold water fishery of high quality **(HQ-CWF)** however from the Moraine State Park dam to the mouth it is listed as a WWF⁸. Table 4.3 lists major streams with designations in the Slippery Rock Creek Watershed.⁹ Note that all tributaries to the major stream within the subwatershed (zone) also have the same protected use. To illustrate the subwatershed designation for the streams listed in Table 4.3, refer to Plate 4.3: Designated Stream Use.

Stream Name	Zone	County	Protected Water Use	Exceptions Toward Specific Criteria
Slippery Rock Creek	Basin, Source to Muddy Creek	Lawrence Butler	CWF	None
Muddy Creek	Basin, Source to Moraine State Park	Butler	HQ-CWF	None
Slippery Rock Creek	Basin, Muddy Creek to Hell Run	Lawrence	CWF	None
Hell Run	Basin	Lawrence	EV; Wild Trout Stream	None
Muddy Creek	Basin, Moraine State Park, Dam to Mouth	Butler Lawrence	WWF	None

Table 4.3: DEP Stream Desig	nations in the Slippery	<u>/ Rock Creek Watershed¹⁰</u>

⁷ Pennsylvania Code. Pennsylvania Department of Environmental Protection. Chapter 93 Water Quality Standards. n.d. (accessed on May 28, 2010); available at http://www.pacode.com/secure/data/025/chapter93/chap93toc.html

⁸ Ibid. ⁹ Ibid.

¹⁰ GIS compiled from data collected by the Southwest Pennsylvania Commission and PASDA.

F. <u>WETLANDS</u>

<u>DEP Description</u>: Wetlands are defined by the Commonwealth of Pennsylvania as, "Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions..."¹¹ Wetlands include what is commonly referred to as swamps and marshes. Wetlands are regulated by DEP (PA Code Title 25, Chapter 105) as well as by the US Army Corps of Engineers (Section 404 of the Clean Water Act).

<u>US Fish & Wildlife Service Description</u>: The US Fish & Wildlife Service **(USFWS)** provides information on wetlands nationwide through the National Wetlands Inventory **(NWI)**. There are two general categories of wetlands: coastal (including estuaries) and inland (including rivers, lakes and riparian areas).¹² In the SRCW, only inland wetlands are present.

Table 4.4: USFWS National Wetlands Inventory Types of Inland Wetlands in the SRCW¹³

Type of Wetland	Description
Freshwater emergent wetland	Herbaceous march, fen, swale and wet meadow
Freshwater pond	Pond
Riverine	River or stream channel
Lakes	Lake or reservoir basin
Other freshwater wetland	

<u>Wetlands in the Slippery Rock Creek Watershed:</u> Wetlands cover about 2.5% of Pennsylvania.¹⁴ Wetland types differ according to characteristics such as topography, hydrology, climate, vegetation, and water chemistry¹⁵. Based on the Cowardin classification system used by the US Fish and Wildlife Service, the following types of wetlands can be found in the SRCW:

Type of Wetland	Description	
Palustrine	Majority of vegetated freshwater wetlands including marshes, swamps, bogs and wet meadows	
Riverine	Includes freshwater rivers, stream channels, and immediately adjacent wetlands.	

In the Slippery Rock Creek Watershed, there are approximately 9,500 acres of wetlands, which equals approximately 4% (261,120 total acres or 408 mi²) of the total area. The majority of wetlands within the watershed are classified palustrine. As shown on Plate 4.1, most palustrine wetlands occur within the glaciated portion of the watershed in Mercer County. Only about 483 acres of riverine wetlands were classified within the SRCW, which are located within the banks of Slippery Rock Creek from the confluence with Connoquenessing Creek to roughly the Butler-Lawrence County border. The large lakes within the watershed were considered lacustrine wetlands; however, for the purposes of this report, they have been accounted for in Subsection I: Lakes and Ponds.

Page. http://www.npwrc.usgs.gov/resource/wetlands/classwet/index.htm

¹¹ Pennsylvania Code. *Title 25, Chapter 105 Dam Safety and Waterway Management.* n.d. (accessed on May 27, 2010); available at http://www.pacode.com/secure/data/025/chapter105/chap105toc.html

 ¹² U.S. Fish & Wildlife Service. National Wetlands Inventory. 2010 (accessed on May 29, 2010); available at http://www.fws.gov/wetlands/
 ¹³ Ibid.

 ¹⁴ Goodrich, Laurie J., Brittingham, Dr. Margaret. Wildlife Habitat in Pennsylvania: Past, Present, and Future. 2002 (accessed May 29, 2010); available at http://www.fish.state.pa.us/promo/grants/swg/nongame_plan/pa_wap_sections/appx2habitat_pt2.pdf
 ¹⁵ Gray, Ayesha. Brooks, Robert P., et all. Penn State Cooperative Wetlands Center Pennsylvania's Adopt-a-Wetland Program Wetland

 ¹⁵ Gray, Ayesha. Brooks, Robert P., et all. Penn State Cooperative Wetlands Center *Pennsylvania's Adopt-a-Wetland Program Wetland Education and Monitoring Module*. 2001 (accessed on May 27, 2010); available at http://old.geog.psu.edu/wetlands/manual/toc.html#top
 ¹⁶ Cowardin, L. M., V. Carter, F. C. Golet, E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U. S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. Jamestown, ND: Northern Prairie Wildlife Research Center Home

Wetlands can be further divided into subsystems based on the substrate (bottom), flooding regime, and vegetation. Table 4.6 shows the acreage of each subsystem of wetlands.

Wetland Type	Acres
Palustrine Aquatic Bed	131.8
Palustrine Emergent	925.7
Palustrine Forested	4,457.9
Palustrine Scrub Shrub	2,312.5
Palustrine Undconsolidated Bottom	1,162.7
Riverine Perennial	482.7
Total Acres	9,473.3

Table 4.6: Wetland Subsystem in the SRCW¹⁷

In addition to providing fish and wildlife habitat, wetlands are directly related to the water resources of an area by protecting and improving water quality, maintaining surface water flow during dry periods, and storing floodwaters.

G. FLOODPLAINS

Flooding is part of a river's natural cycle. Before dams and other types of containment were built, rivers would spread out during a flood, spilling onto adjacent lowlands, which are call 'floodplains.' The flood waters would settle and be absorbed, the flora and fauna would be refreshed and renewed, and the soil would be enriched by silt/sediment and organic material. Even having wetland coverage of 4 percent to 5 percent in a watershed can reduce peak floods by 50 percent¹⁸.

The federal Watershed Protection & Flood Prevention Act of 1954 authorizes federal assistance to local organizations for planning and construction of projects in watershed areas for conservation and use of land and water, and flood prevention¹⁹.

Statewide Flood Management Study: In 2006, the Pennsylvania Emergency Management Agency (PEMA) completed a statewide study of a 100-year flood event using the Federal Emergency Management Agency (FEMA) HAZUS-MH risk analysis software. The base study researched streams with a drainage area of at least 10 square miles and then computed damages in dollars for total economic loss, building and content damage, as well as other economic impacts. The study also estimated the number of damaged homes and the degree of damage to those homes. In 2007, PEMA concluded a new, broader statewide study using HAZUS-MH MR2 that includes damage estimates for 10-, 50-, 100-, 200- and 500-year flood events. The study computed damages in dollars for total economic loss, building and content damage, and other economic impacts. The study also estimated the number of damaged homes and the degree of damage to those homes.²⁰ To view the results of that study, visit http://www.fema.gov/plan/prevent/hazus/hz_pafldstudy.shtm.

¹⁷ GIS compiled from data collected by the Southwest Pennsylvania Commission and PASDA.

¹⁸Bucco, Gloria. Pennsylvania Department of Conservation and Natural Resources. Floodplains: Don't Mess with Mother Nature. 2008 (accessed on May 29, 2010); available at: http://www.dnr.state.ne.us/floodplain/PDF_Files/MotherNature_Part1.pdf

United States Army Corps of Engineers. Flood Risk Management. n.d. (accessed on May 29, 2010); available at http://www.usace.army.mil/CECW/PlanningCOP/Pages/flood.aspx ²⁰ Federal Emergency Management Agency. *Pennsylvania Emergency Management Completes Statewide Flood Study Using HAZUS-MH.*

^{2010 (}accessed on July 1, 2010); available at http://www.fema.gov/plan/prevent/hazus/hz_pafldstudy.shtm

County Flood Management Studies: All of the counties in the watershed have either final or preliminary draft Flood Management Studies that were completed by FEMA. Many of the drafts were completed in 2010. According to the studies, the main flooding problem for all waterways is the potential for flash flooding as a result of intense, localized thunderstorms. The main flooding season is usually the spring and summer months from April to September; however, flooding can occur at any time of the year. The various studies for each county can be found on the web at http://www.rampp-team.com/pa.htm. In Section 3, Land Resources, is a photograph of a flooding event at Boyers, PA.

FEMA Flood Insurance Rate Maps are often available to assist in reviewing a specific property or location. (FEMA contact information: website at http://www.fema.gov/, phone number 1-800-621-3362, TDD: 1-800-462-7585.) The US Army Corps of Engineers has additional information regarding Flood Risk Management at http://www.usace.army.mil/CECW/PlanningCOP/Pages/flood.aspx.

H. LAKES AND PONDS

There are several differences between lakes and ponds. The differences are listed in Table 4.7 and include size, creation, depth, chemistry, and influence on climate. The primary difference is size. Lakes are usually large while ponds are much smaller. Ponds often have the same temperature from top to bottom (uniform), whereas lakes can have dramatically different temperatures from the surface to the bottom waters²¹.

Attributes	Lakes	Ponds
Size	Larger	Smaller
Depth	Deeper	Shallower
Temp. (top vs. bottom)	Often dramatically different	Typically similar
Light penetration	Typically does not reach bottom in deep areas	Typically reaches bottom in all areas
Creation	Typically natural	Typically man-made
Climate impact	Large lakes can affect local climate	Typically greatly affected by local climate

Table 4.7: General Comparison of Lakes and Ponds²²

Intake water sources are rain and/or snow either directly by falling on the lake/pond or indirectly from streams/rivers, springs, and other drainage.

²¹ United States Environmental Protection Agency. Lakes Ponds and Reservoirs. 2010 (accessed on May 27, 2010); available at http://www.epa.gov/bioiweb1/aquatic/lake-r.html 22Ibid.

Figure 4.2: Water Intake/Outtake of a Lake²³



Water leaves the lake or pond by flowing into streams, seeping into the ground, or evaporating into the air. Lakes and ponds can lose water during the winter months to ice, which is mostly recovered in the spring when the ice thaws (some water is lost due to sublimation-evaporation directly from the ice).

The water contained in the lake is "one of the most treasured of our natural resources"²⁴. The Commonwealth of Pennsylvania contains 146,813 acres of lakes and ponds, much of which is used for recreation.²⁵ The Slippery Rock Creek Watershed contains approximately 4,733 acres of lakes and ponds which includes about 2% of the watershed.²⁶

Lakes available for public use in the SRCW include:

- <u>Coopers Lake</u> is a 10-acre lake that is part of a 500-acre, privately-owned campground. The lake is
 primarily used for fishing, boating (trolling motors only), and kayaking/canoeing. Swimming is prohibited.
 Cooper's Lake website provides additional information: <u>https://www.cooperslake.com/home/index.php.</u>
- <u>Harbar Acres Lake</u> part of State Game Lands #95, is stocked with trout and is also known for bass, crappie, bluegill and catfish. Information can be viewed at: <u>http://www.pagameandfish.com/fishing/trout-fishing/PA_0206_02/</u> and <u>http://www.fish.state.pa.us/hotspots.htm.</u>
- <u>Glade Dam Lake</u> is located in northern Butler County along SR-308 north of West Sunbury and just south of Moniteau High School. Glade Dam Lake is part of State Game Lands #95 and species of fish that have been reported include largemouth bass, catfish, and crappie. The Waterfowl Propagation Area, which is usually restricted, opens during the winter months for ice fishing.
- <u>Lake Arthur</u>, which is over 3,000 acres, is by far, the largest lake in the Slippery Rock Creek Watershed. Lake Arthur, located within Moraine State Park, is a man-made lake created by the damming of Muddy Creek. Prior to the lakes creation a large amount of reclamation had to be completed including sealing underground mines, reclaiming surface mines, and capping/plugging old oil and gas wells. The lake is primarily used for recreational activities such as boating, swimming, sailing, fishing, kayaking/canoeing, wind surfing, etc. Visit Moraine State Park's website for information including an activities calendar: http://www.dcnr.state.pa.us/stateparks/parks/moraine.aspx.

Several other privately-owned lakes and over 1500 ponds are also located in the Slippery Rock Creek Watershed.²⁷ Refer to Plate 4.1: Water Resources.

²³ Combat-fishing . *Ecology of Lakes & Ponds for Anglers and other fish-ites.* 2007 (accessed on May 27, 2010); available at http://www.combat-fishing.com/lakepondbalance.htm

 ²² Goodrich, Laurie J. Brittingham, Dr. Margaret. *Wildlife Habitat in Pennsylvania: Past, Present, and Future* 2002 (accessed on May 29, 2010); available at: http://www.fish.state.pa.us/promo/grants/swg/nongame_plan/pa_wap_sections/appx2habitat_pt2.pdf
 ²⁵ Ibid.

²⁶ GIS data acquired from USGS.

²⁷ United States Geological Survey National Hydrography Data set (USGS); available at <u>http://nhd.usgs.gov</u>

Table 4.8: USGS-Recognized Named Lakes in the SRCW					
Name	Size (apx. ac.)	Fish	Municipality (twp.; borough)	County	
Coopers Lake	10.6	Trout, Bass, Catfish, Perch, Bluegills	Worth	Butler	
Harbor Acres Lake	14.3	Brown and Brook Trout, Bass, Crappie, Bluegill, Catfish	Washington	Butler	
Watts Lake	7.2	N/A – private facility	Springfield	Mercer	
Tamarack Lake	17.1	N/A – private facility	Worth	Butler	
Hide-Away Lake	11.1	N/A – private facility	West Liberty	Butler	

Table 4.9. UCOC Decembra d Name d Lakes in the CDOW²⁸

See also Table 4.9: Lakes with DEP-Regulated Dams.

Table 4.5. Lakes with DEI -Regulated Dams in the OROW					
Name	Size	Fish	Municipality	County	
(Yr. Built; DEP #)	(apx. ac.)	1 1311	(twp.; <i>borough</i>)	County	
Glade Dam Lake	170.0	Largemouth Bass Catfish Rainbow Trout	Washington	Butler	
(1973-1974; D10-072)	170.0	Largemouth Dass, Cathsh, Rambow Hout	Cherry	Dutier	
Lake Arthur	2 075 2	Northern Pike, Largemouth Bass, Channel	Muddy Creek	Putlor	
(1966-1968; D10-068)	3,075.Z	Catfish, Black Crappie, Bluegill	Franklin	Dullei	
Barmore Lake ^a	21.5	N/A private facility	Dino	Moreor	
(prior to 1861; D43-007)	21.5	N/A – private raciiity	FILLE	wercer	

Table 4.9. Lakes with DEP-Regulated Dams in the SRCW²⁹

^aInterestingly, Barmore Lake, with the dam built prior to the Civil War, has been historically used for water power and ice harvesting. This lake is owned by the Barmore Country Club.

I. USGS DATA MONITORING STATIONS

The US Geological Survey (USGS) operates a network of 229 continuous-record, streamflow-gaging stations on rivers and streams throughout Pennsylvania. These and other hydrologic-monitoring stations are operated and maintained in cooperation with the DEP, the US Army Corps of Engineers (USACE), the National Weather Service (NWS), and various other federal, state, and local agencies. At 189 of the continuous-record stations, the recorded stream stages are transmitted on a near-realtime basis by way of satellite telemetry to the USGS computer in Lemoyne, PA and to other federal, state, and local agencies in the Commonwealth.³⁰ During normal streamflow conditions, the stations transmit stream-stage data every 4 hours; during floods, the data are transmitted, on average, every 15 minutes. Numerous agencies use the data to initiate evacuations and manage emergency response.

Gaging stations enable the automatic monitoring of streams, wells, lakes, reservoirs, and other water bodies. Instruments at these stations collect information such as water height, discharge, water chemistry and water temperature.³¹ These stations transmit data directly to the designated USGS facility via a satellite communication system. The data are then processed and delivered to the public via the internet (as shown in Figure 4.3 below).

June 2011

²⁸ GIS compiled from data collected by the Southwest Pennsylvania Commission , USGS, and PASDA.

²⁹ Ibid.

³⁰ United States Geological Survey. Statewide Floods in Pennsylvania. 1996 (accessed on May 28, 2010); available at http://water.usgs.gov/wid/FS_103-96/FS_103-96.html

Geology.com. What is a Gaging Station? Stream Discharge Monitoring. 2010 (accessed on May 30, 2010); available at http://geology.com/articles/gaging-station.shtml



Figure 4.3: Data Transfer from the USGS Gaging Station to Computer³²

The USGS stream-gaging program provides a continuous, well-documented, well-archived, unbiased, and broad-based source of reliable and consistent water data. The information can be utilized to aid in managing water resources nationally. Current data are necessary for:

- Forecasting flow extremes
- Making water-management decisions •
- Assessing current water availability
- Managing water quality •
- Meeting legal requirements.

The USGS has 2 active and 2 inactive gaging stations and 11 monitoring stations in the SRCW which are listed in Tables 4.10 and 4.11 as well as illustrated on Plate 4.1.

Table 4.10. 0303 Gaging Stations in the SRCW						
Gaging Station with General Location	Site Number	County	Municipality (twp; borough)	Status		
Slippery Rock Creek at Wurtemburg, PA	3106500	Lawrence	Wayne	Active		
Lake Arthur at Moraine State Park	3106280	Butler	Worth	Inactive		
Muddy Creek near Portersville, PA	3106300	Butler	Worth	Active		
Wolf Creek near Slippery Rock, PA	3106140	Mercer	Liberty	Inactive		

Table 4.10:	USGS	Gaging	Stations	in	the	SRCW ³³
	0000	ouging	otations			

³² Geology.com. What is a Gaging Station? Stream Discharge Monitoring. 2010 (accessed on May 30, 2010); available at http://geology.com/articles/gaging-station.shtml Ibid.

³³ GIS compiled from data collected by the Southwest Pennsylvania Commission , USGS, and PASDA.

Table 4.11: USGS Monitoring Stations in the SRCW ^{3*}						
Stream Name with General Location	Site Number	County	Municipality (twp; borough)			
Slippery Rock Creek at Wurtemburg, PA	3106500	Lawrence	Wayne			
Muddy Creek near Portersville, PA	3106300	Butler	Muddy Creek			
Slippery Rock Creek at Crolls Mills, PA	3106050	Butler	West Liberty			
Jamison Run at Elliotts Mills, PA	3106160	Lawrence	Plain Grove			
Slippery Rock Creek at Moores Corners, PA	3106153	Butler	Worth			
South Branch Slippery Rock Creek near Branchton, PA	3106045	Butler	Cherry			
McMurray Run near Branchton, PA	3106040	Butler	Cherry			
North Branch Slippery Rock Creek at Atwells Crossing, PA	3106035	Butler	Marion			
Slippery Rock Creek at Boyers, PA	3106030	Butler	Boyers			
East Branch Wolf Creek near Grove City, PA	3106108	Mercer	Pine			
Wolf Creek near Grove City, PA	3106100	Mercer	Worth			

J. RUN-OF-THE-RIVER DAMS

The Slippery Rock Creek Watershed has a number of run-of-the-river dams. A run-of-the-river dam according to the PA Dam Safety and Encroachments Act (P.L. 1375, No. 325 dated 11/26/1978) "is a manmade structure which is built across a river or stream for the purposes of impounding water where the impoundment at normal flow levels is completely within the banks and all flow passes directly over the entire dam structure within the banks, excluding abutments, to a natural channel downstream; and [where] DEP determines [the dam] to have hydraulic characteristics such that at certain flows persons entering the area immediately below the dam may be caught in the backwash."³⁵ Historically, these dams were typically built to use the power of the stream to mill grain.

Name	County	Municipality (twp; borough)	Construction Material	Year Built	Current Use	Historic Use	Stream
Bovard Dam	Butler	Cherry	Concrete/stone	1834		N/A	
Park Dam	Butler	Slippery Rock	Concrete	1956	Recreation	N/A	~
Crolls Dam	Butler	Brady	Timber	N/A		N/A	ocl
McConnells Mill	Lawrence	Slippery Rock	Concrete	N/A	Recreation	Mill	ъ ж
Kennedy Mill	Lawrence	Slippery Rock	Concrete	pre-1919		Mill	ery ree
Sara Heinz House Dam	Lawrence	Slippery Rock	Timber	1925	Recreation	N/A	မီဂ
Slippery Rock Dam– Wurtemburg	Lawrence	Perry	N/A	1967	Public water supply	N/A	Slip
Ward Dam	Butler	Slippery Rock	Concrete/stone	N/A		Mill	

Table 4.12: Run-of-the-River Dams in the SRCW³⁶

Note: There are no known remaining run-of-the-river dams on streams other than Slippery Rock Creek.

Run-of-the-river dams have been removed in the Slippery Rock Creek Watershed for habitat restoration and for safety reasons. Most recently, American Rivers improved safety at Camp Allegheny of the Salvation Army by removing the Fairless Murray Dam in April 2010 through the efforts of Beran Environmental Services (a local business in the SRCW in Boyers, PA), the PA Fish and Boat Commission (FBC), and the DEP. The dam had been a safety hazard for young campers for years and had claimed several lives. Removing the dam also helped to increase habitat connectivity and to restore four miles of Slippery Rock Creek. The project was funded by the PA Growing Greener Program. Lisa Hollingsworth-Segedy (AICP, Associate Director of River Restoration for American

³⁴ GIS compiled from data collected by the Southwest Pennsylvania Commission , USGS, and PASDA.

³⁵ Pennsylvania Fish and Boat Commission, Run of the River Dams (accessed 2/1/11) http://www.fish.state.pa.us/rrdam.htm

³⁶ Geographic Information Systems complied from data collected by the Southwest Pennsylvania Commission and PASDA

Rivers) can be contacted for further information at 412-727-6130 or by email at LHollingsworth-Segedy@americanrivers.org.³⁷

Name	County	Municipality (twp; borough)	Stream	Construction Material	Year Built	Date Removed	Historical Use
Cunningham Memorial Dam	Mercer	Pine	Wolf Creek	N/A	N/A	2005	Mill; electricity generation
Camp Allegheny Fairless Murray Dam	Lawrence	Wayne	Slippery Rock Creek	N/A	N/A	2010	N/A
Unnamed Dam	Mercer	Pine	Wolf Creek	Concrete	N/A	2005	N/A

Table 4.13: Run-of-the-River Dams Removed in the SRCW³⁸

K. WATER QUALITY

The condition of the water resources (wetlands, floodplains, lakes and ponds) within the SRCW is largely a result of water quality. In 1997, DEP first implemented the Statewide Surface Waters Assessment Program and completed assessment of all "wadeable" sections of streams and rivers in 2006. Numerical or narrative water quality criteria were used to express the in-stream levels of substances in order to sustain the appropriate designated use relating to aquatic life, water supply, recreation, and fish consumption.

Section 305(b) of the federal Clean Water Act requires periodic reports on the quality of waters in the Commonwealth.³⁹ Section 303(d) of the Clean Water Act requires states to list all impaired waters not supporting uses even after appropriate and required water pollution control technologies have been applied. The source of impairment is listed, which may be one or more point sources (like industrial or sewage discharges), or non-point sources (such as abandoned mine lands or agricultural runoff).⁴⁰ Degraded streams with cause of impairment in the SRCW are shown on Plate 4.1: Water Resources.

For aquatic life, negative impacts are identified primarily through stream biological community assessments. For streams that are used for water supplies, negative impacts are identified by evaluating the chemical quality of raw water monitored by water purveyors and by analyzing edible portions of fish. Recreational use impairments are identified using bacteriological data⁴¹.

The 2010 PA Integrated Water Quality Monitoring and Assessment Report can be accessed at <u>http://www.portal.state.pa.us/portal/server.pt/community/water quality standards/10556/integrated water quality report - 2010/682562</u> and the USEPA and DEP websites also provide information.

Table 4.14 shows causes of degradation to streams within the SRCW. Degraded streams with cause of impairment in the SRCW are shown on Plate 4.1.

³⁷ Morris-Wachter, Debbie. New Castle News. *Dam Removed from Slippery Rock Creek*. April 2010 (accessed on May 30, 2010); available at http://www.ncnewsonline.com/local/x993506354/Dam-removed-from-Slippery-Rock-Creek

³⁸ Geographic Information Systems complied from data collected by the Southwest Pennsylvania Commission and PASDA

³⁹ Pennsylvania Department of Environmental Protection. Commonwealth of Pennsylvania. Assessment and Listing Methodology for Integrated Water Quality Monitoring and Assessment Reporting Clean Water Act Sections 305 (b)/303(d). 2009 (accessed on May 30, 2010); available at:

http://files.dep.state.pa.us/Water/Drinking%20Water%20and%20Facility%20Regulation/WaterQualityPortalFiles/Methodology/MainNarrativeAs sessmentMethods_2009am.pdf ⁴⁰ United States Environmental Protection Access: TMD/ Drivers, 2010 (second data and a contral d

⁴⁰ United States Environmental Protection Agency. *TMDL Primer*. 2010 (accessed on June 1, 2010); available at <u>http://www.epa.gov/reg3wapd/tmdl/ChesapeakeBay/primer.html</u>

⁴¹Pennsylvania Department of Environmental Protection. Commonwealth of Pennsylvania. Assessment and Listing Methodology for Integrated Water Quality Monitoring and Assessment Reporting Clean Water Act Sections 305 (b)/303(d). 2009 (accessed on May 30, 2010); available at:

http://files.dep.state.pa.us/Water/Drinking%20Water%20and%20Facility%20Regulation/WaterQualityPortalFiles/Methodology/MainNarrativeAs sessmentMethods_2009am.pdf

Source of Impairment	Miles
Abandoned Mine Drainage - Metals	56.0
Abandoned Mine Drainage - Metals ; Abandoned Mine Drainage - pH	8.3
Abandoned Mine Drainage - Metals ; Abandoned Mine Drainage - Siltation	52.3
Agriculture - Pathogens	1.3
Agriculture - Siltation	7.5
Agriculture - Siltation ; Agriculture - Turbidity	5.1
Agriculture - Turbidity	5.5
Crop Related Agric - Turbidity ; Grazing Related Agric - Siltation	3.6
Golf Courses - Nutrients	0.8
Land Development - Siltation	3.3
Municipal Point Source - Organic Enrichment/Low D.O. ; Municipal Point Source - Nutrients ; Municipal Point Source - Suspended Solids ; Abandoned Mine Drainage - Metals	1.6
Source Unknown - Cause Unknown	39.5
Surface Mining - Metals	6.8
Surface Mining - Metals ; Abandoned Mine Drainage - Metals	3.4
Surface Mining - Siltation	1.4
Surface Mining - Siltation ; Surface Mining - Turbidity	4.1
Urban Runoff/Storm Sewers - Siltation	2.9
Total Miles of Impaired Streams	203.4

NPDES Permits for Point Sources: National Pollutant Discharge Elimination System (NPDES) permits are issued by either USEPA or an authorized state, such as Pennsylvania, to control discharges through the federal Clean Water Act from pipes, spillways, etc. into streams. Each permit must contain industry-specific, technology-based and/or water-guality-based limits, and establish monitoring and reporting requirements⁴³.

Any facility that intends to discharge into waters of the United States must obtain a permit prior to initiating a discharge. The permit applicant must provide quantitative analytical data identifying the types of pollutants present in the facility's effluent⁴⁴. Once the permit is approved, conditions are established under which a facility may discharge along with effluent limits. The NPDES permit may also include discharge limits based on federal and state water guality criteria or standards designated to protect uses of surface waters⁴⁵. According to the USEPA, these standards, unlike the technologybased standards, generally do not take into account technological feasibility or project costs involved⁴⁶.

PA Code Title 25, §92.1 defines a *point source* as "any discernible, confined and discrete conveyance, including, but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, Concentrated Animal Feeding Operation (CAFO), landfill leachate collection system, or vessel or other floating craft, from which pollutants are or may be discharged."

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⁴² GIS compiled from data collected by the Southwest Pennsylvania Commission, USGS, DEP, and PASDA.

⁴³ United States Environmental Protection Agency. Water Quality Handbook. 2010 (accessed on May 30, 2010); available at

http://water.epa.gov/scitech/swguidance/waterquality/standards/handbook/chapter07.cfm 44 United States Environmental Protection Agency. *Aquaculture*. 2010.(accessed on May 28, 2010); available at http://www.epa.gov/agriculture/anagulaw.html

United States Environmental Protection Agency. Aquaculture. 2010. (accessed on May 28, 2010); available at http://www.epa.gov/agriculture/anaqulaw.html

Types of Regulated Pollutants: The DEP provides additional information regarding NPDES permits through a link on the Wastewater Operator Information website which can be accessed at: http://www.dep.state.pa.us/dep/deputate/waterops/redesign/PAGES/wwoperinfo.htm.

The types of pollutants regulated include:

- Conventional Pollutant— in sanitary wastes of households, businesses, and industries, including human wastes, ground-up food from sink disposals, laundry and bath waters
- Fecal Coliform-bacteria in digestive tracts of humans and animals; indicates potential presence of pathogenic organisms
- Oil and Grease-organic substances that may include hydrocarbons, fats, oils, waxes, and highmolecular fatty acids; often producing sludge solids difficult to process and properly treat
- Toxic Pollutants—particularly harmful to human, animal or plant life; organics, the primary group, includes pesticides, solvents, polychlorinated biphenyls (PCBs), dioxins; metals includes lead, silver, mercury, copper, chromium, zinc, nickel, and cadmium
- Nonconventional Pollutants- not conventional or toxic that may require regulation, including nutrients • such as nitrogen and phosphorus

Major Water Pollution Control Facilities are identified on Plate 4.4. There are numerous additional minor NPDES facilities located throughout the watershed which are not shown.

Total Maximum Daily Load (TMDL) for Point and Non-Point Sources: The USEPA definition of a TMDL is "a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that load among the various sources of that pollutant"⁴⁷. TMDLs can be considered to be a "watershed budget" for pollutants. The TMDL represents the total amount of pollutants that can be assimilated by a stream without causing water quality standards to be The pollutant allocations resulting from the TMDL process represent the amount of exceeded. pollutants that can be discharged into a waterway from each source. The TMDL does not specify how dischargers must attain a particular load reduction.⁴⁸

TMDLs must be developed for several categories:⁴⁹

- Point sources (permitted sewage and industrial discharges)
- Nonpoint sources (agriculture and urban runoff) .
- Lakes •
- Abandoned mine drainage (also called acid mine drainage or AMD) .
- Specific bioaccumulative chemicals (PCBs and chlordane that contaminate fish, resulting in fish advisories limiting or banning the number of fish a person can safely consume)
- Complex situations (combinations of different types)

The TMDL program for nonpoint source impaired waters in Pennsylvania uses a "watershed approach". This enables the focus to be on implementation of remedial efforts in the watershed. The watershed approach begins with a comprehensive assessment of water quality in the watershed and requires a

⁴⁷ United States Environmental Protection Agency. Impaired Waters and Total Maximum Daily Loads. 2008 (accessed on May 30, 2010);

available at http://www.epa.gov/owow/tmdl/overviewoftmdl.html
⁴⁸ Pennsylvania Department of Environmental Protection. *Watershed Management and TMDLs.* 2002 (accessed on May 30, 2010); available at http://www.dep.state.pa.us/dep/deputate/watermgt/wqp/wqstandards/Facts/fs2248.htm ⁴⁹ Ibid.

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definition of watershed size.⁵⁰ After water quality impairments are identified, a planning process occurs to develop strategies that can successfully address and correct water degradation in the watershed. Nonpoint source load allocations are implemented through a combination of federal, state, and local programs which include regulatory, nonregulatory and voluntary efforts⁵¹.

In the SRCW, TMDLs were completed for Blacks Creek and Seaton Creek in 2002 and approved by the USEPA in January 2005. The TMDLs were conducted to address the impairments noted on the 1996 Pennsylvania 303(d) list. According to the TMDLs, all impairments in the Blacks Creek and Seaton Creek subwatersheds resulted from acid mine drainage from abandoned coal mines and abandoned oil and gas drilling.⁵²

The TMDLs address the three primary metals associated with acid mine drainage, iron, manganese and aluminum. TMDLs include calculations of the loadings, for each metal listed and acidity, that can safely be put into the streams and meet the state water quality criteria. The Seaton Creek TMDL, when implemented, is expected to achieve the water guality standards. Future mining activities in Blacks Creek and Seaton Creek Watersheds will be required to meet the percent reductions noted in the TMDL document for discharges⁵³.

Stream Name	County	Category	Cause	EPA Approval (date)	Online Report Link
Blacks Creek	Butler	AMD	Metals pH	1/19/2005	TMDL: <u>Blacks Creek</u> Watershed TMDL
Seaton Creek	Butler	AMD	Other inorganics metals pH	1/19/2005	TMDL: <u>Seaton Creek</u> Watershed TMDL

Table 4.15: TMDLs in the SRCW⁵⁴

To review a detailed statewide list of streams with TMDLs, the "2010 Pennsylvania Integrated Water Quality Monitoring and Assessment Report—Streams, Category 4a Waterbodies, Approved TMDLs" is available at http://www.depweb.state.pa.us (keyword "TMDL").

L. Abandoned Mine Drainage

With knowledge of the cause, documentation of long-term stream impacts, development of environmentally-focused mining methods, and requirement of comprehensive permitting and oversight by enactment of the PA Surface Mining Conservation & Reclamation Act, Clean Streams Law, etc. and the 1977 federal Surface Mining Control & Reclamation Act, only about 1% of modern operations have post-mining discharges requiring treatment.⁵⁵

⁵⁰ Pennsylvania Department of Environmental Protection. Watershed Management and TMDLs. 2002 (accessed on May 30, 2010); available at http://www.dep.state.pa.us/dep/deputate/watermgt/wqp/wqstandards/Facts/fs2248.htm lbid.

⁵² Pennsylvania Department of Environmental Protection Bureau of Abandoned Mine Reclamation. Operation Scarlift Report Slippery Rock Creek. 1970. (accessed on June 1, 2010); available at:

http://www.amrclearinghouse.org/Sub/SCARLIFTReports/SlipperyRock/SlipperyRock.htm 53 Pennsylvania Department of Environmental Protection Knox Office. Slippery Rock Creek Priority Watershed Report. 2004 (accessed on May 30, 2010); available at

⁽http://www.dep.state.pa.us/dep/deputate/minres/districts/homepage/Knox/Watershed/Slippery%20Rock/2004%20Slippery%20Rock%20Cree %20Priority%20Area%20Update%20(DRAFT).pdf

⁵⁴ Pennsylvania Department of Environmental Protection. Pennsylvania Integrated Water Quality Monitoring and Assessment Report -Streams, Category 4a Waterbodies, Approved TMDLs. 2010 (accessed on June 1, 2010); available at

http://files.dep.state.pa.us/Water/Drinking%20Water%20and%20Facility%20Regulation/WaterQualityPortalFiles/2010%20Integrated%20List/Li sStreams/Category4aStreams.pdf

Slippery Rock Watershed Coalition website. SRCW History. 2006 (accessed on June 1, 2010); available at: http://www.srwc.org/

Drainage from historic coal mining activities has, however, resulted in substantial stream degradation in portions of the Slippery Rock Creek Watershed. Some streams were essentially lifeless for decades for about a century due to abandoned mine drainage **(AMD)**. A watershed-wide effort to correct these problems was not initiated until Operation Scarlift in the late 1960s and early 1970s by a predecessor to the DEP.

The Slippery Rock Creek Watershed is not the only watershed significantly impacted by AMD. Degraded drainage from abandoned coal mines has been identified as the largest nonpoint source of stream impairment in Pennsylvania.⁵⁶ According to the 2010 Pennsylvania Integrated Water Quality Monitoring and Assessment Report approximately 5,467 miles of streams are degraded.⁵⁷ In addition, 45 of Pennsylvania's 67 counties are impacted and there are over 250,000 acres of unreclaimed mine lands, including 2.6 billion cubic yards of coal refuse piles.⁵⁸ Pennsylvania also has approximately 7,800 abandoned or inactive underground mines. In many cases, entire watersheds have been completely decimated.

<u>General Characteristics of Abandoned Mine Drainage</u>: The formation of mine drainage is essentially a weathering process that is a function of the geology, chemistry, biology, hydrology, and mining methods at the site. Although the specific process may vary, AMD forms through a series of complex geochemical and, at times, microbial reactions that occur when water and oxygen contact sulfide minerals such as pyrite (FeS₂) which is typically present within coal and/or surrounding rock. Iron sulfide minerals "breakdown" in the presence of water and oxygen (not unlike a nail rusting), which in turn releases iron and forms sulfuric acid. (Without the presence of water, oxygen, and sulfide minerals, AMD will most likely not form.) When the iron is further oxidized and hydrolyzed (reaction associated with water), iron compounds form and settle in ponds, wetlands, and streams.⁵⁹

Due to the yellow, orange, and/or red color, these iron solids are often referred to as "Yellowboy". Although there are a number of steps in the process, these reactions can be represented by the following general chemical equation:

 $4 \text{ FeS}_2 + 15 \text{ O}_2 + 14 \text{ H}_2\text{O} \rightarrow 4 \text{ Fe}(\text{OH})_3 + 8 \text{ H}_2\text{SO}_4$ Pyrite + Oxygen + Water \rightarrow "Yellowboy" + Sulfuric Acid

The iron and sulfuric acid then reacts with other surrounding material to dissolve and release iron, aluminum, manganese, and other metals that might be present, such as zinc, nickel, cadmium, calcium, magnesium, etc. As the water becomes oxygenated and/or gains alkalinity some of the metals form solids (precipitates) that can also accumulate in ponds, wetlands, and streams. When streambeds become coated, the habitat of aquatic insects may be destroyed. As benthic macroinvertebrates are critical to the food chain, loss of this habitat may prevent fish from living and/or reproducing in the stream. In addition, AMD often causes the stream to be acidic with a low pH, which many organisms cannot tolerate.⁶⁰

⁵⁶ Ibid.

⁵⁷ Pennsylvania Department of Environmental Protection. Pennsylvania Integrated Water Quality Monitoring and Assessment Report. 2010 (accessed on January 21, 2011); available at

http://files.dep.state.pa.us/Water/Drinking%20Water%20and%20Facility%20Regulation/WaterQualityPortalFiles/2010%20Integrated%20List /2010%20Pennsylvania%20Integrated%20Water%20Quality%20Monitoring%20and%20....pdf

⁵⁸ BioMost, Inc and Stream Restoration Inc. Blacks Creek Restoration Plan. 2007 (revised 4/2007)

⁵⁹ BioMost, Inc. McCaslin Road Mine Drainage Treatment Operation, Maintenance & Replacement Plan. 2010.

⁶⁰ Ibid.

Chemical parameters are measured to characterize the AMD and to aid in selecting the appropriate treatment include:

pH—indicates whether a solution is acidic, neutral, or basic (alkaline) based on hydronium (H₃O+) ions [a.k.a., hydrogen(H+) ion] concentration; pH scale ranges from 0-14 with 0 most acidic, 7 neutral, 14 most basic.

Alkalinity—typically defined as the acid neutralizing or buffering capacity of a given volume of water. This refers to the ability of water (such as a stream) to neutralize acid; depending on how much alkalinity present, when acid added pH decreases or remain the same.

Acidity— typically defined as the ability of a solution to neutralize alkalinity (base) of a given volume of water.

Dissolved Oxygen (DO)—amount of oxygen dissolved in water; required for fish and other aquatic life.

Sulfate—concentrations >50 mg/L usually indicate coal mine drainage in western Pennsylvania.

Specific Conductivity—measures ability of water to carry an electrical current associated with presence of ions; readings automatically normalized to 25^oC to eliminate variability.

Temperature—affects various physical as well as chemical processes.

Oxidation/Reduction Potential (ORP)—electron loss (oxidation) or gain (reduction); higher the value above zero, the more oxidizing; closer the value to zero the more reducing; negatives values are reducing.

Total Suspended Solids (TSS)—amount of solids within a given volume of water retained when passed through a certain pore-size (typically 0.45 µm) filter

Total Dissolved Solids (TDS)—combined content of all inorganic and organic substances small enough to pass through a 0.2 µm filter

Total Solids—includes both TSS and TDS; usually measured by evaporating a water sample and then drying and weighing the remaining residue.

Metals—iron (Fe), manganese (Mn), aluminum (AI) most commonly monitored in mine drainage.

<u>Passive Treatment Systems:</u> Passive systems use no electricity, require limited maintenance, and use environmentally-friendly materials, such as limestone aggregate and spent mushroom compost in a series of constructed ponds, beds, ditches and wetlands to provide a cost-effective alternative to the conventional treatment of mine drainage which is labor and energy intensive and typically uses harsh chemicals. Passive systems add alkalinity to neutralize acidity while providing an environment suitable for beneficial chemical reactions and biological activity. For instance, dissolving limestone neutralizes the acidity and raises the pH after which dissolved metals, through chemical, biological, and physical processes, form particulates (solids) that are then retained in settling ponds and constructed wetlands. In some cases, where sufficient alkalinity is naturally present in AMD, only settling ponds and constructed wetlands are needed.⁶¹

When designing a passive system, the goal is to include components that provide long-term effective treatment, are economical to install, and require minimal maintenance. There are several main types of passive treatment components that can be used, often in series and/or in parallel, to treat degraded mine drainage. These components are chosen based upon the AMD characteristics (quality and flow rate), preferred chemical or biological process, and available construction space.⁶²

<u>Passive Treatment Systems in the SRCW:</u> Positive improvements are being seen in Pennsylvania's streams! About 300 passive treatment systems have been installed throughout the state, reducing the load of pollutants⁶³. Since 1994, the Slippery Rock Watershed Coalition **(SRWC)** has been actively working to restore the severely degraded headwaters of Slippery Rock Creek. This effort has resulted

⁶¹ Ibid.

⁶² BioMost, Inc. McCaslin Road Mine Drainage Treatment Operation, Maintenance & Replacement Plan. 2010.

⁶³ Stream Restoration Inc., and Datashed. Datashed Homepage. 2010. (accessed on May 30, 2010); available at http://www.datashed.org

in the installation of about 18 passive systems for approximately 30 abandoned mine discharges. These passive systems are currently treating over 750 million gallons of mine drainage per year eliminating about 200 tons of iron, 8 tons of aluminum, and 335 tons of acidity annually from Slippery Rock Creek and its tributaries. This reduction in pollution loading has significantly improved over 11 miles of streams with fish being observed in at least 6 miles of streams for the first time in almost a century.⁶⁴ (Refer to Table 4.16 List of AMD Treatment Systems in the SRCW.)

Much of the work completed by the SRWC to date has been based upon background data collected by the DEP Knox District Mining Office **(Knox DMO)** as published in the 1998 Slippery Rock Creek Watershed Comprehensive Mining Reclamation Strategy **(CMRS)** Reclamation/Remediation Plan for a 27-square mile area of the headwaters.

Even though great strides have been made to restore water resources affected by historical mining activities, additional work is needed to restore streams impaired by AMD in the SRCW.⁶⁵

M. SRCW AMD and Associated Stream Monitoring

Existing monitoring of passive treatment systems and receiving streams in the Slippery Rock Creek Watershed is housed on "Datashed", the website (www.datashed.org) developed by Stream Restoration Inc., 241 Computer Services, and the Western PA Coalition for Abandoned Mine Reclamation using the PHP programming language and open-source software such as APACHE HTTP Server, MySQL database, and Map Server. "Datashed" is a fully-featured, GIS-enabled, internet database designed to assist watershed groups, academic institutions, private industry, and government agencies. This database not only is a data management tool but also is part of the education/outreach effort.

On "Datashed", every restoration project has a page within the website where users can not only view data but also download and print information needed to conduct operation and maintenance activities such as site inspection sheets, site schematics, topographic maps, aerial photos, etc. The site is password-protected for the upload of collected field and laboratory data.

⁶⁴ BioMost, Inc and Stream Restoration Inc. *Blacks Creek Restoration Plan.* 2007 (revised 4/2007)

⁶⁵ Western Pennsylvania Coalition for Abandoned Mine Reclamation (WPCAMR). *The Problem*. n.d. (accessed on June 1, 2010); available at http://www.wpcamr.org/mission/problem.html .

	Argentine Central SR115 Constructed: 2002 Project Type: Passive Treatment System Location: Washington Township, Butler County Stream: Slippery Rock Creek Watershed: Slippery Rock Creek Summary: First pond in 1996 was rec in lieu. Second pond was Title IV ACSI
	BC16
	Constructed: 2008 Project Type: Passive Treatment System Location: Marion Township, Butler County Stream: tributary 15, Blacks Creek Watershed: Slippery Rock Creek Summary: A passive system was constructed to address the BC16 discharge emanating from what appears to be a compromised oil well.
	BC19 & 19B
ATTIC AR	Constructed: 2004 Project Type: Passive Treatment System Location: Marion Township, Butler County Stream: Blacks Creek Watershed: Slippery Rock Creek Summary: This project consisted of installing an aerobic wetland to treat two abandoned mine discharges emanating through old abandoned compromised oil well casings.
	Big Bertha
	Constructed: 1995 Project Type: Passive Treatment System Location: Washington, Butler County Stream: Slippery Rock Creek Watershed: Slippery Rock Creek Summary: Passive Treatment System

Table 4.16: AMD Passive Treatment Systems in the SRCW⁶⁶

⁶⁶ Stream Restoration Inc. and Datashed. Datashed Homepage. 2010. (accessed on May 30, 2010); available at <u>http://www.datashed.org</u>

Do Salo Phaso I
Constructed: 2000 Project Type: Passive Treatment System Location: Venango Township, Butler County Stream: Seaton Creek Watershed: Slippery Rock Creek Summary: De Sale - Phase I
De Sale Phase II Constructed: 2000 Project Type: Passive Treatment System Location: Venango Township, Butler County Stream: Seaton Creek Watershed: Slippery Rock Creek Summary: De Sale - Phase II
De Sale Phase III Constructed: 2002 Project Type: Passive Treatment System Location: Venango Township, Butler County Stream: Seaton Creek Watershed: Slippery Rock Creek Summary: Participants in the Slippery Rock Watershed Coalition received partial funding from the PA Department of Environmental Protection through the Growing Greener initiative to install a passive system to treat.
Erico Bridge Restoration Area Constructed: 2003 Project Type: Passive Treatment System Location: Venango Township, Butler County Stream: Seaton Creek Watershed: Slippery Rock Creek Summary: Seaton Creek is the major tributary most heavily impacted by historical coal mining activities within the Slippery Rock Creek Watershed.
Ferris Passive Treatment System Complex (SR85/SR86 & SR87/88) Constructed: 1997 Project Type: Passive Treatment System Location: Venango Township, Butler County Stream: Slippery Rock Creek Watershed: Slippery Rock Creek Summary: Ferris Complex

Goff Station Restoration Area Constructed: 2000 Project Type: Passive Treatment System Location: Venango Township, Butler County Stream: Murrin Run Watershed: Slippery Rock Creek Summary: Goff Station Restoration Area
Jennings Constructed: 1997 Project Type: Passive Treatment System Location: Brady Township, Butler County Stream: Big Run Watershed: Slippery Rock Creek Summary: Innovative VFP using a mixture of compost and fine limestone as the treatment media. Located at Jennings Environmental Education Center.
SR 101A Constructed: 1998 Project Type: Passive Treatment System Location: Washington Township, Butler County Stream: Slippery Rock Creek Watershed: Slippery Rock Creek Summary: SR 101A
SR 109 Constructed: 1998 Project Type: Passive Treatment System Location: Washington Township, Butler County Stream: Slippery Rock Creek Watershed: Slippery Rock Creek Summary: SR 109
SR 114 Constructed: 1995 Project Type: Passive Treatment System Location: Washington Township, Butler County Stream: Slippery Rock Creek Watershed: Slippery Rock Creek Summary: SR 114

SR 81 - Abandoned Mine Restoration Area Constructed: 2002 Project Type: Passive Treatment System Location: Washington Township, Butler County Stream: Slippery Rock Creek Watershed: Slippery Rock Creek Summary: The mine discharge SR 81, which emanates from an abandoned deep mine has been treated with a passive treatment system consisting of an Anoxic Limestone Drain, Settling Pond and Aerobic Wetland.
SR 96 Constructed: 2001 Project Type: Passive Treatment System Location: Washington Township, Butler County Stream: Slippery Rock Creek Watershed: Slippery Rock Creek Summary: SR 96

N. WATER SUPPLIES

<u>Public Water Supplies:</u> Due to Homeland Security regulations developed since 2001, specific information regarding public water supplies has been restricted and, therefore, is not listed in the Slippery Rock Creek Watershed Conservation Plan. The Slippery Rock Creek is used as a public water supply after treatment.

<u>Private Drinking Wells:</u> Except in larger communities, residences and farms throughout the watershed depend on private water wells and springs. Typically, the wells are a few tens of feet to a couple of hundred feet in depth. Well water is not uncommonly treated for iron which may or may not be related to drainage from coal mines. State regulations do not require maintenance or testing of private water supplies. Information regarding well maintenance is available from the local Penn State Cooperative Extensions or DEP offices listed in Section 1, Project Characteristics.

<u>Well Head Protection Areas</u>: Approximately half of the residents in PA rely on groundwater as a source of drinking water. Figure 4.4 shows a map of the PA Well Head Protection Activities by County. Due primarily to land acquisition costs and various treatment requirements for surfacewater supplies, groundwater is often more cost effective as a public water supply in relation to surface water. The federal Safe Drinking Water Act **(SDWA)**, specifically Section 1428, requires each state to submit a plan to the USEPA that describes how ground-water sources used by public water systems will be protected from contamination.⁶⁷

The DEP implemented the Wellhead Protection Program (WHPP) as an initiative designed to apply proper management techniques and various preventive measures to protect groundwater supplies. The PA WHPP was approved by the USEPA in March 1999. The WHPP is the cornerstone of the Source Water Assessment Program which is also a requirement of the SDWA. The DEP is the primacy agency for the SDWA and the Source Protection Section in the Bureau of Watershed Management is responsible for administering the WHPP and other drinking water source protection

⁶⁷ Pennsylvania Department of Environmental Protection. The Wellhead Protection Program in Pennsylvania. 2002 (accessed on June 2, 2010); available at http://www.dep.state.pa.us/dep/deputate/watermgt/wc/subjects/srceprot/source/WHPPOVER.htm .
efforts throughout Pennsylvania. More information on the WHPP can be obtained by contacting the Source Protection Section at 717-787-5259.⁶⁸



Figure 4.4: PA Wellhead Protection Activities⁶⁹

The public water supplies involved in wellhead protection activities include all of the counties of which a portion lies within the Slippery Rock Creek Watershed.

For more information, please contact the appropriate DEP Regional Office according to your county:

Northwest Region (Meadville Office) 814-332-6899

Counties: Butler, Clarion, Crawford, Elk, Erie, Forest, Jefferson, Lawrence, McKean, Mercer, Venango, Warren.]

Southwest Region (Pittsburgh Office) 412-442-4217

Counties: Allegheny, Armstrong, Beaver, Cambria, Fayette, Greene, Indiana, Somerset, Washington, Westmoreland.

⁶⁸ Pennsylvania Department of Environmental Protection. The Wellhead Protection Program in Pennsylvania. 2002 (accessed on June 2, 2010); available at http://www.dep.state.pa.us/dep/deputate/watermgt/wc/subjects/srceprot/source/WHPPOVER.htm . 69 Ibid.







SECTION 5—BIOLOGICAL RESOURCES

A. INTRODUCTION

The Slippery Rock Creek Watershed **(SRCW)** supports a wealth of "Biological Resources". For the Slippery Rock Creek Watershed Conservation Plan, these plants and animals are not viewed individually but collectively as a community due a natural interdependence. For example, an eastern hemlock, the state tree of Pennsylvania, growing on the banks of the Slippery Rock Creek thrives because a number of conditions aligned at this specific location – sunlight, temperature, humidity, amount and quality of water, soil characteristics, seed dispersal mechanisms, etc. The hemlock, shading the water of the Slippery Rock Creek, in turn provides conditions that other organisms require - like cool, oxygen-rich water which is favored by many desirable fish species. If any of the conditions are changed or eliminated, the tree no longer flourishes, which ultimately affects the fish.

A measure of the ecological health of the watershed is the abundance and richness of life. Biodiversity is a term that reflects this "variety of life". Biodiversity relates to the species present, the genetic variation within the individual species, and the ecosystems within which the organisms live. The "biological resources" of the Slippery Rock Creek Watershed (SRCW) consist of all the plants and animals, the natural communities, and the physical environment.

Biodiversity is also critically important to the quality of life enjoyed by the residents of the SRCW. Besides the abundance of game animals, like white-tail deer and desirable pan and sport fish, there are numerous ecological services, often taken for granted, that a healthy ecosystem provides. Although difficult to quantify, the natural ecosystem provides services of substantial economic value such as, flood control, water purification, temperature regulation, pollination, oxygen production, photosynthesis, waste decomposition, and pest control. These services are typically provided quietly, efficiently, and with no associated monetary fee. Somewhat easier to quantify is the worth of biodiversity relating to products that are harvested, sold and used like food, fuel, fiber, and medicine. Biodiversity is essential to the SRCW by providing an indirect economic stimulant in the form of outdoor recreational opportunities such as hiking, biking, hunting, and fishing.

There is a significant risk of losing these services, products, and opportunities when the components of an ecosystem are ignored or carelessly manipulated. In addition, the chance to gain future services, products, and opportunities may be lost if previously damaged ecosystems are not restored or reclaimed when the occasion arises.

B. HISTORICAL CHANGES

Through time, the biological resources of the SRCW have changed tremendously. The streams in the watershed have flowed through a variety of landscapes and natural communities altered by time, geologic events, changes in climate, and the human pursuit of food, fuel, and shelter. During the past 10,000 years, the watershed has been a glaciated tundra-like landscape that featured caribou and mastodon that changed to a flower-filled prairie ecosystem upon which bison routinely grazed. Early European accounts described shrubby, park–like uplands and stream valleys with virgin forests harboring wolves, catamounts, and flocks of pigeons that darkened the sky. Today, the watershed is a mix of agricultural land, second- and third-growth forest, and suburban/urban landscapes.

<u>Glacial:</u> The entire SRCW has been impacted by ice, both directly and indirectly, at different times during the past one million years. About 140,000 years ago the Illinoian ice advance altered drainage patterns, formed glacial lakes, deposited till (a type of glacial debris) and began carving the Slippery Rock Gorge, now a national landmark. The late Wisconsinan glacier, which advanced into the watershed approximately 20,000 years ago, eliminated most signs of the Illinoian advance. This continental glacier continued to form the Slippery Rock Gorge and left behind drift (glacial debris), kettle (bowl-shaped) depressions, eskers (sinuous mounds), and fluvial (stream) deposits. The

current southwesterly path of the Slippery Rock Creek, which originally flowed northeast, was created by the Wisconsinan glacier encroaching from the north. The glacial events also subdued the topography of the watershed by scraping the high ground and filling the low ground with glacial till and fluvial deposits.¹ The topographic boundaries (surface water divide) forming the SRCW and the natural communities living within the watershed are ultimately a result of the multiple intrusions of ice, the last of which began melting and receding about 13,000 years ago (Wisconsinan glacier).

<u>Postglacial:</u> Within the previously glaciated portion of the watershed (Northwestern Glaciated Plateau Section), the soils supporting the various plant communities are primarily formed from this moderatelydrained glacial till and poorly-drained lake deposits.² Following the retreat of the Wisconsinan glacier, the vegetation that was established in the "new" SRCW was dependent upon climate and the dominant neighboring vegetation of the time. About 7,000 years ago a warm, dry climate developed called the "xerothermic period", which lasted for about 3,000 years. During this time, the prairie existing in the Midwest migrated into Ohio, Wisconsin, and western Pennsylvania, establishing a "prairie peninsula" among the surrounding deciduous and coniferous forests.³ Several "prairie indicator" species - big bluestem grass (*Andropogon gerardii*), little bluestem grass (*Schizachyrium scoparium*), whorled rosinweed (*Silphium trifoliatum*), tall coreopsis (*Coreopsis tripteris*), and blazing star (*Liatris spicata*) were naturally occurring within the watershed.

As annual precipitation amounts increased, however, and the "xerothermic period" came to a close, forests began to establish everywhere soil conditions allowed. Areas lacking soils suitable for mature tree growth became open and shrubby with prairie indicator species occasionally present, as in the case of the relic prairie at the Jennings Environmental Education Center, Brady Township. In some cases animal grazing and fire are thought to have preserved the remnant prairie ecosystems.

<u>European Settlement:</u> The first settlers to the watershed were thought to be David Studebaker and Abraham Snyder in 1793. These settlers built a cabin in Worth Township along the Slippery Rock Creek.⁴ The settlers which followed have provided the first descriptions of the biological resources within the SRCW.

"The heavy timber was along the streams and on the second bottoms, for the most part. The ridge land was often covered only by red bush, not tall and thin on the ground. The soil was so thin it would not even raise good buckwheat. Much of the country was covered by a comparative young growth, though here and there through the forest stood an immense white oak over four feet thick... The country was on the whole open and park-like, and in the summer the weeds grew high everywhere..." – Early Life Along the Slippery Rock, William A. Ralston⁵

As more settlers laid claims to the land, the biological resources of the watershed were again altered. Land containing significant timber was most valuable and claimed first. This land was often near the creeks and the timber was subsequently cut. Wetlands were drained and planted in hay with uplands burned to clear the land for agriculture.

Wildlife was bountiful and early residents of the watershed depended upon the plentiful deer, pigeon, otter, beaver, squirrel, fox, and raccoon for meat and hide. Fish were abundant in most streams. No stream in western Pennsylvania, save perhaps the Clarion River, had such a reputation for the number

¹Sevon, W.D., Fleeger, Gary M., Shepps, Vincent C., *Pennsylvania and the Ice Age* (DCNR Bureau of Topographic & Geologic Survey, 1999), page 16-19.

²Preston, Frank W., *Drainage Changes in the Late Pleistocene in Central Western Pennsylvania* (Pittsburgh, PA: Carnegie Museum of Natural History, 1997), page 7.

³ Stucky, Ronald L., Origin and Development of the Concept of the Prairie Peninsula, Ohio Biol. Surv. Biol. Notes No. 15 (The Ohio State University, 1981), page 4.

⁴ Butler County Planning Commission, *The County of Butler Comprehensive Plan Phase I* (1997), page HHP6.

and quality of fish.⁵ Other forms of wildlife were considered pests and the intent was to control or eliminate bears, wolves, mountain lions, weasels, crows, hawks, owls, and venomous snakes.

Increased hunting pressure, bounties, and changes in the natural communities led to the extirpation of numerous species within the watershed including the wolf, mountain lion, passenger pigeon, otter, beaver, and even the white-tail deer. Eventually, the increase in stream degradation associated with agriculture, clear-cutting, and historical coal mining activities made fish survival in the Slippery Rock Creek impossible.

"In seventy eight [1878], the Shenango Railroad was built and the coal mines along the headwaters were opened to obtain coal for the Youngstown mills. In a few years from a stream through whose waters you could seldom look more than a foot, came a stream through whose waters you could look up to ten or twelve feet, as though through glass, and from which all life had disappeared. I am speaking of the stream from the forks to the mouth of Wolfcreek. Below this, some of the fish managed to exist."

- Early Life Along the Slippery Rock, William A. Ralston⁵

C. INDIGENOUS WILDLIFE

Native wildlife is a renewable resource of great interest to those living in the SRCW and throughout the Commonwealth. Although most needs for wildlife can be met from the surroundings, the fragmentation and alteration of the landscape caused by humans are leaving some needs unfulfilled. In most situations, however, these needs can be met through proper management as demonstrated by the successful programs of the Pennsylvania Game Commission.

According to the National Wildlife Federation, when managing for wildlife, there are four necessities for basic survival: food, water, cover, and space⁶. In addition to meeting basic survival needs, a diversity of habitats is required to support a broad range of native wildlife. As several different species occupy the same area, there is also a need for microhabitats and stratification to ensure that organisms do not inhabit the same niche.

The most important part of maintaining diversity of both animals and habitats is to enable an ecosystem to function properly. Natural ecosystem "services" are provided through interactions where wildlife populations are self-regulating, wetlands help prevent flooding, plants filter water and provide oxygen, etc. In other words, all living things, from the microscopic to the largest plants and animals, play an important role in how the ecosystem operates and in maintaining the status quo.

Maintaining a wide range of habitats where diverse plant and animal assemblages thrive not only creates ample present-day opportunities for hunting and fishing and other outdoor recreation within the SRCW but also sustains these resources for future generations. As discussed in other sections of the conservation plan, in areas receiving support from local residents where historical coal mining activities and habitat alterations were deleterious to the biological resources, restoration efforts continue to be an important goal in the overall health of the SRCW.

<u>Terrestrial:</u> For the purposes of the conservation plan, terrestrial is used to describe animals that live primarily on the land within the SRCW. The animals include birds, mammals, amphibians, and reptiles. Threatened/endangered and invasive species are described later in this section.

<u>Mammals:</u> There is a diverse assemblage of mammals located within SRCW that is most likely attributed to the large tracts of land under the supervision of the Commonwealth of Pennsylvania. These large tracts supply the needed area for food and mating. Diet also plays an important role

⁵ Ralston, William A., *Early Life Along the Slippery Rock* (City: Publisher, 1967), page 34.

⁶ National Wildlife Federation, *What's Your Habitat?, n.d.* (accessed May 27, 2010); available from <u>http://www.nwf.org/Get-Outside/Be-Out-There/Educators/~/media/PDFs/Be%20Out%20There/Schoolyard%20Habitats/whatsyourhabitat2.ashx</u>

relating to the size of the home range as carnivorous mammals typically need considerably larger areas to find food sources than herbivores.

To aid in the management of wildlife, the PA Game Commission has divided the state into Wildlife Management Units **(WMU)**. These WMUs are based on land use, habitat, public land ownership, human density, and physical features. Figure 5.1 shows the extent of the WMUs within the SRCW.



Figure 5.1: Wildlife Management Units within the SRCW

The most important species relating to recreational activities is arguably the white-tail deer, which provides prized hunting opportunities within the SRCW. Table 5.1 identifies the seasonal deer harvest within each WMU that extends within the SRCW. Note that even though the WMUs extend beyond the boundaries of the watershed, the general importance of hunting is clearly illustrated with about 40,000 deer harvested in 2009-2010. This suggests about 20,000 (very roughly) hunters.

WMU	2009-	2009-2010 2008-2009		-2009	2007-2008		2005-2006		2004-2005	
ID	А	AL	А	AL	А	AL	А	AL	А	AL
1A	5500	10700	5400	12600	4900	12500	5500	13400	5100	15600
2D	10000	16000	9500	15600	9100	18100	10000	22100	10500	22100

Table 5.1: Deer Harvest for WMU Extending	g into the SRCW (2004 – 2009) ⁷
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Note: A - Antlered; AL-Anterless; data not available for 2006-2007

⁷ Pennsylvania Game Commission, Bureau of Wildlife Management, *Deer Harvest by Wildlife Management Units (2004 - 2009)*, 2010 (accessed January 24, 2011) available from

http://www.pasda.psu.edu/uci/MetadataDisplay.aspx?entry=PASDA&file=PGC_BNDWMU_DeerHarvest_04_09.xml&dataset=31

Bear hunting is also conducted in the SRCW. Data is available for annual bear harvest on a countywide basis.

COUNTY	2009	2008	2007	2006	2005	2004	2003
BEAVER	0	0	0	0	0	0	0
BUTLER	13	13	9	13	10	5	6
LAWRENCE	0	1	0	0	0	0	0
MERCER	3	6	0	2	4	0	1
VENANGO	33	64	39	43	39	36	40

Table 5.2:	Bear Harvest for	Counties Extending	into the SRCW	(2003 – 2009) [ໍ]

<u>Birds:</u> The SRCW is home to many different bird species including warblers, vireos, Ospreys, American Bittern, Least Bitterns, Upland Sandpiper, and the Bald Eagle. The species that have received probably the most attention in the recent past have been the osprey (fish hawk) and the Bald Eagle, which have been very successfully reintroduced into the SRCW. The Osprey was reintroduced in 1993 through the Moraine Preservation Fund, headquartered at Moraine State Park in Butler County and nesting pairs of Bald Eagles were the focus of the PA Game Commission at Glade Dam Lake in Cherry Township, Butler County in the early 1990s.

As with deer being an important biological resource for hunting, a significant number of turkeys are harvested in the WMUs extending into the SRCW. The location and areal extent of the WMUs are depicted on the previous figure. Even though the WMUs extend beyond the watershed, the following table illustrates the importance of turkeys (about 9000 turkeys harvested in 2009) as a biological resource in the SRCW.

WMU	20	09	20	08	200)7	20	06	20	05	20	04	20	03
ID	S	F	S	F	S	F	S	F	S	F	S	F	S	F
1A	2041	1430	1400	745	2179	805	1671	1015	1474	466	2427	1358	2173	1777
2D	3985	1532	3310	2130	2174	2315	2817	2641	2854	2331	4004	2246	4347	2962

Table 5.3: Turkey Harvest for WMU Extending into the SRCW (2003 – 2009)⁹

S-spring; F-fall

<u>Amphibians and Reptiles:</u> Pennsylvania possesses a diversity of native herptiles (amphibians & reptiles) divided almost equally: 36 species of amphibians and 37 species of reptiles. Herptiles are further divided into 5 main groups: salamanders, frogs, lizards, turtles and snakes.¹⁰

Herptile populations are good indicators of habitat quality. Major threats to species are habitat loss, habitat degradation, loss of seasonal wetlands (essential to some species for reproduction), water pollution, acid deposition in rain and snow, wetland draining and/or flooding, and habitat fragmentation.

Herptiles are under the jurisdiction of the PA Fish and Boat Commission (**PFBC**) and more information can be found at the PFBC website. A compilation of herptile species within the SRCW was first

⁸ The Pennsylvania State University, *Bear Harvest by County (2003 - 2009),* 2010 (accessed January 24, 2011); available from http://www.pasda.psu.edu/uci/MetadataDisplay.aspx?entry=PASDA&file=PGCBearHarvestCounty_03_09.xml&dataset=29

⁹ The Pennsylvania State University, *Turkey Harvest by Wildlife Management Units (2003 – 2009)*, 2010 (accessed January 24, 2011); available from

http://www.pasda.psu.edu/uci/MetadataDisplay.aspx?entry=PASDA&file=PGC_BNDWMU_TurkeyHarvest_03_09.xml&dataset=32 ¹⁰Shaffer, Larry. *Pa Amphibian & Reptiles, 7th edition* (Pennsylvania Fish & Boat Commission, 1991), page no. 12.

completed by Dr. Jack McCoy, curator of herptiles at the Carnegie Museum, Pittsburgh, PA in 1982.¹¹ Both historic and modern records were included. The PA Herpetological Atlas database continues to monitor and record species by location. The PA Biological Survey sub-committee and the Amphibian and Reptile Technical Committee monitor and evaluate the health of numerous species and make recommendations for the welfare of the herptiles. Species recognized as needing special attention are listed as Species of Conservation Concern. The PA Natural Heritage Program (PNHP) conducts inventories and maintains data on species of special concern and may require review processes in conjunction with DEP permitting relating to proposed activities to disturb existing land and water uses. (Refer to discussion of Species of Special Concern.)

Of the 77 species of amphibians and reptiles in Pennsylvania, 49 species are potentially found in the SRCW (64%) which indicates a strong habitat base. The following table compares the state diversity with that of the SRCW.¹²

Table	Table 5.4. Amphibians and Reptiles in SRWC					
	Salamanders	Frogs	Lizards	Turtles	Snakes	
Statewide	22	16	4	14	21	
SRCW	15	9	1	8	16	
% of Total	68	56	25	57	76	

Table 5.4: Amphibians and Reptiles in SRWC¹³

Aquatic: For the purposes of the conservation plan, the term aquatic is used to describe animals and plants that live in streams, ponds, and lakes within the SRCW.

Throughout the Commonwealth of Pennsylvania, a "designated use" classification system has been developed to protect aquatic life and other uses under the federal Clean Water Act. Aquatic life is propagated and maintained based on the designation.¹⁴ Within the SRCW, the designated uses for streams are Cold Water Fishes (CWF) and Warm Water Fishes (WWF) for aquatic life and High Quality Waters (HQ) and Exceptional Value Waters (EV) for special protection. (Refer to Section 4, Water Resources for additional information.)

The Pennsylvania Aquatic Community Classification (ACC) project "describes patterns in aquatic biodiversity to help conservation activities and aquatic resource management in the region."¹⁵ Classifications are meant to relatively define the organisms and aquatic habitats along a gradient of water temperatures and associated stream size. The PA stream designations are used for regulatory purposes and broadly encompass habitats occupied by several ACC fish assemblages. The ACC website, http://www.naturalheritage.state.pa.us/aquaticsintro.aspx, provides additional information on all the different components.

Macroinvertebrates (animals without a backbone and which can be seen without magnification) are also important biological resources present in streams within the watershed. Manv macroinvertebrates are indicator species—"species with such specialized ecological needs that they can be used for assessing the quality, condition, or extent of an ecosystem on the basis of their presence and destiny, or the accumulation and effect of materials in their tissues."¹⁶ Some of the

¹¹McCoy, C.J., Amphibians and Reptiles in Pennsylvania: Checklist, Bibliography and Atlas of Distribution (Spec. Publ. Carnegie Museum Natural History, 6-91), page 6-91.

Johnson, David. Jennings Environmental Education Center and SRCWCP Advisory Council Member. Interview via email January 26, 2011 13 Ibid.

¹⁴ The Pennsylvania Code, Chapter 25 § 93.3 Water Quality Standards, 1997 (accessed May 27, 2010); available from

http://www.pacode.com/secure/data/025/chapter93/chap93toc.html ¹⁵ Western Pennsylvania Conservancy, User's Manual and Data Guide to the Pennsylvania Aquatic Community Classification, June 2007 (accessed May 31, 2010); available from http://www.naturalheritage.state.pa.us/ACC/ACCUser'sManual-TitlePage,TOC,Ch.1-3.pdf

Pennsylvania Department of Environmental Protection, Sustainability for Earth Day: Sustainability Glossary, n.d. (accessed May 29, 2010); available from http://www.dep.state.pa.us/earthdaycentral/03/glossary.htm

indicator species used to determine stream health in the SRCW include the stonefly nymph, mayfly nymph, dobsonfly larva, and casemaking caddisfly larva¹⁷

Fishing has been recognized as an extremely popular pastime for residents and visitors to the Slippery Rock Creek Watershed. Pan and sport fish are plentiful in Lake Arthur (Moraine State Park), Hell Run and portions of the Wolf Creek Watershed. Fishing in the main branch of Slippery Rock Creek and many headwaters tributaries is limited, however, often due to abandoned mine drainage.

D. INDIGENOUS VEGETATION

For the purposes of the conservation plan, native vegetation describes essentially uncultivated land plants including wetland plants within the Slippery Rock Creek Watershed.

Trees: As noted previously, native trees have played an important role in the settlement of the watershed and continue to contribute to the local economy especially through selective tree cutting. The most common forest type, as reported in the Natural Heritage Inventory, is oak-hickory which is dominated by white oak, red oak, mockernut hickory, shagbark hickory, and subdominated by black cherry, white ash, and red maple.¹⁸ Another type of forest in the watershed is the hemlock-northern hardwood forest which is generally observed in the cool, steep-sided, ravines of the Slippery Rock Creek, associated with McConnell's Mill State Park, and in and around the Narrows of Wolf Creek.¹⁹ Mesic (moderate moisture) central forests are noted along Lake Arthur in areas that have been left undisturbed by logging for many years. Forested floodplains are also abundant along Slippery Rock and Wolf Creeks.²

The Slippery Rock Creek Watershed is considered part of the Low Lime Drift Plain and Pittsburgh Low Plateau ecoregions. Species of trees that can be expected in these ecoregions include Northern Hardwoods (dominants: sugar maple, yellow birch, beech, and hemlock), Beech-Maple forests, and Appalachian Oak Forests (dominated by white and red oaks).

Reestablishing native hardwood forests is also being emphasized during the reclamation phase of active surface coal mines by the US Dept. of Interior Office of Surface Mining Reclamation and Enforcement through the Appalachian Regional Reforestation Initiative (ARRI). Through this program, in addition to other hardwood species, essentially pure strains of American Chestnut Trees are being reintroduced to the Slipperv Rock Creek Watershed. The first implementation of ARRI in the watershed was at the demonstration site at the Jennings Environmental Education Center in partnership with the Slippery Rock Watershed Coalition and others

Grasses: Grasslands or prairies are also present in the Slippery Rock Creek Watershed that are dominated by grasses and legumes. These areas are generally open and flat and the soil tends to be fertile, typically making grasslands ideal for crops and livestock. As grasslands are also important for indigenous wildlife, warm season grasses are being reintroduced in open areas through efforts of the PA Game Commission and other stakeholders within the Slippery Rock Creek Watershed. The species typically planted include switchgrass, Big Bluestem, Little Bluestem, and Indian Grass. Demonstration plots have been established at the PA Game Commission Gamelands #95 and at the Jennings Environmental Education Center, where boy scouts participated in the successful planting effort.

¹⁷ Pennsylvania Department of Environmental Protection, Watershed Snapshot, 2009 (accessed May 27, 2010); available from http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-77143/3940-UK-DEP3056.pdf

Smith, Lisa L., Bier, Charles W., et al., Butler County National Heritage Inventory, July 1991 (accessed May 28, 2010); available from http://www.naturalheritage.state.pa.us/CNAI_Download.aspx

Ibid

June 2011

Wetland Plants: Native wetland plants are also found in the Slipperv Rock Creek Watershed. These plants are often in perennially moist areas along stream banks and pond edges and in shallow ditches and other shallow depressions in the land surface. Typical wetland plants present in the watershed include Typha latifolia, Juncus effuss, Juncus candensis, Scirpus cyperinus, Carex lurida, Eleocharis obtusa, Scripus atrovirens, Salix spp., and Cornus amomum to name a few.

A further discussion of native plants is included in this section under Important Habitats.

E. INVASIVE PLANTS AND ANIMALS

Invasive species, as defined by the federal government, is "a species that is non-native (or alien) to the ecosystem... and whose introduction causes or is likely to cause economic or environmental harm or harm to human health".²¹ Invasive species have been identified by the DCNR as the second most important threat to biodiversity; only habitat loss has been recognized as a bigger problem.²²

The principal reason that invasive species threaten biodiversity is the ability of the invasive to outcompete native species. One reason for the vigor of the invasive species is often the lack of natural predators and/or pathogens. Invasive species can have the ability to reduce the amount of light, water, nutrients, and/or space available to native plants, and can alter hydrologic patterns, soil chemistry, moisture-holding capacity, erodibility, etc.²³

Invasive species have entered the SRCW by a variety of ways. Some were introduced inside or outside the watershed unknowingly due to an assumed beneficial purpose. For example, purple loosestrife was sold as an ornamental plant and multi-flora rose was at one time used as a living fence and small game/bird habitat. Some entered the watershed by accident. No matter how or why the invasive species arrived, these species have been known to take over and dominate landscapes across Pennsylvania and the US.

Invasive Plants: Some invasive plants can directly or indirectly injure or cause damage to crops, livestock, natural resources, public health, or the environment and as such identified by the USDA as noxious weeds. There are currently 13 plants on the noxious weeds list for Pennsylvania. The PA Dept. of Agriculture has made the sale, propagation, or transfer of any of these species illegal²⁴.

Common Name	Scientific Name
Marijuana	Cannabis sativa
Musk or Nodding Thistle	Carduus nutans
Canadian thistle	Cirsium arvense
Bull or Spear Thistle	Cirsium vulgare
Jimsonweed	Datura stramonium
Goatsrue	Galega officinalis
Giant Hogweed	Heracleum mantegazzianum
Purple Loosestrife	Lythrum salicaria
Mile-a-minute	Polygonum perfoliatum
Kudzu-vine	Pueraria lobata
Multiflora rose	Rosa multiflora
Shattercane	Sorghum bicolor
Johnson grass	Sorghum halepense

²¹ US Department of Agriculture, National Invasive Species Information Center (NISIC), What is An Invasive Species?, 2010 (accessed May 29, 2010); available from http://www.invasivespeciesinfo.gov/whatis.shtml

²² Hons, Cole, Penn State University, Invasive Plants Threaten PA Biodiversity, Shaver's Creek Responds, 2010 (accessed May 27, 2010); available from <u>http://www.green.psu.edu/news_events/2010_news/shavers.asp</u>²³ U.S. National Park Service, *Weeds Gone Wild*, June 2005 (accessed May 28, 2010); available from

http://www.nps.gov/plants/alien/bkgd.htm#problem

http://www.pacode.com/secure/data/007/chapter110/chap110toc.html²⁵ lbid. U.S. Department of Agriculture, PA Code Title 7§101.1 Noxious Weed Control List, April 1997 (accessed May 29, 2010); available from

Common Invasive Plants in the SRWC: Two of the more common invasive plants encountered in the SRCW are multi-flora rose and Japanese knotweed. Both are prolific and aggressive plants that can take over a landscape quickly.

Japanese Knotweed

Japanese Knotweed, a large, herbaceous, perennial plant native to eastern Asia, was brought to the US in the late 1800's as an ornamental and for erosion control. Japanese Knotweed, with an extensive root system, spreads primarily through rhizomes and can grow up to nine feet in height and have leaves 4-6 inches long and almost as wide.²⁶ An example of a vigorous invasive species, Japanese Knotweed can survive in a wide variety of soil types, pH, sun exposure, and salinity.

The rhizomes of the Knotweed are the "real problem." A rhizome is an underground stem that "gives rise" to roots, aerial stems, and more rhizomes as seen in the following picture:



Figure 5.2: Photograph of Japanese Knotweed Root System²⁷

Knotweed rhizomes spread vigorously, expanding the size of the knotweed stand. Rhizomes are also very durable. A very small piece of rhizome that is moved to another site will give rise to a new plant. Knotweed on streambanks spreads downstream as the bank erodes and pieces of rhizome break off and float downstream to take root elsewhere as picture below.²⁸



Figure 5.3: Photograph of Japanese Knotweed Stream Bank Thicket²⁹

²⁶Pennsylvania Department of Conservation and Natural Resources, DCNR Invasive Exotic Plant Tutorial for Natural Land Managers: Japanese knotweed and Giant knotweed, April 2002 (accessed May 28, 2010); available from

http://www.dcnr.state.pa.us/forestry/invasivetutorial/japanese_knotweed.htm²⁷ lbid.

²⁸ Penn State University Department of Horticulture, *Managing Japanese Knotweed*, 2007 (accessed May 29, 2010); available from http://vm.cas.psu.edu/Publications/CREP_WS_4_POLCU.pdf²⁹ lbid.

As pictured above, the invasive plant can rapidly colonize riparian areas to form dense thickets that can outcompete and exclude native vegetation. A small piece of rhizome that is moved to another site can give rise to a new plant.³⁰ Along stream banks, the invasive plant spreads as the bank erodes and pieces of rhizome float downstream to take root elsewhere.

As can be imagined, eradicating Japanese Knotweed is not an easy task. Suggestions for eliminating this invasive plant include:

- Cut stems repeatedly to reduce vigor. Persistent cutting may control small, isolated populations.
- Apply foliar spray of glyphosate plus sticker-spreader in early June and in late August of the same year at the rate of 4 lbs. active ingredient per acre.
 - Apply foliar spray as needed the following spring if significant regrowth occurs.
 - o Rapidly establish alternative plant cover.³¹

Note that because of the ability of even a small rhizome segment to re-sprout, attempts to eradicate solely through excavation typically fail.

Multiflora Rose

Multi-flora rose (*Rosa multiflora*), a thorny, perennial shrub native to Asia, was brought to the United States originally in the 1800s for use as rootstock for grafted ornamental roses. In the 1930s through the 1950s it was promoted by the United States Department of Agriculture as a "living fence". Millions of seedlings were distributed to farmers and planted throughout the East and Midwest. Natural resource agencies such as the Pennsylvania Game Commission and the Pennsylvania Bureau of Forestry also included the plant in their re vegetation and wildlife enhancement programs until the 1960s. Multiflora quickly established itself as part of the naturalized flora. In 2002, it was estimated that there are 45 million acres of multi-flora rose can be found in numerous places: fields, roadsides, pastures, open woods, forest edges, and riparian areas. While it grows most vigorously in full sun, it can grow in the shade too, and will persist for many years under a tree canopy although it may not flower or fruit very heavily.³² Multiflora rose, which often forms dense thickets, can outcompete native vegetation for sun and nutrients.



Figure 5.4: Photograph of Multi-flora Rose Thicket³³

³⁰ Rhoads, Ann F., Block, Timothy A., *Japanese Knotweed and Giant Knotweed*, April 2002 (accessed May 28, 2010); available from http://www.paflora.org/Polygonum%20spp.pdf

³¹lbid.

³² Ibid.

Removal, which is one of the main management options, is problematic due to the numerous, strong thorns.³⁴ In addition to reaching heights of 9 to 15 feet, this shrub has arching stems that, when in contact with the ground, will root and form new plants. Multi-flora rose is very prevalent within the SRCW and has been observed in open areas associated with old surface coal mines, in Moraine State Park, and along the banks of the Slippery Rock Creek. Recommendations regarding removal of the multi-flora rose include:

- Pull seedlings from the ground. Hand dig small plants: pull larger plants with chain/cable by tractor. Dense thickets may require use of a bulldozer. Take care to remove roots.
- Mow repeatedly for 2–4 years.
- Cut stems and immediately treat with herbicide such as glyphosate or triclopyr. Use same herbicide as foliar spray.³⁵

Additional information regarding invasive plants and management approaches is available from the USDA National Invasive Species Information Center at: <u>http://www.invasivespeciesinfo.gov/.</u>

<u>Invasive Plant Watch List</u>: The following table contains plant species that have been identified as invasive in other Mid-Atlantic states and that have the potential to emigrate to Pennsylvania.³⁶

Species	Description and Threat
Black jetbead Rhodotypos scandens	A shrub that forms dense thickets that displace native woody plants and shades out herbaceous groundcover. This species has not yet been reported in Butler County, but there is the threat of spread from surrounding areas.
Tree-of-Heaven Ailanthus altissima	Introduced to Philadelphia from China in the early 1800s, it is present in disturbed places throughout the county. This fast growing tree is a prolific seed producer and can also proliferate through vegetative means, outcompeting native vegetation.
Japanese knotweed Polygonum cuspidatum Giant knotweed Polygonum sachalinense	These large fast-growing exotics displace natural vegetation and greatly alter natural ecosystems. Typically found along stream banks and other low-lying areas, as well as old home sites and waste areas.
Mile-a-Minute Polygonum perfoliatum	A vine that invades open and disturbed areas and scrambles over native vegetation in open and disturbed areas, limiting their photosynthesis. This species is listed as a noxious weed in Pennsylvania. Not yet known from Butler County.
Purple loosestrife Lythrum salicaria	An herbaceous wetland invasive that is present at scattered sites throughout the county. Once established in a wetland this species is difficult to eradicate and will displace native species.

Table 5.6: Significant Invasive Plant Species In or Near Butler County³⁷

³⁴ Ibid.

³⁵ Ibid.

³⁶ Pennsylvania Department of Conservation and Natural Resources, *Invasive Exotic Plants In Pennsylvania List*, n.d. (accessed May 28, 2010); available from http://www.dcnr.state.pa.us/Forestry/invasivetutorial/list.htm ³⁷ Pennsylvania Natural Heritage Program. 2011. Butler County Natural Heritage Inventory. Western Pennsylvania Conservancy. Pittsburgh,

³⁷ Pennsylvania Natural Heritage Program. 2011. Butler County Natural Heritage Inventory. Western Pennsylvania Conservancy. Pittsburgh, PA. Draft report.

Table 5.6: Significant Invasive Plant Species In or Near Butler County (con't.)				
Species	Description and Threat			
Garlic mustard Alliaria petiolata	An increasingly common invasive biennial herb spreading through natural areas throughout the region. Recent scientific evidence has shown that this species can disrupt mycorrhizal relationships that trees depend on for their growth.			
Japanese honeysuckle Lonicera japonica Oriental Bittersweet Celastrus orbiculatus	These species of vines cover and out-compete native vegetation as well as girdle trees by twining.			
Bush honeysuckles Lonicera tatarica L. morrowii L. maackii	Found in a variety of environments from wetlands to uplands. Competes with native plants for moisture, nutrients, and pollinators. Fruits do not provide high energy food for migrating birds.			
Canada and Bull thistles <i>Cirsium arvense, C. vulgare</i> Nodding (musk) thistle <i>Carduus nutans</i>	Pennsylvania listed noxious weeds. Invades a variety of dry to moist habitats displacing native plants and disrupting community processes.			
Spotted knapweed Centaurea stoebe	Competes with native species by capturing moisture and nutrients. Poses a high threat to dry upland habitats.			
Autumn olive Elaeagnus umbellata	A drought-tolerant species that thrives in many soil conditions. Threatens native ecosystems through competition and alteration of natural succession patterns and nutrient cycling.			
Japanese barberry Berberis thunbergii	Commonly planted ornamental that escapes and forms dense stands in a variety of habitats, including forests and wetlands, displacing native vegetation.			
Winged burning bush Euonymus alatus	A shrub that can form dense thickets that displace native woody and herbaceous plants.			
Multiflora rose Rosa multiflora	Widely planted shrub that invades a variety of habitats excluding most native shrubs and herbs. May be detrimental to the nest of native birds.			
Privet <i>Ligustrum</i> spp.	These shrubs can form dense thickets in floodplains, forests, wetlands, and fields that can outcompete native vegetation			
Reed canary grass Phalaris arundinacea	This grass, though native to PA, forms dense, monospecific stands in open wetlands, wet meadows and riparian areas. It effectively excludes all other plant species, causing greatly decreased biological diversity in wetland communities.			
Common reed Phragmites australis	There is a rare and noninvasive native strain of this grass in PA, but the introduced strain is very invasive, forming large, dense stands that exclude all other plants.			
Curly pondweed Potamogeton crispus	This aquatic plant has become dominant in many of the region's waterways			
Eurasian water-milfoil Myriophyllum spicatum	An aquatic plant tha thrives in nutrient-rich lakes and ponds and out-competes native plants.			

<u>Invasive Animals:</u> Invasive animals include both invertebrates and vertebrates. Invasive animals can cause as much, if not more harm than invasive plants. As plants do not move as freely as animals, plants typically spread more slowly compared to the often rapid "invasion" by animals.

Species	Description and Threat
Asian clam Corbicula fluminea	Found in extremely high densities along major tributaries and rivers, this clam directly competes with native mussels for food and habitat.
Common carp <i>Cyprinis carpio</i>	Introduced as a food fish, this carp is now found anywhere with warm, slow-moving water. As it feeds along the bottom, it mobilizes a large amount of sediment.
Common pine shoot beetle <i>Tomicus piniperda</i>	This beetle damages terminal shoots of pine trees (<i>Pinus</i> spp.) stunting their growth, weakening the trees, and increasing their susceptibility to other pests.
Emerald ash borer <i>Agrilus planipennis</i>	Devastating ash trees (<i>Fraxinus</i> spp.) across the eastern US, emerald ash borer larva kill the tree's sapwood. This species was first found in Butler County in 2007, resulting in a mandatory firewood quarantine and lumber movement restrictions.
European starling <i>Sturnus vulgaris</i>	This bird competes directly with native cavity-nesting birds, and also causes severe crop damage.
Feral swine Sus scrofa	Wild hogs should be aggressively controlled, due to their high mobility and negative impact on livestock, property, and natural areas.
Gypsy moth <i>Lymantria dispar</i>	Though it feeds preferentially on oak trees (<i>Quercus</i> spp.) and their relatives, this moth will eat many tree species, and can cause severe environmental and economic damage.
Hemlock woolly adelgid Adelges tsugae	This insect is causing severe damage to eastern hemlock (<i>Tsuga canadensis</i>), killing up to 90% of infected trees, and greatly modifying ecosystems.
House cat Felis silvestris	House cats, both domestic and feral, can each kill several small animals every day, causing the death of many amphibians, reptiles, birds, and mammals each year.
House mouse Mus musculus	Ubiquitous throughout the world, this mouse carries diseases, competes directly with many native species, and causes significant damage to crops and structures.
House sparrow Passer domesticus	Generally found near humans, this sparrow competes with small, native, cavity nesting birds, and can also cause crop damage.
Multicolored Asian ladybird beetle <i>Harmonia axyridi</i> s	Likely introduced in an attempt to control non-native aphids, this beetle now preys on native insects, and invades houses each winter.
Mute swan <i>Cygnus olor</i>	Though introduced for its beauty, this European swan causes significant damage to wetland vegetation. It is also fiercely competitive, and will exclude all other native waterfowl from its nesting territory sometimes killing intruders.
Norway rat Rattus norvegicus	The Norway rat is typically a pest in human made structures, but is also found around rivers and other water systems. A known carrier for many diseases, this rat is a threat anywhere it occurs.

Table 5.7: Significant Invasive Animal Species in or near Butler County³⁸

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Table 5.7. Significant invasive Animal Species in of hear Butter County (con t.)				
Species	Description and Threat			
Norway rat Rattus norvegicus	The Norway rat is typically a pest in human made structures, but is also found around rivers and other water systems. A known carrier for many diseases, this rat is a threat anywhere it occurs.			
Rusty crayfish Orconectes rusticus	Recently found in Butler County, this invader is rapidly spreading and displacing native crayfish, reducing fish populations, and generally disrupting aquatic systems.			
Sirex woodwasp Sirex noctilio	A recent invader to the U.S., this species attacks living pines and is likely to cause great amounts of damage to pine trees throughout the nation.			
Zebra mussel Dreissena polymorpha	This non-native mussel negatively affects industry and recreation, as well as native species of fish and mussels. Not yet known from Butler County.			

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Emerald Ash Borer

One of the most recent, well-publicized, invasive animals into the Slippery Rock Creek Watershed is the Emerald Ash Borer. Larvae of this beetle feed in the tissues under the bark of ash trees (*Fraxinus* spp.), causing the girdling and death of not only individual branches but also entire trees. Adults of the species are active from mid-May until September. Nationally, tens of millions of ash trees have been lost to this pest, which usually kills the trees within 3-4 years of infestation.



Figure 5.5: Photographs of Emerald Ash Borer Larva (left), Infected Tree (center), Adult (right)³⁹

Since being discovered in Michigan, the beetle has been detected in Ohio, Maryland, Virginia, Indiana, Illinois, West Virginia, Pennsylvania, Wisconsin, Missouri, Minnesota, Kentucky, and New York. The first Emerald Ash Borer infestation in Pennsylvania was detected just south of the Slippery Rock Creek Watershed in Cranberry Township, Butler County in June 2007. Although not publically identified until 2007, the infestation in Cranberry Township is thought to have started around 1999 or 2000. All counties within the SRCW have been included in the quarantine for the Emerald Ash Borer.

³⁹ Pennsylvania Department of Conservation and Natural Resources, *Emerald Ash Borer*, n.d. (accessed July 2, 2010); available from http://www.dcnr.state.pa.us/forestry/fpm_invasives_eab.aspx



Figure 5.6: Counties Quarantined for Emerald Ash Borer (July 30, 2010)⁴⁰

Red-Eared Slider Turtle

An invasive reptile within the SRCW is the Red-Eared Slider Turtle, which has been introduced to Pennsylvania primarily through the release of unwanted pet turtles. Native to the southeastern United States, the Red-Eared Slider competes with Pennsylvania turtles for food and habitat, which may have a negative effect on the population of native species.⁴¹



Figure 5.7: Photograph of the Red-Eared Slider Turtle⁴²

The Red-Eared Slider turtle appears to be the only invasive reptile within the SRCW, as most introduced species do not survive long enough to create a population.

 ⁴⁰ Pennsylvania Department of Agriculture, *Pennsylvania Department of Agriculture Map of Counties Quarantined for Emerald Ash Borer,* June 30, 2010 (accessed July 2, 2010); available from http://www.emeraldashborer.info/files/PA_EABQuarantine.pdf?a=3&Q=144707
 ⁴¹ Pennsylvania Fish and Boat Commission, *PLAY: PA's 10 Least Wanted Aquatic Nuisance Species,* Fall 2001 (accessed May 28, 2010); available from http://www.emeraldashborer.info/files/PA_EABQuarantine.pdf?a=3&Q=144707
 ⁴² United States Commission, *PLAY: PA's 10 Least Wanted Aquatic Nuisance Species,* Fall 2001 (accessed May 28, 2010); available from http://www.fishandboat.com/anglerboater/2001/so2001/leastpostr.pdf

⁴² United States Geological Survey, *NAS - Nonindigenous Aquatic Species Trachemys scripta elegans*, 2009 (accessed May 30, 2010); available from http://nas.er.usgs.gov/queries/FactSheet.aspx?SpeciesID=1261

F. SPECIES OF SPECIAL CONCERN

The Pennsylvania Natural Heritage Program **(PNHP)** is a partnership effort that includes the Western Pennsylvania Conservancy, PA Department of Conservation and Natural Resources, PA Fish and Boat Commission, and PA Game Commission. Through the PNHP, data collection regarding native biological diversity in Pennsylvania is conducted with the information stored in an integrated data management system. The goal is to build, maintain, and provide accurate and accessible ecological information needed for conservation, development planning, and natural resource management⁴³.

The environmental review tool of PNHP is the Pennsylvania Natural Diversity Index (PNDI). The PNDI was querried for species of concern by each of the following four jurisdictional agencies.

•	US Fish and Wildlife Service (USFWS)	10/12/10
•	PA Department of Conservation and Natural Resources (DCNR)	12/17/10
•	PA Fish and Boat Commission (PFBC)	07/15/10
•	PA Game Commission (PGC)	12/02/10

<u>US Fish and Wildlife Service PNDI:</u> A PNDI search conducted by the USFWS provided a list of species that were considered threatened, endangered, or of special concern for a portion of the Slippery Rock Creek Watershed. The following table provides the results of this PNDI search:

Species Name	Common Name	Status	SRWC Location	
Sistrurus catenatus catenatus	Eastern Massasauga Rattlesnake	Endangered	Butler Co. (historically in Lawrence Co.)	
Myotis sodalis	Indiana bat	Endangered	Beaver and Butler Co.	

Table 5.8: USFWS PA Natural Diversity Inventory for a portion of the SRCW⁴⁴

<u>PA Dept. of Conservation and Natural Resources PNDI:</u> A large project review was requested to the appropriate jurisdictional government agency for the entire Slippery Rock Creek Watershed.

PNHP PNDI Abbreviations

<u>Pennsylvania Endangered</u> **(PE)** - Plant species which are in danger of extinction throughout most of their natural range within this Commonwealth, if critical habitat is not maintained or if the species is greatly exploited by man. This classification shall also include any populations of plant species that have been classified as Pennsylvania Extirpated, but which subsequently are found to exist in this Commonwealth.

<u>Pennsylvania Threatened</u> (PT) - Plant species which may become endangered throughout most or all of their natural range within this Commonwealth, if critical habitat is not maintained to prevent their future decline, or if the species is greatly exploited by man.

<u>Pennsylvania Rare</u> (PR) - Plant species which are uncommon within this Commonwealth. All species of the native wild plants classified as Disjunct, Endemic, Limit of Range and Restricted are included within the Pennsylvania Rare classification.

<u>Pennsylvania Extirpated</u> **(PX)** - Plant species believed by the Department to be extinct within this Commonwealth. These plants may or may not be in existence outside the Commonwealth.

⁴³ Pennsylvania Natural Heritage Program, *About Us*, n.d. (accessed May 28, 2010); available from

http://www.naturalheritage.state.pa.us/AboutUs.aspx

⁴⁴ United States Fish and Wildlife Service. PNDI letter to Stream Restoration, Inc. (date missing)

<u>Pennsylvania Vulnerable</u> (PV) - Plant species which are in danger of population decline within Commonwealth because of their beauty, economic value, use as a cultivar, or other factors which indicate that persons may seek to remove these species from their native habitats.

<u>Tentatively Undetermined</u> **(TU)** - A classification of plant species which are believed to be in danger of population decline, but which cannot presently be included within another classification due to taxonomic uncertainties, limited evidence within historical records, or insufficient data.

No current legal status (N) - Plant species under review for future listing.

Note that the habitats listed in the table below are assumed to be for statewide significance and the description may not be specific for the Slippery Rock Creek Watershed.

Plant Species	Common	SRWC Occurrences		State Legal	Prop.	Habitat	Optimun Tin	n Survey nes
	Name	#	Date	Status	Status		flowers	fruits
Alisma triviale	Northern Water- plantain	2	1956	PE	PE	shallow water in ditches, lake margins, stream edges	late Jul. thru late Aug.	
Amelanchier sanguinea	Roundleaf Serviceberry	1	1971	TU	PE	open woods, rocky slopes, barrens	Apr. thru May	Jun. thru Jul.
Bromus kalmii	Brome Grass	1	1984	Ν	PT	rocky wooded slopes, dry or moist woods	Jun. thru Jul.	
Carex alata	Broad-winged Sedge	2	2008	PT	PT	swamps, peaty shores, wet thickets, woods, typ. calcareous soils	N/A	N/A
Carex buxbaumii	Brown Sedge	2	1994 1995	TU	PR	calcareous swamps, swales, meadows	N/A	N/A
Carex lasiocarpa	Slender Sedge	1	1994	PR	PR	sphagnum bogs	N/A	N/A
Carex meadii	Mead's Sedge	1	1991	TU	PE	wet meadows on diabase or serpentine	N/A	N/A
Carex prairea	Prairie Sedge	2	1994	PT	PT	wet calcareous marshes, fens	N/A	N/A
Carex pseudocyperus	Cyperus-like Sedge	1	2003	PE	PE	calcareous swamps, swales	N/A	N/A
Carex sterilis	Sterile Sedge	1	1996	PT	PE	calcareous swamps, fens	N/A	N/A
Carex tetanica	Sedge	4	1994 1995(2) 1996	PT	PT	calcareous wet meadows, swales	N/A	N/A
Cladium mariscoides	Twig Rush	2	1965 2008	PE	PE	marshes, floating bog mats, shallow lake margins	summer thru fall	
Cypripedium calceolus var. parviflorum	Small Yellow Lady's-slipper	1	1981	PE	PE	moist woods and bogs, often on limestone	Apr. thru Jun.	
Cypripedium reginae	Showy Lady's- slipper	1	1988	PT	PT	bogs, fens, swampy woods	May thru Jun.	
Cystopteris laurentiana	Laurentian Bladder-fern	1	1966	ΤU	PE	alkaline rocks	N/A	
Desmodium glabellum	Tall Tick-trefoil	1	1984	TU	TU	wooded roadside banks, open woods	Jun. thru Aug.	
Eleocharis elliptica	Slender Spike- rush	2	2008	PE	PE	moist, calcareous, sandy flats, fens, swales	mid-spring thru late summer	mid-spring thru late summer

Table 5.9: PADCNR Natural Diversity Inventory for SRCW

Table 5.9: PADCNR Natural Diversity Inventory for SRCW (con't.)

Plant Species	Common Name	ع Occ #	RWC urrences	State Legal Status	Prop. Status	Habitat	Optimur Tir	n Survey nes
Eleocharis tenuis var. verrucosa	Slender Spike- rush	1	1995	PE	PE	moist, open ground	mid-spring thru late summer	mid-spring thru late summer
Epilobium strictum	Downy Willow- herb	2	2002	PE	PR	calcareous marshes, meadows, thickets	Jul. thru Sep.	
Eriophorum viridicarinatum	Thin-leaved Cotton-grass	3	1994- 1996	PT	PT	bogs, wet meadows, swamps	May thru Jun.	
Filipendula rubra	Queen-of-the- prairie	4	1990 2002(2) 2003	TU	TU	moist meadows, thickets, roadsides	Jun. thru Aug.	
lodanthus pinnatifidus	Purple Rocket	1	1968	PE	PE	moist alluvial woods, wooded slopes	May thru Jun.	
Lobelia kalmii	Brook Lobelia	1	1951	PE	PE	calcareous swamps, moist pastures, fens	Aug. thru early Oct.	
Parnassia glauca	Carolina Grass- of-Parnassus	2	1996	PE	PE	boggy meadows, seeps on calcareous soils	Aug. thru Sep.	
Pedicularis lanceolata	Swamp Lousewort	4	1951 1952(2) 1994	Ν	PE	swamps, boggy meadows, swales. parasitic on plant roots	Aug. thru Sep.	
Poa languida	Drooping Bluegrass	2	1989	TU	PT	moist woods, fens	late May thru early Jun.	
Poa paludigena	Bog Bluegrass	1	1996	PT	PR	boggy woods, swamps	late May thru Jun.	
Populus balsamifera	Balsam Poplar	1	1988	PE	PE	cool, seasonally wet soils, bog margins	N/A	
Prenanthes racemosa	Glaucous Rattlesnake- root	1	1965	PX	PX	moist ground near bogs, old quarry; (believed extirpated)	N/A	
Ranunculus ambigens	Waterplantain Spearwort	1		Ν	TU	low, wet ground, swamps, muddy ditches	May thru Aug.	
Salix myricoides	Broad-leaved Willow	1	1997	Ν	PE	stream banks, swamps	N/A	
Salix serissima	Autumn Willow	2	1994 1995	PT	PT	fens, wet meadows on calcareous soils	after leaves emerge	
Schoenoplectus acutus	Hard-stemmed Bulrush	2	1996 2008	PE	PE	shallow water of lake, pond margins	Jun. thru Aug.	
Solidago speciosa var. speciosa	Showy Goldenrod	2	1969 1983	Ν	PT	moist meadows, rocky woods, thickets, roadsides on diabase and limestone	late Aug. thru Oct.	
Solidago uliginosa	Bog Goldenrod	5	1964 1995(3) 2002	Ν	PT	bogs, swamps, sedge meadows, fens	Aug. thru Oct.	
Spiranthes lucida	Shining Ladies'- tresses	2	1975 1996	Ν	PT	moist banks, lake shores, wet meadows, typ. calcareous soils	May thru Jul.	
Stenanthium gramineum	Featherbells	7	1962 to 1989	Ν	TU	moist clearings	July thru early Sep.	
grammoun		26	2007 10				Carly Cop.	

Plant Species	Common Name	SRWC Occurrences # Date		SRWCStateOccurrencesLegal#DateStatus		Habitat	Optimum Survey Times	
Swertia caroliniensis	American Columbo	4	1970's 1995(2) 1996	PE	PE	open deciduous woods on calcareous soils	May thru Jun.	
Symphyotrichum ericoides	White Heath Aster	1	1979	TU	PT	calcareous cliffs, outcrops	late summer & fall	
Trollius laxus	Spreading Globeflower	3	1987 1992(2)	PE	PE	rich moist calcareous meadows, swamps, open woods	Apr. thru May	
Veratrum virginicum	Virginia Bunchflower	3	1996(2) 2008	Ν	PE	moist woods, seepages, damp clearings	Jun. thru Aug.	
Viburnum trilobum	Highbush- cranberry	4	1991	TU	PT	swamps, fens, wet woods	late May	Aug. thru Sep.
Vittaria appalachiana	Appalachian Gametophyte Fern	1	1981	PT	PT	heavily shaded, moist crevices, non-calc. rock overhangs; PA only gametophytes	N/A	
Penstemon laevigatus	Beard-tongue		6/14/50	N	TU		N/A	

Table 5.9: PADCNR Natural Diversity Inventory for SRCW (con't.)

The PA Department of Conservation and Natural Resources has also identified amphibians and reptiles that are of special concern in the Slippery Rock Creek Watershed.

Herptile Group	Special Concern Species					% of Total Herptile Groups in SRCW		
Salamanders	Four-toed Salamander	Hellbender	Jefferson Salamander					20%
Frogs	Northern Leopard Frog	Western Chorus Frog						22%
Lizards	Five-lined Skink ^a							100%
Turtles	Bog Turtle ^b	Blanding' s Turtle ^b						25%
Snakes	Eastern Massauga Rattlesnake ^c	Kirtland's Snake ^c	Eastern Ribbon Snake	Northern Copperhead	Ribbon Snake	Short-head Garter Snake	Smooth Green Snake	43%

Table 5.10: PADCNR Amphibians and Reptiles of Special Concern in the SRWC

^a records scarce; ^b exceptionally rare – presence doubtful; ^c PA Endangered Species

The Massasauga Rattlesnake and the Kirtland's Snake require further description as both have been designated Endangered Species. The Massasauga, one of the three venomous snakes in Pennsylvania, is the most obscure, the smallest, and the rarest. The relict prairie at the Jennings Environmental Education Center, Brady Township, Butler County, is a preferred habitat of the Massasauga. Recent field work of the DCNR indicates that populations are declining in the watershed, however. In addition, the vast majority of reported Massasauga sightings have turned out to be other species; however, there may be small populations that have not been identified. The

Kirtland's Snake, like all of the "water" snakes in PA, is harmless. The Kirtland's Snake has become so rare that sightings are nearly non-existent. Never a common snake, very few confirmed sightings have been made since the 1950s. Small pockets may still exist within the watershed, however.⁴⁵

<u>PA Fish and Boat Commission PNDI:</u> The PAFBC provided a brief report, as requested, for the SRCWCP that also listed the Eastern Massasauga Rattlesnake (*Sistrurus catenatus catenatus*) as a species of special concern. The PAFBC described the species as a "mild mannered rattlesnake of wetlands and nearby upland areas" that is restricted to the northwest region of the state. The PAFBC also noted that the population of the Massasauga is presently threatened by filling, draining, and otherwise disturbing the habitat.⁴⁶

Besides the freshwater mussels that are now extirpated from Pennsylvania, the PAFBC also stated that many of the remaining mussel species should be listed as threatened or endangered due to the limited distribution and population, at least at the state level. Status of freshwater mussel species in PA is currently under review.⁴⁷ Freshwater mussel species are "extremely vulnerable to physical changes (i.e., siltation, dredging, trenching, rip-rap, stream depth, velocity) and chemical changes (i.e., pH, temperature, dissolved oxygen, organic contaminants, heavy metals) to the aquatic environment.

<u>PA Game Commission PNDI:</u> The PAGC also provided a letter that listed species with a status of threatened, endangered, or of special concern in the SRCW as provided in the following table.

Scientific Name	Common Name	Status
Myotis sodalis	Indiana Bat	
Rallus elegans	King Rail	
Cistothorous platensis	Sedge Wren	Endangered
Botaurus lentiginosus	American Bittern	
Ixobrychus exilis	Least Bittern	
Spiza americana	Dickcissel	
Haliaeetus leucocephalus	Bald Eagle	
Bartramia longicauda	Upland Sandpiper Threatened	
Pandion halaetus	Osprey	
Asio flammeus	Short-eared Owl	
Podilymbus podiceps	Pied-billed Grebe	
Ardea herodias	Great Blue Heron	
Gallinula chloropus	Common Moorhen	Special Concern
Myotis septentrionalis	Northern Long-eared Bat	
Cistothorus palustris	Marsh Wren	

Table 5.11: PGC PNDI Results for the SRCW⁴⁸

PA Natural Heritage Program – Species of Conservation Concern

During the review of the Draft SRCWCP, additional information regarding species and other features of conservation concern were submitted for inclusion in the Final SRCWCP. rovided Table 5.11 lists all the species of concern in the SRCW. Helpful information to the table is below:

⁴⁵ Hulse, Arthur, McCoy, C.J., Censky, Ellen, *Amphibians and Reptiles of Pennsylvania and the Northeast* (Cornell University Press, 2001), pages 6-91.

⁴⁶ Urban, Christopher A., Pennsylvania Fish and Boat Commission letter to Stream Restoration, Inc., July 15, 2010.

⁴⁷ Ibid.

⁴⁸ Braun, Olivia A., Pennsylvania Game Commission PNDI letter to Stream Restoration, Inc., December 2, 2010.

Global (GRANK) and State (SRANK) Ranking

Global and State Ranking is a system utilized by the network of 50 statewide natural heritage programs in the United States. Although similar to the federal and state status designations, the ranking scheme allows the use of one comparative system to rank all species in a relative format. Unlike state or federal status designation guidelines, the heritage ranking procedures are also applied to natural community resources. Global ranks consider the imperilment of a species or community throughout its range, while state ranks provide the same assessment within each state. Although there is only one global rank used by the heritage network, state ranks are developed by each state and allow a one-system comparison of a species or communities imperilment state-by-state. For more information, contact the Pennsylvania Natural Heritage Program.

Global Element Ranks

G1 = Critically imperiled globally because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.

G2 = Imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.

G3 = Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range or because of other factors making it vulnerable to extinction throughout its range; in terms of occurrences, in the range of 21 to 100.

G4 = Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.

G5 = Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.

GH = Of historical occurrence throughout its range, i.e., formerly part of the established biota, with the expectation that it may be rediscovered (e.g., Bachman's Warbler).

GU = Possibly in peril range-wide but status uncertain; need more information.

GX = Believed to be extinct throughout its range (e.g., Passenger Pigeon) with virtually no likelihood that it will be rediscovered.

GNR = Global rank has yet to be assessed. A GNR rank does not indicate commonness or a globally secure distribution.

G? = Not ranked to date.

State Element Ranks

S1 = Critically imperiled in state because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extirpation from the state.

S2 = Imperiled in state because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it vulnerable to extirpation from the state.

S3 = Rare or uncommon in state (on the order of 21 to 100 occurrences).

S4 = Apparently secure in state, with many occurrences.

S5 = Demonstrably secure in state and essentially ineradicable under present conditions.

Global and State Ranking (misc.)

SA = Accidental (occurring only once or a few times) or casual (occurring more regularly but not every year) in state, including species which only sporadically breed in the state.

SE = An exotic established in state; may be native elsewhere in North America (e.g., house finch or catalpa in eastern states).

SH = Of historical occurrence in the state, perhaps having not been verified in the past 20 years, and suspected to be still extant.

SN = Regularly occurring, usually migratory and typically nonbreeding species for which no significant or effective habitat conservation measures can be taken in the state.

SR = Reported from the state, but without persuasive documentation which would provide a basis for either accepting or rejecting (e.g., misidentified specimen) the report.

SU = Possibly in peril in state but status uncertain; need more information.

SX = Apparently extirpated from the state.

SZ = Not of significant conservation concern in the state, invariably because there are no (zero) definable element occurrences in the state, although the taxon is native and appears regularly in the state.

S? = Not ranked to date.

Notably, the study of naturally occurring biological communities is complex and natural community classification is unresolved both regionally and within Pennsylvania. The Global and State Ranking of natural communities also remains difficult and incomplete. Although many natural community types are clearly identifiable and are ranked, others are still under review and appear as G? and/or S?.

Scientific Name (or as noted) Common Name		Common Name	Last Date Observed	GRANK	SRANK	State Legal Status	PABS Status (recommended)	
BI	BIRDS							
	Rallus elegans	King Rail	1993	G4	S1B	PE	PE	
	Rallus limicola	Virginia Rail	2008	G5	S3B	Ν	Ν	
	Porzana carolina	Sora	2008	G5	S3B	Ν	CR	
	Gallinula chloropus	Common Moorhen	1992	G5	S3B	Ν	CA	
	Fulica americana	American Coot	1992	G5	S3B,S3N	Ν	CR	
	Bartramia longicauda	Upland Sandpiper	2009	G5	S1S2B	PT	PT	
	Asio flammeus	Short-eared Owl	2003	G5	S1B,S3N	PE	PE	
	Thryomanes bewickii altus	Appalachian Bewick's Wren	1939	G5T2Q	SH	Ν	PX	
	Cistothorus platensis	Sedge Wren	2004	G5	S1B	PE	PE	
	Cistothorus palustris	Marsh Wren	1988	G5	S2S3B	Ν	CR	
	Spiza americana	Dickcissel	2000	G5	S2B	PE	PE	
MA	MAMMALS							
	Myotis septentrionalis	Northern Myotis	1990	G4	S1	Ν	CR	
	Mustela nivalis	Least Weasel	1950	G5	S3	N	CU	
FR	ESHWATER MUSSELS							
	Cyclonaias tuberculata	Purple Wartyback	1919	G5	SX	Ν	PX	
	Fusconaia subrotunda	Long-solid	1991	G3	S1	Ν	PE	
	Lampsilis fasciola	Wavy-rayed Lampmussel	1990	G5	S4	N	Ν	
	Lasmigona compressa	Creek Heelsplitter	2008	G5	S2S3	N	CR	
	Potamilus alatus	Pink Heelsplitter	1990	G5	S2	N	CR	
	Villosa iris	Rainbow Mussel	2008	G5Q	S1	Ν	PE	
	Utterbackia imbecillis	Paper Pondshell	2008	G5	S3S4	Ν	CU	
BL	ITTERFLIES							
	Euphyes conspicuus	Black Dash	2006	G4	S3	N	Ν	
	Pieris virginiensis	West Virginia White	2008	G3?	S2S3	N	Ν	
	Lycaena hyllus	Bronze Copper	2008	G4G5	S3	Ν	Ν	
	Euphydryas phaeton	Baltimore	2008	G4	S3	Ν	Ν	
	Hesperia leonardus	Leonard's skipper	2008	G4	S3	Ν	Ν	
DF	AGONFLIES AND DAMSELFLIES	3						
	Aeshna constricta	Lance-tipped Darner	2007	G5	S3S4	N	Ν	

Table 5.12: Species of Conservation Concern in the SRCW⁴⁹

⁴⁹ ⁴⁹ Pennsylvania Natural Heritage Program Database. Accessed via email on April 2011. County Natural Heritage Inventory Program. Pittsburgh, PA.

	Argia tibialis	Blue-tipped Dancer	1961	G5	S1	Ν	Ν
	Boyeria grafiana	Ocellated Darner	2007	G5	S3	Ν	Ν
	Calopteryx angustipennis	Appalachian Jewelwing	1965	G4	S1S2	N	Ν
	Celithemis eponina	Halloween Pennant	2007	G5	S2S3	Ν	Ν
	Enallagma divagans	Turquoise Bluet	2008	G5	S3	N	Ν
	Gomphus rogersi	Sable Clubtail	2007	G4	S1	N	Ν
	Libellula incesta	Slaty Skimmer	2007	G5	S3S4	Ν	Ν
ĺ	Macromia taeniolata	Royal River Cruiser	2007	G5	S1	Ν	Ν
	Nasiaeschna pentacantha	Cyrano Darner	2009	G5	S1	Ν	Ν
	Rhionaeschna mutata	Spatterdock Darner	2008	G4	S1	Ν	Ν
	Sympetrum obtrusum	White-faced Meadowhawk	2008	G5	S3S4	Ν	Ν
Ì	Tachopteryx thoreyi	Gray Petaltail	1940	G4	S3	Ν	Ν
LA	ND SNAILS		•				
	Ventridens virginicus	split-tooth dome	2008	G4	S2S3	N	Ν
	Vertigo bollesiana	delicate vertigo	2008	G4	S2	N	Ν
ľ	Haplotrema concavum	gray-foot lancetooth	2008	G5Q	S2S3	N	Ν
	Columella simplex	high-spire column	2008	G5Q	S2S3	N	Ν
ł	Discus patulus	domed disc	2008	G5	S3	N	Ν
Ы	ANTS						
	Frigenia bulbosa	Harbinger-of-spring	1998	G5	S4	PT	PR
ł		Stiff Cowbane	1941	G5	S2		PT
	Conoclinium coelestinum	Mistflower	2007	G5	S4	N	SP
	Helianthus microcentalus	Small Wood Supflower	1960	G5	\$4 \$4	N	SP
ł	Prenanthes crenidinea	Crepis Rattlesnake-root	1995	G4	S4	PF	SP
	Prenanthes racemosa	Glaucous Battlesnake-root	1972	G5	SH	PX	PX
	Solidado speciosa var speciosa	Showy Goldenrod	1983	G5T5?	S2	N	PT
	Solidago uliginosa	Bog Goldenrod	2002	G4G5	S2	N	PT
ł	Symphyotrichum drummondii	Hairy Heart-leaved Aster	1946	G5	SH	N	PF
	Symphyotrichum ericoides	White Heath Aster	1979	G5	S3	TU	PT
ł	Symphyotrichum firmum	Firm Aster	1996	G5T5	S4	TU	SP
	Iodanthus pinnatifidus	Purple Rocket	1968	G5	S1	PF	PF
ł	l obelia kalmii	Brook Lobelia	1951	G5	S1	PE	PE
	Viburnum trilobum	Highbush-cranberry	1991	G5T5	S1S2	TU	PT
ľ	Phyllanthus caroliniensis	Carolina Leaf-flower	1981	G5	S1	PE	PE
	Desmodium alabellum	Tall Tick-trefoil	1984	G5	SU	TU	TU
	Swertia caroliniensis	American Columbo	1996	G5	S1	PE	PE
	Epilobium strictum	Downy Willow-herb	2010	G5?	S3	PE	PR
	Polygonum amphibium var. stipulaceum	A Water Smartweed	1996	G5T5	S4	TU	SP
ĺ	Ranunculus ambigens		2008	G4	S3	N	TU
	Trollius laxus	Spreading Globeflower	1992	G3	S1	PE	PE
ĺ	Rhamnus alnifolia	Alder-leaved Buckthorn	1996	G5	S4	TU	SP
	Amelanchier sanguinea	Roundleaf Serviceberry	1971	G5	S2	TU	PE
Ì	Filipendula rubra	Queen-of-the-prairie	2003	G4G5	S1S2	TU	TU
	Populus balsamifera	Balsam Poplar	1988	G5	S1	PE	PE
Ì	Salix myricoides	Broad-leaved Willow	1997	G4	S2	N	PE
Ì	Salix petiolaris	Meadow Willow	1996	G5	S4	TU	SP
Ì	Salix serissima	Autumn Willow	1995	G4	S2	PT	PT

	Parnassia glauca	Carolina Grass-of-Parnassus	1996	G5	S2	PE	PE
	Pedicularis lanceolata	Swamp Lousewort	1994	G5	S1S2	Ν	PE
	Pedicularis lanceolata	Swamp Lousewort	1952	G5	S1S2	N	PE
	Penstemon laevigatus	Beard-tongue	1950	G5	S3	N	TU
	Alisma triviale	Northern Water-plantain	1995	G5	S1	PE	PE
	Carex alata	Broad-winged Sedge	2008	G5	S2	PT	PT
ĺ	Carex bebbii	Bebb's Sedge	2008	G5	S1	PE	PE
	Carex buxbaumii	Brown Sedge	1995	G5	S3	TU	PR
	Carex interior	Inland Sedge	2008	G5	SNR	Ν	SP
	Carex lasiocarpa	Slender Sedge	1994	G5	S3	PR	PR
	Carex meadii	Mead's Sedge	1991	G4G5	S1	TU	PE
	Carex prairea	Prairie Sedge	1994	G5	S2	PT	PT
	Carex pseudocyperus	Cyperus-like Sedge	2002	G5	S1	PE	PE
	Carex sterilis	Sterile Sedge	1996	G4	S1	PT	PE
	Carex tetanica	A Sedge	1996	G4G5	S2	PT	PT
	Cladium mariscoides	Twig Rush	2008	G5	S2	PE	PE
	Eleocharis elliptica	Slender Spike-rush	2008	G5	S2	PE	PE
	Eriophorum viridicarinatum	Thin-leaved Cotton-grass	1996	G5	S2	PT	PT
	Schoenoplectus acutus	Hard-stemmed Bulrush	1996	G5	S2	PE	PE
	Scleria pauciflora	Few Flowered Nutrush	1869	G5	S2	PT	PT
	Lemna turionifera	A Duckweed	1934	G5	S1S3	TU	TU
	Erythronium albidum	White Trout-lily	1958	G5	S3	Ν	TU
	Veratrum virginicum	Virginia Bunchflower	2008	G5	S1	Ν	PE
	Stenanthium gramineum	Featherbells	2008	G4G5	S1S2	Ν	TU
	Cypripedium calceolus var. parviflorum	Small Yellow Lady's-slipper	1981	G5	S1	PE	PE
	Cypripedium reginae	Showy Lady's-slipper	1988	G4	S2	PT	PT
	Spiranthes lucida	Shining Ladies'-tresses	1996	G5	S3	N	PT
ļ	Spiranthes romanzoffiana	Hooded Ladies'-tresses	1925	G5	S1	PE	PE
	Poa languida	Drooping Bluegrass	1989	G3G4Q	S2	TU	PT
	Poa paludigena	Bog Bluegrass	1996	G3	S3	PT	PR
	Asplenium pinnatifidum	Lobed Spleenwort	1947	G4	S3	N	PR
	Cystopteris laurentiana	Laurentian Bladder-fern	1966	G3	S1	TU	PE
	Cystopteris tennesseensis	Bladder Fern	1947	G5	S1	Ν	PE
	Equisetum x ferrissii	Scouring-rush	1941	GNA	S1	N	PE
	Vittaria appalachiana	Appalachian Gametophyte Fern	1981	G4	S2	PT	PT
NA	TURAL COMMUNITIES						
	Golden saxifrage - sedge rich seep	Golden saxifrage - sedge rich seep	1995	GNR	S2	Ν	Ν
	Herbaceous vernal pond	Herbaceous vernal pond	2007	GNR	S3S4	N	Ν
	Open sedge (carex stricta, c.	Open sedge (carex stricta, c.	1990	GNR	S1	N	Ν
	prairea, c. lacustris) ten Bottomland oak - bardwood	prairea, c. lacustris) ten Bottomland oak - bardwood					
	palustrine forest	palustrine forest	1992	GNR	S2	N	Ν
	Red maple - black ash	Red maple - black ash	2002	GNR	S2S3	N	Ν
	palustrine torest Red maple - black-gum	Palustrine forest Red maple - black-dum					
	palustrine forest	palustrine forest	1987	GNR	S3S4	N	Ν
	Hemlock - mixed hardwood	Hemlock - mixed hardwood	1987	GNR	S3S4	N	N
	Alder - ninebark wetland	Alder - ninebark wetland	2008	GNR	S3	N	Ν

	Buckthorn - sedge (carex interior) - golden ragwort fen	Buckthorn - sedge (carex interior) - golden ragwort fen	2008	GNR	S1	Ν	Ν	
GE	GEOLOGIC FEATURES							
	Esker	Esker	1982	GNR	SNR	Ν	N	
	Waterfalls and rapids	Waterfalls and Rapids	1979	GNR	SNR	Ν	Ν	
	Cave, limestone solutional	Cave, Limestone Solutional	1984	GNR	SNR	Ν	Ν	
	Erosional remnant	Erosional Remnant	1979	GNR	SNR	N	N	
	Tufa	Tufa	2008	GNR	SNR	Ν	Ν	

County Natural Heritage Inventories - Biological Diversity Areas

County Natural Heritage Inventories (CNHIs) have been produced by PNHP for each of the counties in the SRCW. CNHIs include maps of Biological Diversity Areas (BDAs), which are areas containing species of conservation concern, exemplary natural communities, or exceptional native diversity.

An interactive map on the PNHP website (http://www.naturalheritage.state.pa.us/cnhi/cnhi.htm) is available. An update to the Butler CNHI is in progress and the results from that inventory is summarized below in draft form. The final version is scheduled for completion in the summer of 2011.

Table 5.13: Biological Diversity Areas in the SRCW 50

Significance County **BDA Name** Description Category

		Guidgery				
	Hidden River Cliffs	Local	Limestone outcrops			
	Moraine State Park Cabins	Notable	Upland habitat for a plant species of concern.			
	Shawood Bark	High	Aquatic and creekside habitat for 2 dragonfly species and			
	Shawood Faik	підп	1plant species of concern.			
	North Shore Tributary	Notable	A wetland that supports the Cyrano darner, a dragonfly			
	North Choro Thisdary		species of concern.			
	Big Run Valley					
		Notable	Early successional habitat for a butterfly species of conce			
		Natabla	Nexting behitet for convert			
	Maraina Dragagatian Area	Notable	Nesting habitat for osprey.			
	Noraine Progagation Area	Notable	Wetland habitat for a bird species of concern.			
	North Shore Cove Marsh	Notable	Wetland habitat for the Baltimore checkerspot butterily.			
	Elora Valley	Notable	Nesting habitat for osprey.			
	Jennings Prairie	Exceptional	A remnant prarie that provides habitat for several plants and			
lei						
utl	West Liberty Fen	Exceptional	A seepage wetland that provides habitat for wetland birds, a			
В		•	dragontly and several plant species of concern.			
	Slippery Rock Creek	Notable	Floodplain habitat for a butterfly and two plant species of			
	Natural Area		concern.			
	Lower Wolf Creek Valley	High	An outstanding geologic feature and habitat for 2 species of			
			concern.			
	Wolf Creek Narrows	High	Aquatic, wetland, and upland habitat for a variety of species			
		-	Wetland babitat for waterplantain spearwort, a plant species			
	Mercer Wetlands	Notable	of concern.			
	Hogg Woods	Local	Old growth stand of American beech.			
	Slippery Rock Creek, Rock	Natabla				
	Falls to Crestview Road	INOTADIE	Aquatic nabitat for two mussel species of concern.			
	Ring Swamp	Local	A shrub swamp.			
	Seaton Creek	Notable	A shrub swamp that provides habitat for a plant species of			
	Ocation Oreek	TNOLADIG	concern.			

⁵⁰ Pennsylvania Natural Heritage Program Database. Accessed via email on April 2011. County Natural Heritage Inventory Program. Pittsburgh, PA.

County	BDA Name	Significance Category	Description		
	The Glades Wildlife Area	Exceptional	A large impoundment and surrounding wetlands that support a variety of plant and animal species of concern.		
	Five Points	Notable	Riparian habitat for a plant species of concern.		
	Brachton Bottoms	High	Aquatic and riparian habitat for a plant, a snail, a dragonfly, and one other species of concern.		
	Findlay Run	Notable	Floodplain habitat for a butterfly and a plant species of concern.		
	Christy Run at Calico Road	Notable	Wet meadow habitat for two plant species of concern.		
	Slippery Rock Creek Gorge	High	Aquatic habitat for several species of concern.		
	Valley	Notable	Forest that supports a moth and a butterfly species of concern.		
	Lake Arthur	Notable	Aquatic and wetland habitat for several birds and dragonflies of concern, and an important area for migrating waterfowl.		
ř	Porter's Cove	Local	A wetland complex.		
sutle	Muddy Creek Marsh	Exceptional	Large wetland that supports numerous plant and animal species of concern.		
ш	Boyers	High	Aquatic and upland habitat for a plant and several animal species of concern.		
	Slippery Rock Creek at Windy Road	Notable	Aquatic and creekside habitat for a species of concern.		
	Big Run	Notable	Aquatic and creekside habitat for a species of concern.		
	State Game Lands #95 pool	Local	A vernal pool.		
	Glacial Wetlands	Local	A large circumneutral wetland.		
	Jacksville Esker	High	An outstanding geologic feature that provides habitat for a plant species of concern.		
	Countyline Grassland (also in Venango County)	High	The expansive hay fields and fallow fields on the border of Venango and Butler Counties in Irwin Township provide critical habitat for a species of concern.		
	Slippery Rock Creek at Elliots Mills (also in Lawrence County)	Notable	Aquatic and creekside habitat for several species of concern.		
	Brent	High	Reclaimed strip mine, now grassland that provides habitat for a species of concern.		
	Plain Grove	Exceptional	Wetland complex that includes fen and seepage wetland communities and is the location of numerous plant species of concern.		
	Grange Hall	Exceptional	Calcareous fen community and the location of several plant species of concern, one of which is rare throughout its range.		
e	McConahy Road Wetland	Notable	Black ash swamp and tussock sedge marsh that is a habitat for a plant species of concern.		
ren	Harlansburg Swamp	Local	Shrub swamp and historic location of a plant species of concern.		
Law	Hell Run	Exceptional	Exceptional value stream and gorge of Hell Run supporting older growth forest natural community.		
	Grindstone Confluence	Notable	Gorge, riverine islands and floodplain that is the location of a sycamore river birch floodplain scrub community.		
	Brush Run	High	Open marsh provides habitat for several plant species of concern.		
	Muddy Creek Falls	Local	Falls of Muddy Creek is a natural community and location of a plant species of concern.		
	Triangle Woods	Local	Rich, mature and diverse northern hardwoods forest.		
	Taylor Run Marsh	Notable	I wo quality wetland natural communities in the Taylor Run watershed.		

Table 5.13: Biological Diversity Areas in the SRCW (con't.)

County	BDA Name	Significance Category	Description	
	Barmore Lake	Exceptional	Isolated wetland that is the location of two species of concern.	
	Swamproot	Notable	Wetland that is the location of a natural community and a plant species of concern.	
	Amsterdam	Notable	Roadside habitat and mature forested areas that provide habitat for two species of concern.	
L D	Swamp Run Tributary	County	Small, isolated wetland that is the location of a plant species of concern.	
Merce	Grove City Swamp	Notable	Large swamp on an unnamed tributary to Wolf Creek containing mature tamarack which provides habitat for a plant species of concern.	
	Wolf Creek Swamp	Notable	Wetlands along Wolf Creek provide habitat for a species of concern.	
	Pine Swamp	Exceptional	Headwater wetland complex that provides habitat for an exceptional natural community and several species of concern.	
	Wolf Creek Wetlands	Notable	Wetland and terrestrial habitats along Wolf Creek support a species of concern.	

Table 5.13: Biological Diversity Areas in the SRCW (con't.)

G. IMPORTANT HABITATS

<u>General Habitats:</u> The National Land Cover Database (NLCD) is a dataset produced by the USGS that classifies the land cover over the entire United States using 30-meter resolution imagery from the Landsat Thematic Mapper satellite data. Using unsupervised clustering algorithms, land cover was broken down into a 16-class key based on Anderson Land Cover Classification. The land cover based on the 2001 NLCD dataset for the SRCW is shown on Plate 5.1.

Land Cover Type	Area (AC)
Open Water	6024.0
Developed, Open Space	18065.0
Developed, Low Intensity	5310.8
Developed, Medium Intensity	1012.8
Developed, High Intensity	224.2
Barren Land	477.7
Deciduous Forest	146865.4
Evergreen Forest	1401.7
Mixed Forest	3324.1
Shrub, Scrub	1.6
Grassland, Herbaceous	5362.8
Pasture, Hay	28498.2
Cultivated Crops	44560.1
Woody Wetlands	119.9
Emergent Herbaceous Wetlands	73.2

Table 5.14: Land Cover for SRCW (2001)⁵¹

⁵¹ GIS compiled from data collected by the Southwest Pennsylvania Commission and PASDA.

As displayed in the above table, the majority of natural habitats present in the watershed can be generally described as being forest and grassland. Wetlands and open water are also found in the watershed in smaller amounts.

<u>Forest:</u> Approximately 58% of the SRCW is covered by forest according to the NLCD. This habitat is particularly important in the support of game animals like the white-tailed deer and turkey that are present in the watershed. The forests are managed by private landowners or where on public lands primarily by the PA Game Commission, DCNR, or local government agencies.

<u>Grassland:</u> Approximately 13% of the SRCW is covered by grasslands according to the NLCD. Most grasslands in the SRCW are farmlands that include hay fields or pasture for livestock. Fallow grasslands can be important nesting areas for many bird species. In fact, some species will only nest in areas with un-mowed grass, like the ring-necked pheasant⁵².

To promote and manage grasslands for wildlife in the Commonwealth, stakeholders are advised to:

- Avoid planting exotic or invasive species, as native species may not be able to compete.
- Avoid cutting hay between April and August as this coincides with the nesting period for many bird species. If mowing or haying is needed, remember to have the cutting blade 6 inches above the surface to prevent accidental wildlife fatalities.
- Limit the invasion of woody vegetation as grasses may not be able to compete.⁵³
- Enroll farmland into the Conservation Reserve Enhancement Program (CREP), in which funding is provided for maintaining the natural condition of the land. (As of March 2006, Pennsylvania had the largest CREP program in the nation, with over 265,000 acres in 59 of 67 counties⁵⁴.)

As previously mentioned, warm season grasses are being reintroduced in selected open areas by the PA Game Commission and other stakeholders in the SRCW. Warm season grasslands food, nesting sites, and cover for many types of birds and small mammals.

<u>Wetland:</u> Wetland habitats are also important to the Slippery Rock Creek Watershed as well as Pennsylvania where there are over 700,000 acres of wetlands statewide. Throughout the Commonwealth, most (97%) of the wetlands are palustrine (marsh-like) with the exception of wetlands in the shallow zone of Lake Erie⁵⁵. Approximately 6% of the SRCW is covered by lakes, ponds, reservoirs and wetlands, where the wetlands include such communities as robust emergent marshes and shrub swamps which are common in several townships including Marion, Venango, Washington and Cherry Townships.⁵⁶

Wetlands are not evenly distributed over the landscape but concentrated in the glaciated northeastern and northwestern parts of Pennsylvania. Thus the occurrences of wetland-specific birds correspond to these wetland habitat distributions. The Slippery Rock Creek Watershed lies at the south end of this wetland haven. Even though wetland-specific birds utilize the wetland habitats, many other species of

⁵² Pennsylvania Game Commission, *Mowing and Wildlife: Managing Open Space for Wildlife Species*, 2001 (accessed May 29, 2010); available from http://www.portal.state.pa.us/portal/server.pt?open=514&objlD=699845&mode=2

⁵³ Rodewald, A. D., *Managing Wildlife Habitat on Public Open Space,* Bulletin 915 (The Ohio State University Extension, 2004), pages 9-12.

 ⁵⁴ Ducks Unlimited, *Pennsylvania's CREP Leads the Nation*, 2006 (accessed May 30, 2010); available from http://www.ducks.org/news-media/pennsylvanias-crep-leads-the-nation-
 ⁵⁵ Pennsylvania Department of Conservation and Natural Resources, *Wetland Distribution and Types*, n.d. (accessed May 30, 2010);

⁵⁵ Pennsylvania Department of Conservation and Natural Resources, Wetland Distribution and Types, n.d. (accessed May 30, 2010); available from <u>http://www.dcnr.state.pa.us/wlhabitat/aquatic/dist.aspx</u>
⁵⁶ Smith Lisa L. Biar Charles W. et al. Weatern Pernerited Conservation Distribution and Types, n.d. (accessed May 30, 2010);

⁵⁶ Smith, Lisa L., Bier, Charles W., et al., Western Pennsylvania Conservancy, *Butler County National Heritage Inventory,* July 1991 (accessed May 29, 2010); available from

http://www.naturalheritage.state.pa.us/CNAI_PDFs/Butler%20County%20NHI%201991%20WEB.pdf

birds with a wide range of habitats are observed. The Red-winged Blackbird, for example, is a common species in marshes throughout the watershed but is found in other found in upland grassland habitats as well. Also, the Gray Catbird, Yellow Warbler, and Eastern Towhee are abundant in shrub/scrub wetlands but may be equally common in shrub/scrub successional stages in upland areas.⁵⁷

Wetland plants provide food, shelter, nesting, and spawning sites for animals and provide dissolved oxygen and filter and store sediment carried by runoff from disturbed land including abandoned coal mines. Watershed biological resources include more than birds. The waters of wetlands alone are teaming with many microscopic organisms. Insects abound, including damselflies, dragonflies, water striders, and boatmen. Invertebrates like crayfish live there too. These creatures, and many more, form the basis of the food pyramid for the fish, reptiles, amphibians, birds, and mammals that flourish in wetland habitats. Streams, lakes, ponds, and wetlands are spawning and nursery grounds for fish. In fact, most freshwater fish feed in wetlands or upon food produced in wetlands of the watershed.

Of the 38 species of amphibians recorded in the watershed, 32 (84%) find home in wetlands. Twenty-five percent (11 of 41 species) of all reptiles spend nearly all of their lives in wetlands. Approximately 125 species of shore and wading birds, waterfowl, and some songbirds perform most of their daily activities in, on, or around water. Large mammals associated with wetlands include muskrat, otter, and beaver. Pennsylvania officially has listed more than 500 plants in special concern categories under authority of the Wild Resources Conservation Act (1982). Many of these species inhabit in the Slippery Rock Creek Watershed and are listed later in this section under the topic "Specials of Special Concern."

Although small emergent (i.e., cattail marshes) wetlands occur throughout western Pennsylvania, habitats large enough to support certain rare species like American and Least Bitterns and King Rail are specifically localized in the few remaining large marshes in Erie, Crawford, Mercer, Lawrence, and Butler Counties. On the other hand, riparian wetland habitat is diverse and contains the largest number of wetland species of birds in the watershed. Also, forested or palustrine wetlands constitute forty-five percent of wetlands making them the most widespread kind of wetland habitat in the watershed and Commonwealth.⁵⁸

Due to the biological diversity and beneficial environmental "services" provided by wetlands, the USDA Natural Resource Conservation Service (NRCS) has developed a program, similar to the CREP, known as the Wetland Reserve Enhancement Program (WREP) in which technical and financial support are provided for wetland restoration meeting the purposes of the USDA Wetlands Reserve Program. As of 2002, there were over one million acres enrolled in the WREP program, of which 3,613 acres were enrolled in the Commonwealth. More information on the WREP program can be found at the following link: <u>http://www.pa.nrcs.usda.gov/programs/WRP/index.html.</u>

<u>Stream</u>: Stream habitats are also important to the SRCW. According to the DEP designated stream uses, the majority of the streams in the watershed provide a habitat for cold water fishes. As noted in Section 1 of the SRCWCP, there are 151 miles of major streams in the watershed and many hundreds of miles of smaller perennial and intermittent streams. Healthy streams are important in the watershed not only for recreational activities such as fishing and boating (kayak, canoe, etc.) but also for the use of Slippery Rock Creek near Ellwood City as a public water supply by PA American Water. (Refer to Section 4, Water Resources.) Until recently, fish were not observed in some headwater streams for over 50 to 100 years. Due to stream restoration efforts, however, including the installation of over 18 passive systems treating a total of about 1 million gallons of abandoned coal mine drainage

58 Ibid.

⁵⁷ Wilhelm, Dr. Gene, Bartramian Audubon Society, Email Interview, January 26, 2011.

annually, fish have been documented indicating that the habitat is being restored. Nonetheless, similar to other areas of Pennsylvania, additional effort is needed to address the legacy of historical mining. (Refer to Section 2, Issues, Concerns and Constraints.)

A statewide stream assessment, conducted by the USEPA during 1993 and 1994, revealed that 27% of the streams were in poor condition based on fish and insect populations.⁵⁹ The studies also indicated that riparian habitat alteration and channel sedimentation were a problem on 21% and 19% of the stream miles in the Commonwealth, respectively, suggesting that development and alteration of riparian habitats continue to impact streams and rivers. Other sources of impact to the stream habitat include acidic deposition, nutrient and runoff pollution, and non-native fishes⁶⁰.

Important Bird Areas: An area that support critical habitat for a diversity of birds species or species of special concern is designated as an Important Bird Area (IBA) by the National Audubon Society Pennsylvania Chapter. In 1996, Pennsylvania was the first state to develop an IBA program in the United States. Pennsylvania's Ornithological Technical Committee, comprised of top bird experts, determines whether or not a site meets one or more of the above criteria. Once a site is officially identified as an IBA, volunteer monitoring efforts are initiated. This monitoring primarily focuses on the nesting season – tracking the numbers and variety of birds breeding in that particular habitat. But the monitoring also extends to the land itself, focusing attention on the main threats to Pennsylvania's IBA habitats. These threats include but are not limited to:

- Habitat fragmentation
- Suburban sprawl
- Overbrowsing by deer

The Ornithological Technical Committee to date has identified 87 IBA sites encompassing over two million acres of the state's public and private lands.⁶¹ The areas include locations for prime breeding sites for land and water birds, winter roosts and migratory staging areas. The criteria used to select IBA sites are:

- Any site having exceptional concentration and/or diversity of bird life, defined as 2,000 waterfowl at one time (excludes resident Canada Geese), 100 shorebirds together at one time, 50 breeding pairs of wading birds, or 10,000 migrant raptors per season.
- Support a significant population of state or federally-listed threatened or endangered avian species.
- Support a significant population of one or more avian species on Pennsylvania's "special concern" list.
- Contain representative, rare, threatened, endangered, or unique habitats with birds characteristic of those habitats.
- Sites where long-term (i.e., years) avian research or monitoring is in progress.

A total of four IBAs are located within the SRCW and are shown on Plate 5.2.

⁵⁹ PA Department of Conservation and Natural Resources, *Stream and River Quality Today*, n.d. (accessed May 28, 2010); available from http://www.dcnr.state.pa.us/wlhabitat/aquatic/streamqual.aspx ⁸⁰ Ibid

⁶¹ Wilhelm, Dr. Gene, *Bartramian Audubon Society Sanctuaries: Including Important Bird Areas in the Eco-Region* (New Castle, PA: Commercial Printing Company, 2008), page 4.

IBA ID	Name	ACRES		
11	The Glades - SGL 95	1,5945.1		
10	Pennsy, Black & Celery Swamps -SGL 151 & 284	29,076.1		
12	Moraine State Park & Jennings EEC	1,6527.5		
77	McConnell's Mill State Park	3,480.8		
	Total Core IBA Areas	65,029.5		

Table 5.15: Important Bird Areas within the SRCW

More information about each of the IBAs can be found on the Audubon Pennsylvania website at <u>http://pa.audubon.org/iba/IBAs.html</u>.

<u>Bartramian Audubon Society Sanctuaries</u>: The Bartramian Audubon Society **(BAS)** became a local chapter of the National Audubon Society in 1982. The mission of the BAS is to "preserve the native plant and animal communities in our eco-region, through monitoring and protecting vulnerable, rare, threatened and endangered life forms."⁶² BAS offers educational programs to local communities and additional information can be accessed at: <u>http://www.bartramianaudubon.org.</u>

As of 2011, the Bartramian Audubon Society has 138 sanctuary owners protecting 4430.6 acres and monitors 8 IBAs with 38,319 acres for a total of 42,749.6 protected acres. Sanctuary sites include extensive diverse breeding bird habitats, such as emergent wetlands, forested wetlands, stream islands, riparian forests, shrub wetlands, open water, upland coniferous, deciduous, and mixed forests, and grassland components.

Pennsylvania is making an important contribution to the conservation of bird habitats in the western hemisphere. "Penn's Woods" are critical to many interior forest birds, providing nesting habitat to 17% of the world's Scarlet Tanagers and 9% of the Wood Thrushes. Many of Pennsylvania's large rivers, lakes, and mountain ridges provide critical migratory stopovers for waterfowl, shorebirds, and raptors.⁶³ Some of the notable birds within the SRCW are included in Table 5.12

Common Name	Species Name	Designation	
American Bittern	Botaurus lentiginosus	Endengered	
Least Bittern	Ixobrychus exilis		
King Rail	Rallus elegans	Endangered	
Sedge Wren	Cistothorus platensis		
Osprey	Pandion haliaetus		
Bald Eagle	Haliaeetus leucocephalus	Threatened	
Northern Harrier	Circus cyaneus		
Upland Sandpiper	Bartramia longicauda		
Northern Bobwhite Colinus virginianus		Condidatos	
Barn Owl	Tyto alba		
Golden-winged Warbler	Vermivora chrysoptera	AI- RISK	
Pied-billed Grebe	Podilymbus podiceps		
American Coot	Fulica americana	Candidates	
Wilson's Snipe	Gallinago delicata	Rare	
Marsh Wren	Cistothorus palustris]	

Table 5.16: Local Breeding Bird Species of Special Concern in the SRCW⁶⁴

⁶² Ibid.

⁶³ Wilhelm, Dr. Gene, Bartramian Audubon Society, Email Interview, January 26, 2011.

⁶⁴ Ibid.

andhill Crane	Grus canadensis	
rginia Rail	Rallus limicola	
ora	Porzana carolina	
ommon Moorhen Gallinula chloropus		Vulnorabla
orthern Parula	Parula americana	Vullielable
erulean Warbler	Dendroica cerulea	
rothonotary Warbler	Protonotaria citrea	
orm-eating Warbler	Helmitheros vermivorus	

<u>BAS Wildlife Sanctuary Program</u>: The BAS offers a "Wildlife Sanctuary Program" which enables private land owners the opportunity to commit their land to nature, thus providing a natural preserve for wildlife plants and animals. There are four requirements for a property to become a Wildlife Sanctuary:

- Must be a minimum of 20 acres
- Biologically diverse
- Possess other outstanding natural qualities
- Allow all natural processes to continue unabated in perpetuity⁶⁵

There are neither financial rewards nor tax breaks for entering into the Wildlife Sanctuary Program, which is "another option and model to a land trust or conservation easement for landowners who want to retain their property in an undisturbed natural state for future generations." As of 2011, there are a total of 50 Wildlife Sanctuaries in the SRCW preserving a total of 4055 acres of outstanding biodiversity.⁶⁶

Some of the wildlife sanctuaries within the SRCW are listed in Table 5.15.

County	Sanctuary Name	Municipality (twp; <i>borough</i>)	Acres
	Slippery Rock Park	Slippery Rock	23.40
	Forrester Road	Slippery Rock	135.40
	Jennings Environmental Education Center	Brady	300.00
	Christley Mills	Slippery Rock	25.12
	Susan A. Ralston Property	Slippery Rock	80.00
Butler	Slippery Rock Property (Commonwealth of PA)	Slippery Rock	92.00
	Tamarack Lake	Worth	50.22
	Blain Property	Franklin	27.00
	Shultz Property	Boyers	26
	Miller Woods	Slippery Rock	42.11
	Poplar Forest Wetlands Initiative	Slippery Rock	109.63
	Mason Property	Harrisville	20.19

Fable 5.17:	Audubon	Wildlife	Sanctuaries	in the	SRCW ⁶⁷

⁶⁵ Wilhelm, Dr. Gene, Bartramian Audubon Society, Email Interview, January 26, 2011

⁶⁶ Ibid.

⁶⁷ Wilhelm, Dr. Gene, *Bartramian Audubon Society Sanctuaries: Including Important Bird Areas in the Eco-Region* (New Castle, PA: Commercial Printing Company, 2008), pages 6-19.
	Robert A. Macoskey Center (Slippery Rock University)	Slippery Rock	78.00
	South Main Street Forest (Slippery Rock University)	Slippery Rock	16.30
	Old Stone House Forest (Slippery Rock University)	Brady	73.65
Lawrence	Bruce Hazen/Kimberly Donovan Propterty	Ellwood City (Hell's Hollow of McConnell's Mill State Park)	19.1
Moreor	Barcaskey Property	Liberty	132.00
wercer	Lenzelhof Property	Liberty	85.00

For queries and applications, please contact Dr. Gene Wilhelm, BAS Wildlife Sanctuary Program, 513 Kelly Blvd., Slippery Rock, PA 16057-1145, phone 724-794-2434, or email <u>genewilhelm@aol.com</u>.

<u>BAS Bird and Butterfly Sanctuary Program</u>: The BAS believes that "ecology should begin at home"⁶⁸ and thus created the Bird and Butterfly Sanctuary Program. The program "aims to promote a better understanding of birds, butterflies and other wildlife in general and develop a natural system of mini-sanctuaries..."⁶⁹ The natural organic way is introduced in order to invite birds and butterflies to the property. This is accomplished by planting trees, shrubs, vines and herbaceous forms of native plants that serve the various needs of birds and butterflies as well as increase the beauty of the land. Birds and butterfly habitats are emphasized by the BAS for several reasons:

- Highly mobile
- Specific microhabitat requirements
- React rapidly to changes in their surroundings
- Scientifically unique
- Esthetically beautiful
- Easily seen
- Socially appealing⁷⁰

Other benefits are the songs of birds which are greatly enjoyed and birds also help to reduce the insect pests that attack flowers, lawns, gardens, and people. Butterflies and hummingbirds are primary pollinators of flowers. As of 2011, there are 88 Bird and Butterfly areas preserving a total of 376.024 acres in the SRCW.⁷¹

For queries and applications, please contact Dr. Gene Wilhelm, BAS Wildlife Sanctuary Program, 513 Kelly Blvd., Slippery Rock, PA 16057-1145, phone 724-794-2434, or email <u>genewilhelm@aol.com.</u>

<u>Corridor Preservation</u>: The Butler, Lawrence, and Mercer County National Heritage Inventories created an idea for corridor preservation. Dr. Gene Wilhelm then proposed the idea of connecting and combing the corridor system to the IBAs and filling habitat gaps with BAS sanctuaries. In 2004 a strategy was proposed establishing Sandy Creek, Wolf Creek, Slippery Rock Creek, and their tributaries as a natural riparian greenway complex and corridor system that would connect four IBAs of high avian species richness:

⁶⁸ Ibid.

⁶⁹ Ibid.

⁷⁰ Ibid.

⁷¹ Wilhelm, Dr. Gene, Bartramian Audubon Society, Email Interview, January 26, 2011.

M.K. Goddard State Park—State Game Lands #270 (IBA# 79) to the north with McConnell's Mill State Park (IBA #77) and Moraine Sate Park—Jennings Environmental Education Center (IBA#12) to the south and the Glades State Game Lands 95 (IBA #11) to the east. In 2005, Barrows Herony/Brucker Sanctuary (IBA#8), Shenango Reservoir (IBA #9) and Pennsy, Black and Celery Swamps State Game Lands 284 and State Game Lands 151 (IBA #10) were added to the system.⁷²

<u>Important Mammal Areas</u>: An area that can support critical habitat for a diversity of mammals or species of special concern is designated as an Important Mammal Area **(IMA)** by the Pennsylvania Wildlife Federation. Similar to the IBA, the Important Mammal Areas Project **(IMAP)** is a partnership of sportsmen, scientists, conservation groups and professionals. There are no IMAs in the SRCW, but there are several in other areas of the state.

<u>Conservation Areas Based on Biodiversity:</u> Areas in the Slippery Rock Creek Watershed have been identified for specific conservation practices. County National Heritage Inventories **(CNHI)** provide the following classifications for conservation areas within the SRCW relating to biological diversity:⁷³

Significance Rank	Site Description
Exceptional (Ex)	exceptional importance for biological diversity and ecological integrity of county or region contains one or more occurrences of state or national species of special concern or a rare natural community of adequate size, condition, and extent deserve complete and strong protection.
High (Hi)	highly important for biological diversity of county or region contains species of special concern or highly-ranked natural communities typically large and primarily undisturbed sites deserve strong protection.
Notable (Nb)	contains occurrences of species of special concern or natural communities either more common or of smaller size and extent than exceptional or high rank, or have activity and disturbance deserve special protection within the context of characteristics, degree of disturbance, and place in community.
Local (Lo)	 great potential for protecting biodiversity of county has not yet been found to contain species of special concern or state significant natural communities deserve further study because of size, undisturbed character, or proximity to other significant areas

Table 5.18: Significance Rankings and Description for BDA

• Biological Diversity Area (BDA)

An area of land recognized as supporting populations of state, nationally, or globally significant species or natural communities; high-quality examples of natural communities or ecosystems; or natural exceptional native diversity. These areas are typically small, and contain a buffer that protects the natural community or habitat that is needed to support the site.

Landscape Conservation Area (LCA)
 An area of land larger than a BDA that contains minimal human disturbance and allows
 ecosystems to function on a landscape level. Areas often contain multiple BDAs.

⁷² Wilhelm, Dr. Gene, *Bartramian Audubon Society Sanctuaries: Including Important Bird Areas in the Eco-Region* (New Castle, PA: Commercial Printing Company, 2008), pages 3-9.

⁷³ Pennsylvania National Heritage Inventory Program, *County National Heritage Inventories*, 2010 (accessed May 30, 2010); available from http://www.naturalheritage.state.pa.us/CNAL_Download.aspx

• Dedicated Area (DA)

An area of land that is to be protected by the specific intention of a property owner, which may result in the site becoming a future BDA or a high-quality area within an already designated BDA. Numerous sites within the watershed could be DAs in the future through landowner agreements, special programs, or other methods.

Biological diversity areas were identified and ranked, as described above, by the Western PA Conservancy for counties within the watershed and are shown on Plate 5.3.

As noted in the table below, the County National Heritage Inventories list 41 BDA in the 408-sq. mi. SRCW that support important habitats relating to biological diversity. Mercer and Venango Counties are not represented in the table as there are no sites located within the watershed.

There is a new interactive BDA map. Click on <u>http://www.naturalheritage.state.pa.us/cnhi/cnhi.htm</u> to find a link to the full description of each BDA as well as the online CNHI reports. Updated data for the Butler County NHI report will be at: <u>http://www.naturalheritage.state.pa.us/CNAI_Download.aspx</u>.

PNHP now maps 'Core' and 'Supporting Landscape' levels for each BDA. The Core is the habitat of the species of concern, or the central target for conservation, which cannot be developed without significantly affecting the viability of the species in the Core. The Supporting Landscape can accept a limited degree of impact or development. Core and Supporting Landscape polygons are only available for Butler and Venango Counties at this point. Please check the CNHI website for updated info: http://www.naturalheritage.state.pa.us/.

County	Name	Description	Rank
	Boyers	PA endangered animal	Ex
	Branchton Bottoms	Unique wetland community	Ex
	Currys Mills Floodplain	Unique community/ wetland	Hi
	Ferris Wetland	Community	Hi
	Harlansburg Swamp		Co
	Hogg Woods	Small significant natural community; min. buffer zone	Nb
	Jennings Environmental Education Center	Dry-mesic acidic central forest; prairie	Ex
	Kennedy / Balanced Rocks	Unique natural community	Hi
	Lake Arthur Tributary	Unique natural community. Small in size and somewhat degraded.	Hi
<u> </u>	Lower Wolf Creek Valley	Unique wetland, forest, and stream communities. Habitat for plants species of special concern.	Ex
utle	McConahy Road Wetland		Nb
ā	McMurray Run	PA endangered animal; diminished habitat (additional investigation)	Hi
	Moraine State Park Office Valley	PA threatened animal	Hi
	Moraine State Park Propagation Area	PA threatened animal	Ex
	Muddy Creek	Wetland community	Ex
	Muskrat Cove Valley	Significant natural community	Hi
	North Branch Wetland	Forested wetland community; some disturbance	Hi
	Ring Swamp	Unique natural community	Ex
	Seaton Creek Wetland	Significant wetland community	Hi
	Slippery Rock Creek Gorge	Significant natural communities (2)	Hi
	Slippery Rock Creek Property	Significant forest and wetland communities.	Ex
	The Glades Wildlife Area	Species (2) of special concern	Ex

Table 5.19: CNHI Biological Diverse Areas (BDA) within the SRCWD⁷⁴

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Table 5.19: CNHI Biological Diverse Areas (BDA) within the SRCWD (con't.)

County	Name	Description			
	Brush Run	Open marsh; several special concern plant species	Hi		
nce	Grindstone Confluence	Gorge, riverine, islands, floodplain; sycamore floodplain scrub community	Nb		
vrei	Harris Bridge Slopes	Forested slope of Slippery Rock Creek Gorge; high quality natural community	Nb		
Lav	Hell Run	Exceptional value stream; gorge supporting natural old-growth forest	Ex		
	Muddy Creek Falls	Natural community; historic location special concern plant species	Co		
	Amsterdam	Roadside; mature forested area; special concern plant & animal species	Nb		
	Barmore Lake	Isolated wetland; special concern plant & animal species	Ex		
	Brent		Hi		
	Grange Hall		Ex		
	Grove City Swamp	Headwater wetland; special concern plant species	Nb		
	Millbrook Swamp	PA special concern animal species	Hi		
Cel	Pine Swamp	Raised bog, swamp forest, marsh; dominated by Northern Hardwoods	Ex		
Mer	Plain Grove		Ex		
_	Swamp Run Tributary		Со		
	Swamproot	Natural community; special concern plant species	Nb		
	Taylor Run Marsh		Nb		
	Triangle Woods		Co		
	Wolf Creek Swamp	Forested floodplain; special natural community	Nb		
	Wolf Creek Wetlands	PA special concern animal species	Nb		







SECTION 6—CULTURAL RESOURCES

Cultural resources contribute to a place's identity. People in every culture identify with their communities through sense of place, and the cultural landscape helps to define an area's heritage as well as its distinctive nature. Cultural resources also serve as a catalyst for attracting outsiders to visit, which in turn can help fuel an area's economy. Tourism not only contributes to a community by providing employment, income and cultural benefits, it can also generate visibility, tax revenue and help to diversify the economic base.

For purposes of this plan, cultural resources will include the recreational opportunities and the archaeological and historic sites within the Slippery Rock Creek Watershed. It will provide an inventory and analysis of the recreational resources by facilities and use, and the archaeological and historical resources by type and importance.

A. RECREATION

According to the National Recreation and Park Association (NRPA): "Parks and Recreation are resources and services provided for the purposes of leisure, entertainment and recreational pursuits by the citizens... or a specific subunit. Resources may be public spaces and facilities like parks, nature preserves, open space areas, greenways, trails, and built structures for sport, recreation or arts programs. Examples of services include recreational activity programs, athletic leagues, special events, arts programs, and environmental education programs."¹

The NRPA further defines public and private recreation as it relates to parks and recreation resources and services:

Public parks are "any area or portions of areas dedicated or designated by any Federal, State or local agency primarily for public recreational use" and public recreation is defined as "activities that take place at a public park/facility - sports, physical activities, exposure to natural surroundings, arts and culture, to name a few. These activities may be passive or active and may be performed at will by the visitor or be organized by a public agency."²

Private recreation "encompasses resources and services offered by the private sector, though they are only delivered to members or paying visitors. Examples include YMCA, health and fitness centers, resorts, and guide services. There are also guasi-public providers like power companies, land trusts and other authorities that manage resources that may be used for recreation purposes."3

The Slippery Rock Creek Watershed is rich in both public and private recreational opportunities. A wide variety of recreational resources and services exist throughout including:

Parks and Game Lands: According to the NRPA Fact Sheet, Parks and Recreation boost the local economy, increase local property values, improve youth safety, reduce juvenile crime, and enhance health and wellness among the local population.⁴ Though a new "Systems Approach" to parks and recreation planning is advocated⁵, NRPA's standard parks classification system is still widely used. This traditional system categorizes parks according to geographical size, service area radius, and size to population ratio which includes: Mini-Parks, Special Use Areas, Neighborhood Parks, Community Parks, and Regional Parks. For the purposes of this plan, however, parks will be classified according

¹ National Recreation and Park Association, What is "Parks & Recreation" (accessed August 25, 2010); available at http://www.nrpa.org/Explore-Parks-and-Recreation/What-is-Parks-and-Rec/What-is-Parks---Recreation-.aspx

² Ibid.

³ Ibid.

⁴ National Recreation and Park Association, Parks & Recreation Discover (accessed August 25, 2010); available at

http://www.nrpa.org/uploadedFiles/Fact%20Sheet%20Final.pdf ⁵ Richard Williams and Peter Dyke, "The New NRPA Guidelines for Open Space," *Illinois Parks & Recreation*, March/April 1997, p 17-19. Available at http://www.lib.niu.edu/1997/ip970317.html

to ownership as *State (State Parks and State Game Lands)*, *Municipal* or *Private*. Refer to Plate 6.1: Recreational Resources.

<u>State Parks:</u> State Parks generally fall under the category of *regional parks* in the NRPA standard park classification, or parks which include 200 or more acres, serve a population within a one hour driving radius and provide 5 to 10 acres for every 1,000 persons in that service area. The Slippery Rock Creek Watershed is fortunate to house three state parks which are managed by the Pennsylvania Department of Conservation and Natural Resources (**DCNR**): Jennings Environmental Education Center, McConnell's Mill State Park and Moraine State Park. In 2009, Pennsylvania's State Park System was awarded the "Best in Nation" title, a title it will carry to 2011, by the American Academy for Park and Recreation Administration and the National Recreation and Park Administration. The DCNR was awarded this National Gold Medal for Excellence in Parks and Recreation Management in part "for its innovative approaches that have drawn people into state parks in new ways and connected them to nature through outdoor recreation."⁶ Details were sourced from the Recreational Guide for each park.

In May 2010, the Department of Recreation, Park and Tourism Management at Penn State University published an economic impact analysis of the state park system. The study was based on 2008 data and a summary of economic significance figures for the state parks in the watershed are included in their individual sections. Both the full report and park specific reports can be accessed at: http://www.dcnr.state.pa.us/stateparks/economicimpact/index.aspx.

Jennings Environmental Education Center

Named in honor of Dr. Otto Emery Jennings, one of the state's most renowned botanists, Jennings Environmental Education Center **(JEEC)** provides environmental education and interpretation programs and also has hiking and cross-country skiing trails through its woodlands and famed prairie ecosystem. JEEC's 20-acre prairie is home to the blazing star, among other prairie plants, and the endangered Massasauga rattlesnake. Jennings is also home to the only significant population of American Columbo, an endangered plant species in PA. In addition, natural resources management and research are conducted at JEEC, which is located near Slippery Rock, PA. In 2008, visitors spent an estimated \$1,465,000, resulting in \$1,527,000 in sales and contributing \$560,000 labor income to 20 jobs⁷. Additional information about JEEC is included under the "Trails", "Wildlife & Birding Areas" and "Environmental Education" headings in this section.

McConnells Mill State Park

This park houses the 930-acre Slippery Rock Gorge Natural Area, a designated National Natural Landmark including Hell's Hollow with natural habitats, wildflowers and waterfalls. Located near Portersville, PA, McConnells Mill also includes an operational 1800's grist mill and a covered bridge listed on the National Register of Historic Places. Recreational opportunities at the park include picnicking; a playfield/sledding area; two climbing and rappelling areas; hunting, trapping and dog training areas; fishing; whitewater boating; hiking; and environmental education and interpretation programs. In 2008, visitors to McConnell's Mill spent an estimated \$6,019,000, resulting in \$6,277,000 in sales and contributing \$2,299,000 labor income to 81 jobs.⁸ Additional information about McConnells Mill is included under the "Trails", "Scenic Vistas", "Boating", "Fishing", "Hunting & Trapping", "Environmental Education", "National Register Sites", "Other Places of Historical Significance", "History Trails" and "Historic & Cultural Events" headings in this section.

⁶ Pennsylvania DCNR, *Pennsylvania State Parks: Best in the Nation* (accessed August 25, 2010); available at <u>http://www.dcnr.state.pa.us/stateparks/award.aspx</u>

⁷ Penn State Department of Recreation, Park and Tourism Management, "The Economic Significance of Pennsylvania State Parks: One Page Fact Sheets for Individual State Parks," May 2010, p.37.

⁸ Ibid, p. 46.

Name	Nearest Town	County	Total Acreage ⁹	Acres in Watershed ¹⁰	Facilities/Services
Jennings Environmental Education Center	Slippery Rock	Butler	291	291	 Picnic tables Pavilion Hiking trails (5 mi) Interpretive trails (1/2 mi) Cross-country skiing Snowshoeing Hunting Restrooms Education/interpretive programs
McConnells Mill State Park	Portersville	Lawrence	2,759	2,759	 Picnic tables Play equipment Baseball/softball field Sledding hill Hiking trails (9 mi) Climbing/rappelling areas (2) Hunting Fishing Whitewater boating Canoe access area Restrooms Education/interpretative programs
Moraine State Park	Portersville	Butler	16,532	16,509	 Picnic tables Pavilions (7) Play equipment Hiking trails (28 mi) Swimming Restrooms Beach volleyball Disc golf (18 hole) Geocache trail Hiking (28 mi) Equestrian trails (20 mi) Bike trails (7 mi) Mountain bike trails (6 mi) Boating Windsurfing Ice fishing Ice fishing Ice boating Sledding Ice skating Cross-country skiing Snowmobiling Cabin rental Education/interpretive programs
			Total	19,559	

Table 6.1: State Parks within the Slippery Rock Creek Watershed

Moraine State Park

Located near Portersville, PA, Moraine includes the 3,225-acre Lake Arthur with 42 miles of shoreline, a stone and log pioneer cabin - Davis Cabin and an historic oil exhibit - the Muddy Creek Oil Field. Recreational opportunities abound at Moraine State Park and include picnicking; swimming; disc golf; biking and mountain biking; boating; windsurfing; fishing; hunting; horseback

⁹ Geographic Information Systems complied from data collected by the Southwest Pennsylvania Commission and PASDA. ¹⁰ Ibid.

riding; hiking; ice fishing; ice boating; sledding; ice skating; cross-country skiing; snowmobiling; cabin rental and environmental education and interpretation programs. The park also hosts an annual Regatta. In 2008, visitors to Moraine spent an estimated \$26,747,000, resulting in \$28,612,000 in sales and contributing \$10,467,000 labor income to 364 jobs.¹¹ Additional information about Moraine is included under the "Trails", "ORV Areas", "Wildlife & Birding Areas", "Scenic Vistas", "Camping", "Boating", "Fishing", "Hunting & Trapping", "Environmental Education", "Other Places of Historical Significance" and "History Trails" headings in this section.

<u>State Game Lands</u>: State Game Lands **(SGLs)** are public lands managed by the Pennsylvania Game Commission. The mission statement of the Pennsylvania Game Commission is "to manage all wild birds, wild mammals, and their habitats for current and future generations". As noted in Section 5, Biological Resources, recreational hunting, especially for deer and turkey, is popular in the Slippery Rock Creek Watershed. As hunting may be prohibited on private property, State Game Lands offer hunting opportunities to the general public upon acquisition of a license during the appropriate season. There are five State Game Lands in the Slippery Rock Creek Watershed: #95, #130, #151, #216 and #284. Details for State Game Lands were sourced from the Pennsylvania Game Commission website at <u>www.pgc.state.pa.us</u>. In addition to trail and hunting opportunities provided in all of the game lands, State Game Lands #95 includes scenic vistas, the Glades Wildlife Area and two lakes for fishing. Additional information SGL 95 is provided under the "Trails", "ORV Areas", "Wildlife & Birding Areas", "Scenic Vistas", "Boating", "Fishing" and "Hunting & Trapping" headings in this section. Additional information for SGL 130, 151, 216, and 284 is included under the "Trails" and "Hunting & Trapping" headings in this section.

Name	Municipality (township)	County	Total Acreage ¹²	Acres in Watershed ¹³	Facilities/Services
SGL 95	Cherry, Concord, Washington, Venango	Butler	9,311	6,356	 Hunting Fishing Designated Routes (6.7 mi) – biking, equestrian ATV/Snowmobile route (1.3 mi)
SGL 130	Jackson, Sandy Lake, Worth	Mercer	3,160	391	 Hunting Designated Routes (3.2 mi) – biking, equestrian
SGL 151	Liberty Plain Grove	Mercer Lawrence	1,431	1,431	 Hunting Designated Routes (1.1 mi) – biking, equestrian
SGL 216	Scott, Slippery Rock	Lawrence	492	492	 Hunting Designated Routes (0.75 mi) – biking, equestrian
SGL 284	Springfield Plain Grove, Washington	Mercer Lawrence	1,455	187	 Hunting Designated Routes (2.1 mi) – biking, equestrian
			Total	8,857	

Table 6.2: State Game Lands within the Slippery Rock Creek Watershed

<u>Municipal Parks</u>: Most municipal parks can be classified as *community parks*– 30 to 50 or more acres, serving a one- to 2-mile radius and providing 5 to 8 acres for every 1,000 persons in that area; *neighborhood parks* – 15 or more acres, serving a ¼- to ½-mile radius and providing one to 2 acres for every 1,000 persons in that area; or *mini parks* – less than one acre up to 5 acres, serving a ¼-mile

¹¹ Ibid, p. 47.

¹² Geographic Information Systems complied from data collected by the Southwest Pennsylvania Commission and PASDA.

¹³ Ibid.

radius and providing ¼ to ½ acre per 1,000 persons in that area. Some municipal parks may also be classified *special use*, or provide a single recreational activity such as a swimming pool, playing field, community center, performing arts venue, etc. Sixteen municipal parks in the Slippery Rock Creek watershed have been identified and some offer recreation and educational programs. Table 6.3 indicates municipal parks within the watershed and the facilities and programs they offer.

Name	Location	County	Size (ac.)	Facilities/Services
Clay Township Community Park	Clay Twp.	Butler	n/a	 Playground Pavilion Basketball court Multi-purpose field
Harrisville Community Park	Harrisville	Butler	23	 Deck hockey rink Ice rink Horseshoe courts Pavilions (3) Skate park Ball fields Playground area Soccer field Basketball court Sand volleyball court
Marion Township Community Park	Marion Twp.	Butler	3	 Picnic tables Pavilions Baseball/softball fields Basketball courts Play equipment
Portersville Community Park	Portersville	Butler	38	 Horseshoe courts Pavilion Playground area Ballfield Multi-purpose fields
Slippery Rock Park	Slippery Rock	Butler	60	 Picnic tables Pavilions Baseball/softball fields Football/soccer fields Playground area Water Electric Recreation Center Children and adult programs
Gilmore Street Playground	Grove City	Mercer	1	 Basketball court (1/2) Play equipment
Greenwood Drive Playground	Grove City	Mercer	n/a	Picnic tablesPavilionsPlay equipment
Grove City Memorial Park	Grove City	Mercer	214	 Picnic tables Pavilion(s) Basketball courts Baseball/softball fields All purpose/football fields Walking/biking trails Pond/dock Swimming pool Wading pool Play equipment Restrooms Water Electric

Table 6.3: Municipal Parks within the Slippery Rock Creek Watershed

Name	Location	County	Size (ac.)	Facilities/Services
Hunter Farm	Grove City	Mercer	239	 Picnic tables Pavilions Basketball court (1/2) Soccer fields Walking/biking trails (3 mi) Play equipment
Joseph D. Monteleone, Jr. Youth Festival Park	Grove City	Mercer	n/a	• Gazebo
McConnell Street Playground	Grove City	Mercer	1	Basketball court (1/2)Play equipment
Rainey Avenue Playground	Grove City	Mercer	1	Basketball court (1/2)Play equipment
Stewart Avenue Playground	Grove City	Mercer	1	 Picnic tables Pavilions Basketball court (1/2) Play equipment
Terrace Avenue Playground	Grove City	Mercer	1	Basketball court (1/2)Play equipment
Little League Ballfields	Pine Twp.	Mercer	n/a	• n/a
Pine Grove Community Center	Pine Twp.	Mercer	n/a	• n/a
Tota	a/		582	

Table 6.3: Municipal Parks within the Slippery Rock Creek Watershed (cont.)

Source(s)—Mercer County Comprehensive Plan – Volume 4: Greenways, Open Space and Rural Recreation Plan, 2006; Butler County Department of Parks and Recreation municipal parks inventory; <u>http://slippery_rockpark-rec.org/facilities.html</u>; and <u>http://grovecityonline.com/pandr/</u>.

<u>Private Parks</u>: The Slippery Rock Creek Watershed is also home to privately-owned parks which are open to the public and include:

YMCA Camp/ARMCO Park

This 75-acre park is located along Slippery Rock Creek in Slippery Rock Township. Operated by the Butler County Family YMCA, it is open to the public from June through September and offers camping, a learning trail, picnic tables and pavilions, a playground, horseshoe pits, a multipurpose field, volleyball courts, a sand volleyball court, a basketball court, a dance hall and an outdoor swimming pool. Additional information is available at: http://www.bcfymca.org.

Glacier Wetlands Preserve

This 100-acre Wild Waterways Conservancy property, located in Worth Township, Butler County, includes a Glacier Wetlands Natural Area with nature trails planned for the future. Additional information can be accessed at: <u>http://www.wildwaterways.org/</u>.

Miller Esker

This 33-acre natural area, owned by the Western Pennsylvania Conservancy **(WPC)**, is located in Worth Township, Butler County. WPC properties are open to the public for "low-impact" activities such as hiking, wildlife viewing and photography. Visitor guidelines available via the WPC website at: <u>http://www.paconserve.org/assets/2010_WPC_Property_Visitor_Guidelines.pdf</u>.

Miller Woods Tract

This 42-acre site, owned by Slippery Rock University, is in Slippery Rock Township, Butler County. A Certified Audubon Wildlife Sanctuary since 2005, the property boasts a variety of birds and wildflowers. Additional information on the Miller Woods Tract is included in the "Archeological Resources" heading of this section.

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West Sunbury Community Park

This eight acre park is owned by the West Sunbury Volunteer Fire Department and is located adjacent to the firehouse. The park contains ball fields and is operated by the West Sunbury Baseball Association.

Wolf Creek Narrows

Located in Slippery Rock Township, Butler County, this 115-acre natural area is owned by the WPC and includes a hiking trail. Classified as one of their "featured properties", it provides easy public access with designated parking and trails. Additional information is included in the "Trails", "Wildlife & Birding Areas", "Fishing" and "Hunting" headings of this section. A visitor guide is available at: <u>http://www.paconserve.org/assets/2010_Wolf_Creek_Narrows.pdf</u>.

Table 6.4: Publically-Accessible Private Parks within the Slippery Rock Creek Watershed

Name	Location (township)	County	Size (ac.)	Facilities/Services
YMCA Camp/ARMCO Park	Slippery Rock	Butler	75	 Camp sites (6) Learning trail Picnic tables Pavilions (4) Play equipment Horseshoe pits (5) Multi-purpose field Volleyball courts (2) Sand volleyball court Basketball court Swimming pool Dance hall
Glacier Wetlands Preserve	Worth	Butler	100	Natural area
Miller Esker	Worth	Butler	33	Natural area
Miller Woods Tract	Slippery Rock	Butler	42	Natural area
West Sunbury Community Park	West Sunbury	Butler	8	Ball fields
Wolf Creek Narrows	Slippery Rock	Butler	115	Natural areaHiking trail (1.5 mi)
		Total	373	

Source(s): <u>http://www.visitbutlercounty.com/outdoors/parks</u>; <u>http://www.wildwaterways.org/</u>; <u>http://www.paconserve.org/292/wpc-properties</u>; <u>http://www.paconserve.org/assets/2010_Wolf_Creek_Narrows.pdf</u>; Butler Co. Dept. of Parks & Recreation municipal parks inventory; Geographic Information Systems complied from data collected by Southwest PA Commission and PASDA.

<u>Trails</u>: Most recreational trails are rated according to skill level and classified as easy, moderate or difficult. The watershed offers several types of recreational trails for all skill levels, including over 57 miles of hiking/walking trails, over 51 miles of bicycle trails and routes and over 30 miles of equestrian trails. During the winter months, selected trails are made available for cross-country skiing at both *Jennings Environmental Education Center* and *Moraine State Park*, and Jennings permits snowshoeing and provides snowshoes on a first-come basis. Refer to Plate 6.1: Recreational Resources.

<u>Hiking/Walking Trails</u>: There is one multi-state trail and 8 local trails or trail systems available to the public for hiking/walking in the Slippery Rock Creek Watershed.

North Country Trail

This National Scenic Trail crosses 7 states, including Pennsylvania and its Slippery Rock Creek Watershed, and stretches over 4,000 miles. The trail enters the watershed at *Moraine State Park* and extends to Pleasant Valley Road at the Old Stone House where it continues north. According to the Butler County Chapter of the North Country Trail Association, one of the "best 10 miles of the trail in Western Pennsylvania" is located in the watershed between Route 308 and

Route 38, the Branchton Road. This section is classified as a moderate skill level hike and traverses *PA Game Lands #95* and its Glades waterfowl area.

Jennings Environmental Education Center Trails

This center offers over 5 miles of loop trails through both woodland and prairie. The trails include:

- Eight (8) easy hiking trails (approximately 2 miles long)
- Four (4) moderate hikes (approximately 2 miles long)
- Two (2) difficult trails (approximately 1 mile long)
- Two (2) easy self-guided interpretive trails featuring wildflowers and prairie history.
- In winter, some trails are appropriate for cross-country skiing and snowshoeing. Snowshoes are available on a first come-first serve basis.

McConnells Mill State Park Trails

A park naturalist is available on a seasonal basis to conduct guided hikes. McConnells Mills has 9 miles of hiking trails for most skill levels:

- One (1) easy (1/2 mile long)
- Two (2) moderate (1/2 mile long and 2 miles long)
- One (1) moderate to difficult (6.2 miles long).

Moraine State Park Trails

The Moraine Preservation Fund maintains an interpretive trail at the park along with the Native Plant and Butterfly Trail. This park also offers approximately 28 miles of hiking trails including:

- Two (2) easy trails (1.5 miles long and 2.6 miles long)
- Two (2) moderate trails (ranging from 1.1 miles long and 1.9 miles long to 3 miles long)
- One (1) moderate to difficult (1.5 miles long to 4 miles long)
- One (1) difficult hiking trail (14 miles long).

Grove City Memorial Park Trail

This community park offers a walking trail.

Hunter's Farm Trail

This 3-mile bike and walking trail is located in Grove City Borough.

The Macoskey Center Trails

Two interpretive trails are located at the center. Users may self-guide or participate in a guided walk by Slippery Rock University faculty or Macoskey Center staff.

- Blue Bird Trail (0.75 mi.) illustrates ecological succession and ecosystem response to human disturbance.
- Green Frog Trail (0.45 mi.) illustrates regenerative partnerships between man and the ecosystem.

Wolf Creek Narrows Trail

This natural area includes a one mile loop trail.

YMCA Camp/ARMCO Park Learning Trail

This interpretive trail, which is free and open to the public, begins behind shelter #2 at the park.

<u>Biking Trails:</u> There are also opportunities for family "bike hikes" or mountain biking in the Slippery Rock Creek Watershed.

BicyclePA Routes

Two BicyclePA routes cross the watershed:

- Route A, parallel to I-79, crosses north-south through Mercer, Lawrence and Butler counties in the western portion
- Route V, parallel to I-80, crosses east-west through the northern region in Butler, Mercer, and Venango counties.

Moraine State Park Trails

The park offers two different types of bicycle trails:

- One (1) paved non-loop bicycle trail with many steep grades and curves (7 miles long).
- One (1) mountain bike trail loop (6 miles long)

Hunter's Farm Trail

This 3-mile bike and walking trail is located in Grove City Borough.

State Game Lands

Nearly fourteen miles of designated routes for bicycles are located in the State Game Lands, portions of which are in the watershed. These routes are located in:

- Game Lands #95 in Butler County (6.7 miles)
- Game Lands #130 in Mercer and Venango Counties (3.2 miles)
- Game Lands #151 in Lawrence and Mercer Counties (1.1 miles)
- Game Lands #216 in Lawrence County (0.75 miles)
- Game Lands #284 in Lawrence and Mercer Counties (2.1 miles)

According to the PA Game Commission regulations, "anyone who rides a non-motorized vehicle, conveyance or animal on State Game Lands must do so only on designated routes. Such riding activities will not be permitted, except on Sundays or on roads open to public travel, from the last Saturday in September to the third Saturday in January, and after 1 p.m. from the second Saturday in April to the last Saturday in May. This does not apply to anyone lawfully engaged in hunting, trapping or fishing on State Game Lands."¹⁴ Specific information for each route is at: <u>http://www.portal.state.pa.us/portal/server.pt?open=514&objID=607643&mode=2</u>.

<u>Equestrian Trails</u>: Not only are there opportunities for hiking and biking, there are also trails for horseback riding in the Slippery Rock Creek Watershed.

Moraine State Park Trails

Approximately 20 miles of trails for horseback riding are available.

State Game Lands

Approximately fourteen miles of designated routes for horseback riding are located throughout the State Game Lands of the watershed. These are the same routes and fall under the same regulation listed under bicycle routes above. Routes are located in:

• Game Lands #95 in Butler County (6.7 miles)

¹⁴ Pennsylvania Game Commission, *Designated Routes for Horses and Bicycles* (accessed September 1, 2010); available from http://www.portal.state.pa.us/portal/server.pt?open=514&objlD=621523&mode=2

- Game Lands #130 in Mercer and Venango County (3.2 miles)
- Game Lands #151 (1.1 miles) and #285 (2.1 miles) in Lawrence and Mercer Counties
- Game Lands #216 in Lawrence County (0.75 miles)

Refer to Plate 6.1: Recreational Resources for locations of hiking/walking, biking, and equestrian trails.

<u>ORV Areas</u>: Off road vehicles **(ORV)** are defined as "any type of vehicle which is capable of driving on and off a paved or gravel surface The most common use of these vehicles is for sightseeing in areas distant from pavement. The use of higher clearance and higher traction vehicles enables access on trails and forest roads that have rough and low traction surfaces."¹⁵ The watershed includes public areas specifically designated for off-road vehicle use as well as private facilities where off-road enthusiasts can ride for a fee.

Moraine State Park Trails

This public park designates 26 miles of its trails for snowmobiling during the winter months.

Slippery Rock Dunes Outdoor Park

A private facility located on Barron Road in Slippery Rock, PA, "the Dunes" offer over four miles of dirt bike and all-terrain vehicles (ATV) trails for enthusiasts of all ages and skill level.

State Game Lands #95

According to the Pennsylvania Game Commission Designated Routes Northwest Region listing, a designated route in Cherry and Washington Townships follows an existing Handicap ATV and snowmobile route for 1.3 miles. The route can be accessed via the Game Lands parking lot at Pleasant Valley Road.¹⁶

Switchback Raceway

Located on Route 8 north of Butler, PA, this private 71-acre facility caters to dirt bike and ATV enthusiasts of all ages and skill levels.

In addition to these areas, the *Marion Township VFD* operates an ORV course in Murrinsville, PA and hosts an Off Road Motorcycle & ATV (OMA) Race as part of the OMA Nationals.

<u>Birding Areas:</u> Opportunities for viewing birds in the Slippery Rock Creek Watershed are found at the state parks, natural areas, trails and gamelands found within its borders. The Pennsylvania Society for Ornithology **(PSO)** highlights the Jennings Environmental Education Center, Moraine State Park and Pennsylvania State Game Lands #95 (the Glades) as areas of particular interest for birding. Birding areas are shown on Plate 5.2: Important Bird Area Map within the Biological Resources Section.

Jennings Environmental Education Center

Jennings is home to an abundance of bird species and is a certified Bartramian Audubon Society Wildlife Sanctuary. According to the PSO:

"Rare spring and autumn migrants are the occasional Yellow-bellied Flycatcher or Olive-sided Flycatcher that are particularly attracted to the prairie edge of Jennings in the spring and late summer. Jennings is also known for its aerial performing male American Woodcock in late March through April and for the high density of breeding Cerulean Warbler in the oak-hickory-wild black

 ¹⁵ "Off-road vehicle," in Wikipedia. n.d. (accessed October 13, 2010); available at <u>http://en.wikipedia.org/wiki/Off-road_vehicle</u>
 ¹⁶ Pennsylvania Game Commission, *Designated Routes Northwest Region*. n.d. (accessed September 1, 2010); available from http://www.portal.state.pa.us/portal/server.pt?open=514&objlD=607643&mode=2

cherry forest surrounding the prairie. Highly recommended are the short (0.25-mile each) and easy (flat) Prairie Loop and Blazing Star Trails in Jennings. Watch here for Broad-winged Hawk, American Woodcock (April evenings), nesting Eastern Bluebird, Tree Swallow, Yellow, Chestnutsided, Lawrence's, and Blue-winged warblers, and Common Yellowthroat. Glacier Ridge Trail (0.31 mile) cuts through some of the most scenic forest of Jennings and harbors Cerulean, Blackthroated Green and Kentucky warblers."17

Moraine State Park

Moraine boasts a waterfowl observation deck and hosts many species of birds including herons, osprey, loons, warblers and bald eagles. Neotropical migrators, birds which breed north of the Tropic of Cancer and winter south of the same, can also be spotted at the park. In addition, the Moraine Preservation Fund operates a Barn Owl Propagation Program at the park in an effort to replenish the population of this Pennsylvania species of special concern. Again, according to the Pennsylvania Society for Ornithology:

"Lake Arthur is a key migratory stopover for water birds in interior western Pennsylvania. Its size ensures that the lake freezes later and thaws earlier than most surrounding lakes and ponds. Further, it is situated on the primary migration route of the Tundra Swan as evident by tens of thousands flying directly over the site every March-April and October-November. If inclement weather occurs while the swans are migrating, thousands use the lake for rest and food for a few hours to a day or two. A few Osprey nest on the lakeshore with another 4-5 pairs nesting on microwave communication towers surrounding the park. A pair of Bald Eagles has been producing an average of 2 fledglings annually for the past several years. The wetlands located in the many coves of the lake have supported many breeding species, including Wood Duck, Hooded Merganser, Great Blue Heron, Green Heron, Pied-billed Grebe, Virginia Rail, Sora, American Coot, and Sedge Wren. When Lake Arthur is drawn down some summers, the South Shore cove mudflats attract up to 21 species of shorebirds."18

Combined Birding Resources at Jennings and Moraine State Parks

"The combined site's various forests and edges support 21 breeding species of warblers, including Lawrence's Warbler returning to Jennings' prairie edge for 3 consecutive years. Recent Cornell Lab of Ornithology field surveys revealed as many as 25 singing male Cerulean Warbler in Jennings and another 20 singing males in nearby Moraine State Park. Northern Waterthrush and Yellow-breasted Chat are common breeders in Moraine." 15

The Glades Wildlife Area

Located at State Game Lands #95, the Glades offers 15.945 acres of diverse habitat including a 2.5-mile lake, wetlands, marshes, swamps, mature forests, meadows, farmland and abandoned mines sites. The Glades is known for large populations of waterfowl, deer, turkey, grouse, bear, rabbit, pheasant and squirrel. According to the Butler County Chapter of the North Country Trail Association, along the 10-mile section of trail through SGL #95 you may see beavers, bear, deer and coyote. The Pennsylvania Society for Ornithology details the bird life of the Glades:

"Glades Dam Lake is responsible for establishing a conducive habitat for the appearance and nesting of the Osprey and Bald Eagle, both Pennsylvania threatened species. The lake is shallow and tends to freeze early and thaw later than other nearby bodies of water... Until recently, the currently listed Pennsylvania endangered American Bittern, Least Bittern, and Sedge Wren and the Pennsylvania threatened Upland Sandpiper were common here. All four species require wet meadows and marsh conditions at least some time during their breeding regimen and these vegetative conditions, although greatly diminished, are still present.

¹⁷ Pennsylvania Society for Ornithology, PSO Site Guide: Moraine State Park (Lake Arthur) Butler (accessed August 29, 2010); available at http://www.pabirds.org/SiteGuide/PASitePage.php?SiteID=47 ¹⁸ Ibid.

Furthermore, other breeding wetland species are well documented in recent field surveys: Piedbilled Grebe, Virginia Rail, Sora, Common Moorhen, American Coot, Wilson's Snipe, Marsh Wren, and Swamp Sparrow. Interior area sensitive forest species known to breed here are Acadian and Least flycatchers, Veery, Wood Thrush, American Redstart, Ovenbird, Hooded Warbler, Kentucky Warbler, Cerulean Warbler, Northern Parula, and Louisiana Waterthrush. SGL 95 is consistently a birding hotspot for recording unusual species for this part of Butler County, such as Sandhill Crane (spring), American Pipit (spring), Northern Shrike (winter), Northern Mockingbird (resident), Rusty Blackbird (spring and autumn) and the rare Brewer's Blackbird (autumn). There is suspicion that the Golden-crowned Kinglet, Red-breasted Nuthatch, and Brown Creeper breed in the many evergreen plantations on the site but confirmation is still lacking."²⁰

Miller Woods Tract

This 42-acre natural area is adjacent to Wolf Creek Narrows in Slippery Rock Township, PA and is noted for its variety of birds.

Wolf Creek Narrows

This 115-acre natural area includes floodplain, riparian borders and upland deciduous forests. These habitats provide a mix of wildlife from amphibians to birds which include belted kingfisher, Louisiana waterthrush, red-eyed vireo and wood thrush.

Bartramian Audubon Society Sanctuaries

The Bartramian Audubon Society **(BAS)**, which serves Butler, Lawrence, Mercer and Venango counties, certifies public and private properties throughout the watershed with its Sanctuary Programs. "Certified BAS Wildlife Sanctuaries" are generally 20 or more acres while "Certified BAS Bird and Butterfly Sanctuaries" can include small yards and parcels. Additional information regarding BAS sanctuaries is available on their website at: www.bartramian Audubon.org.

<u>Scenic Vistas:</u> Beautiful scenery and vistas are found throughout the Slippery Rock Creek Watershed. Some scenic vistas of note include:

The Glades Wildlife Area

A vista point is located near the parking lot off State Route 308.

McConnells Mill

A scenic vista is identified in this park's recreational guide, located at Alpha Pass and Cleland Rock.

Moraine State Park

A scenic vista is maintained by the park where the North Country Trail jogs toward Muddy Creek in the vicinity of Lindey Road.

State Game Lands #95

The PA Game Commission website mentions a "vista point" located near a designated route in the vicinity of Christie Road.²¹

Refer to Plate 6.1: Recreational Resources for locations of scenic vistas.

 ²⁰ Pennsylvania Society for Ornithology, *PSO Site Guide: State Game Lands 95 (The Glades) Butler* (accessed August 29, 2010); available at http://www.pabirds.org/SiteGuide/PASitePage.php?SiteID=45
 ²¹ Pennsylvania Game Commission, *Designated Routes NorthWest Region* (accessed September 1, 2010); available at

²¹ Pennsylvania Game Commission, *Designated Routes NorthWest Region* (accessed September 1, 2010); available at http://www.portal.state.pa.us/portal/server.pt?open=514&objlD=607643&mode=2

<u>Camping:</u> Several camping opportunities exist in the Slippery Rock Creek Watershed. While camping is not permitted within the state parks, game lands or along the North Country Trail segment which passes through the watershed, there are eight private campgrounds with campsites available as detailed in Table 6.5 below. In addition, *Moraine State Park* has 11 modern, heated cabins available for year-round rental, the YMCA Camp/ARMCO Park has 6 camp sites available for rental, and the *Boy Scouts of America Moraine Trails Council* operates two camps within the watershed, *Camp Agawam* in Lawrence County and *Camp Bucoco* in Butler County, both located on Slippery Rock Creek. **Refer to Plate 6.1: Recreational Resources.**

Name	Location	County	Camp Sites
Bear Run Campground	Portersville	Butler	318
Breakneck Campground	Portersville	Lawrence	75
Cooper's Lake Campground	Slippery Rock	Butler	96
Kozy Rest Campground	Harrisville	Butler	173
Lake Arthur Family Campground	Slippery Rock	Butler	n/a
Moraine Camplands	Slippery Rock	Butler	n/a
Peaceful Valley Campground	West Sunbury	Butler	175
Slippery Rock Campground	Slippery Rock	Butler	n/a
		Total	837

Table 6.5: Campgrounds in the Slippery Rock Creek Watershed

Source---http://www.visitbutlercounty.com/images/brochures/BCTCB_Campground_Brochure.pdf

<u>Golfing:</u> There are a variety of opportunities for golfing in the Slippery Rock Creek Watershed. A total of seven courses are situated in the watershed. These range from 9 to 18 holes and include public, semi-private and private membership facilities as detailed in Table 6.6 below. **Refer to Plate 6.1: Recreational Resources.**

Name	Location	County	Public/Private	# Holes
Green Meadows Golf Course	Volant	Lawrence	Public	18
Grove City Country Club	Grove City	Mercer	Private	18
Oakview Golf Club	Slippery Rock	Butler	Semi-private	18
Pine Grove Golf Course	Grove City	Mercer	Public	18
Shamrock Public Golf Course	Slippery Rock	Butler	Public	9
Valley View Golf Course	Harrisville	Butler	Public	9
Willow Hills Golf Center, Inc.	Grove City	Mercer	Public	9

Table 6.6: Golf Courses in the Slippery Rock Creek Watershed

<u>Geocaching:</u> "Geocaching is an outdoor sporting activity in which the participants use a Global Positioning System **(GPS)** receiver or other navigational techniques to hide and seek containers, called "geocaches" or "caches", anywhere in the world. A typical cache is a small waterproof container containing a logbook. Larger containers such as plastic storage containers (tupperware or similar) or ammo boxes can also contain items for trading, usually toys or trinkets of little value. Geocaching is often described as a "game of high-tech hide and seek," sharing many aspects with benchmarking,

trigpointing, orienteering, treasure-hunting, letterboxing, and waymarking."²² Many geocaches are designed to provide educational opportunities about the geology, geography, history or culture of the area in and around the cache site. In addition, some caches are part of a trail, leading participants on to another cache until the course is completed.

Moraine State Park

According to the 2010 Official Visitors Guide for Butler County, there are over two dozen geocache sites within this park.

Other Sites

A recent internet search for caches in the watershed revealed hundreds of locations in addition to Moraine State Park, including the Old Stone House and the Macoskey Center. To learn more, visit <u>http://www.geocaching.com/</u> and enter your zip code to search for nearby geocaches.

<u>Boating:</u> The Slippery Rock Creek Watershed offers boaters a variety of options, including paddling, sailing and windsurfing, and power boats and personal watercraft **(PWC)**. Lake Arthur offers ten launch sites, a marina and an additional dry mooring providing access to the waters for boaters. Sailboats, rowboats, paddleboats, canoes, kayaks, motorboats and pontoon boats are available for rent near the Crescent Bay area. **Refer to Plate 6.1: Recreational Resources.**

<u>Canoeing, Kayaking & Rafting:</u> Paddling is permitted on both Glade Dam Lake and Harbor Acres Lake (located in the *State Game Lands #95*) as well as on Lake Arthur. Canoe racks are available to Lake Arthur paddlers and are located at Davis Hollow Marina in *Moraine State Park*.

Whitewater boating is available on Slippery Rock Creek, with approximately six miles of Class II (novice) to Class IV (advanced) waters running through *McConnells Mill State Park*. Access to the creek is at:

- Slippery Rock Creek access at Harris Bridge, which was a joint effort of McConnells Mill State Park, Butler County Corrections, and the Western Pennsylvania Conservancy. The improvements were funded through WPC's Canoe Access Development Fund. The site is on park property and their staff and equipment were used for the initial work at the site. Butler County Corrections provided physical labor over a number of days.
- Rose Point (US 422 Bridge). There is portage approximately 2.5 miles downstream at the Eckert Bridge/Old Mill Dam in the park.

<u>Sailing & Windsurfing</u>: Sailing and windsurfing are permitted on Lake Arthur. Sailing is popular on the lake and several races and regattas take place during the summer months. For a calendar of events, please see <u>http://www.dcnr.state.pa.us/Calendar/list.asp?ICSORG=6210</u>. Due to strong winds and light boat traffic, Barber Point is recommended for windsurfing. Sailboard racks are available at the Davis Hollow Marina in *Moraine State Park*.

<u>Power Boats & PWC</u>: Trolling motors are permitted on Glade Run and Harbor Acres Lakes located in the State Game Lands #95. Power boats and personal watercraft are permitted on Lake Arthur at *Moraine State Park*, however, the use of motors in excess of 20 hp is prohibited.

<u>Liveries</u>: Livery services are available at Bear Run Campground, Crescent Bay (Moraine) Boat Rental, *Moraine State Park* and Rogers Rifle, Rod and Reel, all in Portersville.

²² "Geocaching," in Wikipedia. (accessed October 13, 2010); available at http://en.wikipedia.org/wiki/Geocaching

<u>Marinas</u>: Moraine State Park has a marina at Davis Hollow providing fuel, off-shore mooring, dry mooring, short-term berth space, outdoor winter storage and ADA accessible mooring. In addition, a sailboat dry mooring area is located at Watts Bay.

<u>Fishing:</u> Fishing the lakes and streams is a popular activity in the Slippery Rock Creek Watershed, which is home to six "Pennsylvania Fishing Hot Spots" as identified by the PA Fish and Boat Commission (PAFBC). From fly fishing to trolling, these "hot spots", along with other designated public access fishing spots, provide a wide variety of fishing opportunities. **Refer to Plate 6.1: Recreational Resources.**

Lake Arthur/Moraine State Park

Lake Arthur is a warm water fishery and a PAFBC "hot spot". Common to the 3,225-acre lake are northern pike, largemouth bass, panfish, channel catfish, black crappie, bluegill, musky and walleye. Fish habitats have been installed throughout the lake and the PAFBC stocks muskellunge, walleye, channel catfish and hybrid striped bass.

The Glades Lake

Situated in *State Game Lands #95*, this "hot spot" is open only during winter months for ice fishing. Species include big largemouth bass, catfish and crappie. The Lake's outflow area is known for panfish.

Harbor Acres Lake

This "hot spot" is located in *State Game Lands #95* and is part of the Select Stocked Lake program. Common species include bass, crappie, bluegill and catfish. A great location for ice fishing, Harbor Acres Lake is stocked with 2,000 trout during the first week of January.

Hunter's Farm

Located in Grove City Borough, Hunter's Farm offers a trout fishing area on Wolf Creek.

McConnells Mill State Park

Fishing is permitted anywhere along Slippery Rock Creek inside the park, with the exception of dam structures. A catch-and-release fly fishing only area is located by the Armstrong Bridge. The park is noted for trout, which is stocked several times per season, and bass.

North Branch Slippery Rock Creek Sec. 2

According to the PAFBC, this "hot spot" is a suggested location for Stocked Trout.

Taylor Run Sec. 2

According to the PAFBC, this "hot spot" is a suggested location for Stocked Trout from one mile above S.R. 1018 bridge downstream to mouth.

Wolf Creek Narrows

Fishing is permitted along Wolf Creek in this natural area in accordance with state regulations.

Wolf Creek Sec. 2

According to the PAFBC, this "hot spot" is a suggested location for Stocked Trout, from the Route 58 bridge in Grove City downstream to the Airport Road bridge.

Hunting & Trapping: Hunting and trapping is permitted in the public lands of the watershed as described below. In addition, some private landowners participate in the Public Access Cooperator

Lands Farm-Game and Forest-Game Programs. Additional private land may be available for hunting and trapping with permission from the landowner(s).

According to Pennsylvania Game Commission regulations, it is illegal to hunt or trap on private land without the consent of the landowner. Contrary to popular belief, private land does not have to be "posted" in order to prohibit hunting activity. There are no public shooting ranges in the watershed, though private ranges are available at local Sportsmen's Clubs and a listing of clubs in the watershed is included under the "Other Recreational Resources" heading of this section. **Refer to Plate 6.1: Recreational Resources.**

<u>State Game Lands</u>: As previously noted, five State Game Lands **(SGL)** are located within the watershed: *SGL* #95 in Butler County, *SGL* #130 in Mercer and Venango Counties, *SGL* #151 and SGL #284 in Mercer and Lawrence Counties and *SGL* #216 in Lawrence County. The 9,383-acre State Game Lands #95, Butler County's largest preserve with over 6,000 acres in the watershed, is noted for bear, deer, turkey, small game and waterfowl.

<u>State Parks</u>: Hunting and trapping are permitted in designated areas and during established seasons in both McConnells Mill and Moraine State Parks. The training of dogs is also permitted in the hunting areas of both parks from the day after Labor Day through March 31 of each year. The hunting of woodchucks or groundhogs is prohibited at both parks. Common game species at *McConnells Mill State Park* include grouse, deer, turkey, rabbit and squirrel. Approximately 13,600 acres is available for hunting and trapping at *Moraine State Park*, where popular game species include waterfowl, deer, turkey, grouse, bear, rabbit, pheasant and squirrel.

<u>Conservation Lands</u>: Hunting and trapping is permitted on Western Pennsylvania Conservancy (WPC) properties in accordance with Pennsylvania Game Laws. Two WPC properties are located in the Slippery Rock Creek Watershed: the 33-acre *Miller Esker Natural Area* and the 115-acre *Wolf Creek Narrows Natural Area*. Both tracts are located near Slippery Rock, PA.

Local Groups Offering Both Recreation and Environmental Education Activities: Environmental education opportunities abound for the general public in the SRCW. Many programs are available to the community and educators through the *Pennsylvania Game Commission*; the *Pennsylvania Fish and Boat Commission*; the *Pennsylvania Department of Conservation and Natural Resources*; the *Pennsylvania Department of Environmental Protection*; the *County Conservation Districts*; the *Penn State Cooperative Extension*, the *Jennings Environmental Education Center*, *McConnells Mill State Park* and *Moraine State Park*. In addition, the watershed boasts several unique local organizations which provide environmental education opportunities and programs detailed below.

Slippery Rock Watershed Coalition (SRWC)

The goals of the SRWC are to: restore the land, water, and wildlife resources of the Slippery Rock Creek Watershed, which has been impacted by acid mine drainage; provide an opportunity for individuals, community groups, and students from local colleges to become involved in restoration efforts; develop new technology relating to land restoration and discharge abatement; and develop informational posters, videos, newsletters, and web pages to aid as educational tools. The watershed coalition accomplishes their education goals by actively engaging students and volunteers in their restoration projects; supporting student research from grade school through college; attending community events throughout the watershed and providing information and hands-on learning experiences to attendees; maintaining an educational and information

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packed website detailing their projects and offering links to additional resources; and publishing a monthly newsletter. In addition, the SRWC, in conjunction with Stream Restoration, Inc., compiles, updates, and maintains a publicly accessible, GIS-enabled water quality database called Datashed which is available at www.datashed.org; and is prominent in the organization of the annual Ohio River Watershed Cruise, an educational cruise which is provided free-of-charge to the general public. <u>http://www.srwc.org/</u>.

Friends of McConnell's Mill State Park Inc.

This non-profit organization supports the protection of McConnell's Mill State Park through their mission: "To aid in the protection and defense of McConnell's Mill State Park through the education of the general public, to engage in the land preservation, land acquisition, and the protection of natural resources as a nonprofit corporation." <u>http://www.fmmsp.org/</u>

The Macoskey Center at Slippery Rock University

This 83-acre facility at Slippery Rock University was established to "promote sustainability through demonstration, education and research."²³ The center accomplishes this through a variety of environmental education programs for school groups, including an outdoor garden classroom at the Slippery Rock Area Elementary and PA Farm Day; community oriented sustainable living workshops; and its annual Earth Festival. The center also boasts a wind turbine, solar panels, organic community and market gardens, a small woodlot, a composting research and demonstration project, restoration ecology projects, interpretive trails, a reference library and a gathering space.

http://www.sru.edu/academics/colleges/ches/macoskey/Pages/index.aspx.

Moraine Preservation Fund (MPF)

A non-profit volunteer organization, the mission of the MPF "is to promote community stewardship of natural resources within Moraine State Park, McConnells Mill State Park and Jennings Environmental Education Center."²⁴ Volunteers with MPF provide wildlife education classes, focusing on barn owls, to schools and other groups. In addition, it operates the Nautical Nature pontoon providing interpretive programs about the wildlife at Moraine State Park and the development of Lake Arthur. <u>http://www.morainepreservationfund.org/</u>.

Pennsylvania Center for Environmental Education (PCEE)

Housed at Slippery Rock University, according to the PCEE website at <u>www.pcee.org</u>, "The Pennsylvania Center for Environmental Education promotes the environmental education process as a tool to sustain environmental quality for Pennsylvania. As partners, they work to empower all PA citizens to individually and collectively exercise environmental stewardship. The Center will disseminate environmental education information and materials; facilitate partnerships for the purpose of providing environmental education; assist in professional development in environmental education; integrate environmental education." The PCEE website also offers the *EE Connections* online newsletter as well as a calendar of state-wide environmental education and outdoor events and programs calendar.

The Bartramian Audubon Society

Located in Slippery Rock, this chapter of the National Audubon Society serves Butler, Lawrence, Mercer and Venango counties. Their research, community and education programs includes the Our Feathered Friend Field Kit Discovery Trunk which can be borrowed by schools, home school groups, 4-H clubs and scouts. http://www.bartramianaudubon.org/.

²³ Slippery Rock University, *Macoskey Center* (accessed July 21, 2010); available at http://www.sru.edu/academics/colleges/ches/macoskey/Pages/index.aspx

²⁴ Moraine Preservation Fund (accessed July 21, 2010); available at <u>http://www.morainepreservationfund.org/index.html</u>

The Slippery Rock Creek Watershed is also home to local chapters of environmental organizations as well as local Sportman's Clubs, Scout Troops, Parks and Recreation Departments, etc. These groups often provide environmental education opportunities to the community and include:

<u>Other Recreational Resources:</u> Residents of and visitors to the Slippery Rock Creek Watershed can participate in a host of other recreational opportunities beyond those discussed. Some additional resources include:

<u>Slippery Rock Area Parks & Recreation</u> – Year-round family recreational activities are offered, including children's day camps, pre-school classes, arts and crafts, youth basketball and girls softball; and adult classes. Schedules and additional information are available at: <u>http://www.slipperyrockpark-rec.org/</u>.

<u>Sportsmen's Clubs</u> – Several sportsmen's clubs are located within the Slippery Rock Creek Watershed and include²⁵:

- Boyers Sportsmen's Club, Boyers, PA (Butler County)
- Deer Hunters Association, Harrisville, PA (Butler County)
- Grove City Sportsmen's Club, Grove City, PA (Mercer County)
- Moraine Conservation & Sportsmen Associations, Slippery Rock, PA (Butler County)
- Slippery Rock Sportsmen's Club, Slippery Rock, PA (Butler County)
- Three Rivers Sportsman's Club, Inc., Boyers, PA (Butler County)
- Valleyview Gun Club, Boyers, PA (Butler County)
- Swissvale Acron Sportsman's Association, Pittsburgh, PA (Butler County)
- Castlewood Rod & Gun Club, New Castle, PA (Lawrence County)
- West Sunbury Sportsman Club, West Sunbury, PA (Butler County)
- Rockhill Hunting Club (Butler County)

<u>Kaleidoscope Arts Festival</u> - Hosted annually by Slippery Rock University, this festival's mission "is to bring free or low cost, quality arts programming to an underserved region" as it "strives to be the premier arts presenter in the region."²⁶ Additional information available at: <u>http://kaleidoscope.sru.edu/</u>.

B. ARCHAEOLOGICAL AND HISTORICAL RESOURCES

The archaeological and historical resources of the Slippery Rock Creek Watershed narrate history and contribute to residents' sense of place by serving as a visible reminder to their cultural heritage. They also provide interesting destinations for visitors. People who travel "to experience the places and activities that authentically represent the stories and people of the past and present" are referred to as heritage tourists.²⁷ These heritage tourists tend to stay longer and spend more money than other types of travelers.²⁸ Conserving the archaeological resources and preserving the historical resources in the watershed not only advances pride of place but also boosts the economy as well. For more information, please contact the PA Historical and Museum Commission at http://www.phmc.state.pa.us.

²⁵ Butlerwebs, *Hunting & Fishing – Western PA Areas In & Near Butler County, PA* (accessed January 18, 2011): available at <u>http://www.butlerwebs.com/allareas/hunting.htm</u>

²⁶ Kaleidoscope (accessed July 21, 2010); available at http://kaleidoscope.sru.edu

²⁷ Cultural Heritage Tourism, *Getting Started: How to Succeed in Cultural Heritage Tourism* (accessed October 6, 2010); available at <u>http://www.culturalheritagetourism.org/howToGetStarted.htm</u>
²⁸ National Trust for Historic Preservation, *Heritage* Tourism (accessed October 6, 2010); available at

²⁸ National Trust for Historic Preservation, *Heritage* Tourism (accessed October 6, 2010); available at <u>http://www.preservationnation.org/issues/heritage-tourism/</u>

History of European Settlement: Like many places, the Slippery Rock Creek Watershed has an interesting history, including the origin of the name itself. Many tales have circulated as to how the creek became known as The Slippery Rock. It should come as no surprise that common to them is a person or animal slipping on a rock while crossing the creek. Among the victims of the lore are Native Americans, General George Washington and a British soldier's horse. The slippery nature of the rock is surrounded by more than one legend as well and explanations include slime build-up on the rocks in the creek bed to oil from a natural seep coating a rock.

While the correct origin of the name Slippery Rock may never be known, the history of the area is not subject to debate. Clues to the past are evident in the landscape today, from arrowheads found in freshly plowed fields, to overgrown fence rows that reveal former farmlands. Solitary stone chimneys dot the landscape indicating the locations of old homesteads while abandoned coal mines, iron furnaces, oil wells and rail beds pay homage to the industries which helped fuel the economy.

Throughout its history, the Slippery Rock Creek and its tributaries were the lifeblood of the watershed. Archaeological findings support that Upper Woodland Natives camped along the creek beds in the area now known as the Slippery Rock Creek Watershed as they hunted and gathered for subsistence. According to the History of Butler County Pennsylvania, 1895, the Shawanese, Munceys, Seneca and remnants of the Delaware all claimed lands in the area. The Franklin Trail, which traverses the watershed, was the earliest traveled route by settlers from Pittsburgh north to Lake Erie and was originally an Indian trail.²⁹ An 1875 map of "Indian towns" published by the Historical Society of Pennsylvania indicated settlements by the Cushcushking on Wolf Creek in Slippery Rock Township and the Kaskaskunk west of Holyoke in Center Township. Later recorded oral histories from the first settlers tell of Indian cornfields belonging to the Cornplanter tribe, which were cultivated until 1796 on the site of present day Harrisville.³⁰

Frontiersmen, who came to the watershed in the period after the Revolutionary War and ahead of the first settlers, subsisted by hunting and trapping. The first settlements began around 1796 to 1797 and the early pioneers, who arrived with their possessions on horseback, found an area characterized by old growth forests teeming with wildlife, rich agricultural lands, numerous springs and abundant natural resources. These pioneers, who were predominantly of Irish, Scottish and German descent, set to work establishing homes and farms, followed by mills and schools and eventually townships and towns as illustrated by S.W. &d P.A. Durant in The History of Lawrence County Pennsylvania, 1770-1877:

"Eighty years of hard work, beginning with the Herculean labors performed by the "first settlers," and ending with the lighter, though no less important tasks of the present generation, have made the "wilderness blossom like the rose." The places where once stood somber forests now teem with the luxurious products of a cultivated soil; the many streams, erewhile rippling undisturbed along their rocky channels, have felt the power of man's mechanical genius, and their rapid currents have been breasted by strong dams, and made to be of more use than watering the trees and plants which grew on their borders; the treasures of earth's substrata have been made to yield bountifully of the accumulated deposits of ages, and establishments have been erected for their manufacture; shops, grist and woolen mills, saw-mills, foundries, paper-mills, and all the varied institutions necessary to supply the wants of a growing population, have sprung up and are flourishing, and the change is so great that one scarce can realize that less than a century has passed since this thickly-settled region, with its populous and prosperous cities and villages, was once an immense wilderness, uncultivated and unexplored, in whose forest-recesses the wild-beast and savage roamed undisturbed for many years before the invading foot of the white settler made its first impress in the region, and his axe created sad havoc among the trees of the "grand old forests." m31

²⁹ History of Butler County Pennsylvania, Chapter 43: Mercer Township, (Chicago: Waterman, Watkins, & Co., 1883); available at http://www.rootsweb.ancestry.com/~pabutler/1883/83-43.htm

History of Butler County Pennsylvania, Chapter II: Aborigines and Explorers (R.C. Brown Co., Publishers, 1895); available at http://www.rootsweb.ancestry.com/~pabutler/1895/95x02.htm ³¹ S.W. and P.A. Durant, *History of Lawrence County Pennsylvania, 1770 – 1877: Scott Township* (1877); available at

http://usgwarchives.net/pa/lawrence/1877/scott.htm

Early settlers found the land in the watershed to be "well adapted to grazing and a variety of crops."³² The watershed included many prime agricultural lands which were used both for grazing livestock and cultivation. Wheat, oats and corn were principal crops and remain so today.

The Slippery Rock Creek and its tributaries were utilized for their power by the settlers throughout the watershed. Evidence includes the record of numerous distilleries and log, grist, oil and woolen mills constructed along their banks during the early to mid-nineteenth century. Locations of mills mentioned in the <u>History of Butler County Pennsylvania – 1883</u> include, among others, Croll's Mill, Mechanicsburg, McDeavitt's Run and Brown's Run in Brady Township; McMurray's Run in Clay Township; Slippery Rock Creek in Marion Township; and Wolf Creek in Slippery Rock Township. As land values increased in the watershed, the flooding of lands caused by the dams which powered the mills became unpopular. Most mills ceased operation by the mid-1800's.

Iron furnaces appeared by the 1820s, and included the Mount Etna (1822) and Hickory (1836) furnaces in Slippery Rock Township, Butler County³³, the Marion furnace (c. 1850) in Marion Township, Butler County³⁴ and the Lawrence furnace (c. 1865-66) in Slippery Rock Township, Lawrence County³⁵. These furnaces ceased operation by about 1875.

Drilling for oil began in the watershed around the 1860's and the furor subsided by the 1880s. During the oil "boom", some wells along Slippery Rock Creek in Lawrence County produced up to 200 barrels a day³⁶, while wells located in the Butler County petroleum fields in the watershed's eastern extreme produced thousands of barrels a day³⁷.

Coal and limestone were mined beginning in the watershed about 1840 and continuing today. Mining helped open the area to trade by prompting the construction of railroads to transport coal to markets outside the watershed. In 1876, the Shenango & Allegheny Railroad was formed by Mercer Mining & Manufacturing Company to transport coal from its mines at Pardoe, Mercer County and Harrisville, Butler County, to Shenango, Branchton, and later to Butler. Mining began to boom within the Slippery Rock Creek headwaters around 1876 when the railroad was extended to Hilliards, PA. Hilliard Station served as the eastern terminus. Additional extensions in the area carried their own descriptive corporate names and after a series of reorganizations the railroad became known as the Pittsburgh. Shenango and Lake Erie (**PS&LE**). By 1892, the railroad connected the coal reserves in the Slippery Rock Creek Watershed to the port of Conneaut, OH. Five years later, the railroad also connected the coal reserves in the Slippery Rock Creek Watershed to Pittsburgh when the PS&LE, Union Railroad Company and the Carnegie Steel Company formed the Butler and Pittsburgh Railroad Company (B&P). In 1897, PS&LE and B&P were consolidated into the Pittsburgh, Bessemer & Lake Erie. Four years later, Andrew Carnegie formed the Bessemer and Lake Erie Railroad (B&LE) under exclusive ownership. To move the coal to market, the B&LE extended a six-mile spur from the main line in the Slippery Rock Creek headwaters. Mining towns like Erico and nearby Goff Station sprang up all along the railroad. Although the coal produced in the area could be shipped to Pittsburgh, the coal mined along the B&LE was said to be of superior quality for steam purposes and the entire production from the mines in Butler County were reportedly shipped north for distribution along the Great Lakes. Figure 6.1 depicts the B&LE from Conneaut, OH along Lake Erie to the Union Railroad near North Bessemer, PA. The map also depicts the B&LE and associated lines in the Slippery Rock Creek Watershed³⁸.

³² History of Butler County Pennsylvania, Chapter 51: Venango Township (Chicago: Waterman, Watkins, & Co., 1883); available at http://www.rootsweb.ancestry.com/~pabutler/1883/83-51.htm.

³³ (bid, Chapter 42: Slippery Rock Township); available at <u>http://www.rootsweb.ancestry.com/~pabutler/1883/83-42.htm</u>.

³⁴ Ibid, Chapter 41: Concord Township; available from <u>http://www.rootsweb.ancestry.com/~pabutler/1883/83-41.htm</u>.

³⁵ S.W. and P.A. Durant, *History of Lawrence County Pennsylvania*, 1770 – 1877: *Slippery Rock Township* (1877); available at <u>http://usgwarchives.net/pa/lawrence/1877/sliprock.htm</u>

³⁶ Ibid, Plain Grove Township; available at http://usgwarchives.net/pa/lawrence/1877/plaingro.htm

³⁷ History of Butler County Pennsylvania, Chapter 48: Marion Township (Chicago: Waterman, Watkins, & Co., 1883); available at http://www.rootsweb.ancestry.com/~pabutler/1883/83-48.htm

³⁸ Slippery Rock Creek Watershed Coalition. *Erico Bridge Restoration Area – Final Report* (December 2004), 2-1 - 2-2.



Figure 6.1: Railroads in the SRCW³⁹

³⁹ Butler County Historical Society. Butler, PA. Collected in 2004.

Archaeological Resources: "Archaeology is the study of past human behavior through the systematic recovery and analysis of material remains or objects." Prehistoric archaeology studies cultures without written language, deciphering their activities through artifacts such as tools and pottery, while historical archaeology studies cultures with written history by examining records such as diaries, public documents, photographs and maps.⁴⁰ Some archaeological discoveries include an entire site consisting of many artifacts, whereas others are simply locations where a single object is found. It is difficult to document the location of every archaeological discovery in the Slippery Rock Creek Watershed, however, some sites are publicly known such as:

Elliott Mine Archaeological Complex

Listed as a Pennsylvania At Risk property by Preservation Pennsylvania, Inc. in 1999 and still considered at-risk today, this "complex is a cluster of more than twenty recorded prehistoric archaeological sites situated on nearly two hundred acres of glacial terraces overlooking Slippery Rock Creek... The sites contain artifacts typical of nearly every known prehistoric contact period (of) Native American culture in the Allegheny drainage (and) have the potential to document the entire sequence of aboriginal occupation in the Slippery Rock valley and tell us a great deal about the evolution of Native American cultures over the last 12,000 years."41

Miller Tract

Located on Wolf Creek in Butler County, this is believed to be a site occupied by Native Americans from the Archaic to Historic periods.42

Old Stone House

An ongoing archaeological excavation of a summer kitchen is assisted by volunteers under the coordination of Dr. Ed Dlutowski.43

Historical Resources: Much of the cultural history of the Slippery Rock Creek Watershed is evident in its historic assets. These include designated National Historic Landmarks and eligible properties, places of State and local historic significance, historical and cultural trails and established historical and cultural themed events. Refer to Plate 6.2: Historical Resources.

National Register Properties: Properties which are officially designated as National Historic Landmarks are listed in the National Register of Historic Places. These properties "include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture."44 Two properties in the watershed are listed on the National Register:

Wendell August Forge

Destroyed by fire on March 6, 2010, the former forge was built in Grove City in 1932. Originally established in 1923, Wendell August Forge remains the oldest operating metal forge in the state.

McConnells Mill Covered Bridge

This registered National Historic Landmark is located in Lawrence County at McConnells Mill State Park. The bridge is a historically significant structure built in 1874 of Howe Truss design.

⁴⁰ Pennsylvania Historical & Museum Commission, *The Value of* Archaeology, (accessed September 1, 2010); available at http://www.portal.state.pa.us/portal/server.pt/community/everyone/2058/value_of_archaeology/285324

Preservation Pennsylvania, Inc., Preserving Pennsylvania, Special Issue, Harrisburg, PA, Spring 1999.

⁴² Butler County Planning Commission, The County of Butler Comprehensive Plan Phase I (1997), HHP2.

⁴³ The Old Stone House Museum, Take a Hike with Washington on November 27 (accessed October 21, 2010); available from

http://oldstonehousepa.org/ 44 Pennsylvania Historical & Museum Commission, National Register Program, (accessed September 1, 2010); available from http://www.portal.state.pa.us/portal/server.pt/community/pennsylvania_and_national_register_programs/3780

<u>National Register Eligible Properties</u>: In order to be considered for listing in the National Register of Historic Places, a property must meet a set of criteria as defined by the National Park Service and set forth on their website at <u>www.nps.gov/nr/publications/bulletins/nrb15/nrb15_2.htm</u>. The PA Historical and Museum Commission historic resource files identify sixteen National Register Eligible properties within the watershed which are depicted in Table 6.7 below.

Name	Key No.	County	Municipality (township/borough)	Year Built
Book Bridge	131601	Butler	Muddy Creek	c.1895
Courtney Mill Overhead Bridge	131592	Butler	Mercer	1927
Daugherty Mills	96376	Butler	Slippery Rock	1822
Frank Hall Bridge	131456	Butler	Brady	1903
Payne #2 Bridge	131655	Butler	Muddy Creek	1909
West Hall	36847	Butler	Slippery Rock	na
L.R. 37083 Bridge	48	Lawrence	Perry	1891
Lawrence Furnace (Lime Kiln)	96250	Lawrence	Slippery Rock	c.1846
McCartney Hollow Bridge	168	Lawrence	Perry	1913
McConnell's Mill	86414	Lawrence	Slippery Rock	1845
Pleasant Hill Grange No. 1505	125206	Lawrence	Perry	c.1900
Wilroy Furnace	96843	Lawrence	Slippery Rock	c.1854
Bridge No. 2712	97696	Mercer	Wolf Creek	1929
Chestnut Street Bridge	102413	Mercer	Grove City	1930
Grove City U.S. Post Office	67751	Mercer	Grove City	c.1933
(Patterson School Road Bridge)	136369	Mercer	Wolf Creek	1897

<u>Pennsylvania Historical Marker Program</u>: The Pennsylvania Historical & Museum Commission administers the historical marker program to highlight important people, places, and events that have influenced Pennsylvania history. This has been an ongoing program since 1946 and citizens may nominate a person, place or event each year. The Slippery Rock Creek Watershed includes two Pennsylvania Historical Program Markers of record which are detailed in Table 6.8 and below.

Table 6.8: Pennsylvania Historical Markers for Old Stone House in the SRCW⁴⁵

Title	County	Category	Location	Text	Dedicated
Old Stone House	Butler	Buildings & Architecture, Business & Industry, Houses & Homesteads	At site, PA SR8 at junction PA SR173	A haven for lumbermen, drovers and travelers, this important landmark and once famous hostelry was built in 1822 at the crossroads of the old Venango Trail and Butler to Mercer Pike by John K. Brown of Oliver. The Marquis de Lafayette may have stopped here on June 1, 1825.	1968
Old Stone House	Butler	Buildings & Architecture, Business & Industry, Houses & Homesteads	At site, PA SR8 at junction PA SR173	Pioneer wayside inn. Built in 1822 and reconstructed in 1963.	1968

⁴⁵ Pennsylvania Historical & Museum Commission, *Pennsylvania Historical Marker Program*, (accessed September 1, 2010); available from http://www.portal.state.pa.us/portal/server.pt/community/pennsylvania_historical_marker_program

<u>Other Historical Markers</u>: The Butler County Tourism & Convention Bureau lists the following historical markers in their publication detailing local museums, historical societies and historic sites:

Christian Frederick Post-King Beaver Treaty Marker

This roadside marker commemorates the 1758 treaty negotiated between Morovian Missionary and colonial government emissary Christian Frederick Post with King Beaver and other chiefs. This led the Delawares to withdraw their allegiance with France during the French and Indian War. It is located 2 miles west of Slippery Rock on Miller Road near the Wolf Creek Narrows.⁴⁶

Wigton Massacre Marker

This roadside marker, not found on the State database, memorializes the Wigton family who was murdered by Seneca Indian Sam Mohawk in 1843. It is located 8 miles south of Slippery Rock at the entrance to the Muddy Creek cemetery on Route 8.⁴⁷

<u>Pennsylvania "At Risk" Sites</u>: Preservation Pennsylvania, Inc. publishes an annual list of threatened historic properties in the Commonwealth based upon the following criteria:

- "The property is listed or determined eligible for listing in the National Register of Historic Places, or
- The property is considered a contributing structure in a National Register Historic District, or
- The property is designated historic by local government, and the property is faced with imminent recognized endangerment either from overt action, neglect, incompatible use or loss of context."⁴⁸

In addition to the *Elliott Mine Archeological Complex* discussed in Archeological Resources above, the watershed had one historic property designated at risk:

VanGorder Mill Bridge

This bridge was listed "at risk" in 2008, along with a number of other metal truss bridges which were scheduled for replacement in the State Transportation Improvement Program, and has since been demolished. Formerly located over Slippery Rock Creek in Lawrence County, this structure was a Pratt thru truss bridge built in 1891 by the Pittsburgh Bridge Company and Nelson and Buchanan.⁴⁹ Additional information on the bridge may be obtained at: http://www.historicbridges.org/pennsylvania/vangordermill/.

<u>Other Places of Historical Significance</u>: The watershed is home to many other places of historical significance. The Pennsylvania Historical and Museum Commission database, for instance, identifies over 120 historic resources within the watershed boundaries. County Historical Societies and Visitor Bureaus inventory historical properties as well. Some places of historical significance which are accessible to the public include:

Davis Cabin

According to the Moraine State Park Recreational Guide, this pre-American Revolution era cabin is constructed of log and stone and is "a fine example of pioneer construction." The former summer home of Mrs. Catherine Davis and her sister Mrs. Eleanor Holt, it currently serves as the headquarters for the PA Chapter of the North Country National Scenic Trail Association.

⁴⁶ Butler County Tourism & Convention Bureau, *Experience History*, p 14.

⁴⁷ Ibid.

⁴⁸ Preservation Pennsylvania, Inc., *Preserving Pennsylvania*, Special Issue, Harrisburg, PA, Spring 1999.

⁴⁹ Preservation Pennsylvania, Inc., *Preserving Pennsylvania*, Special Issue, Harrisburg, PA, 2008.

Hickory Corner School

This school was built c. 1891 in Franklin Township, Butler County and was later moved to the Slippery Rock University Campus. The furnished school house is open on special occasions.⁵

Muddy Creek Oil Field

This turn-of-the-century historic oil exhibit is located within Moraine State Park and includes a Bessemer engine pumping jack and other early oil industry equipment. Demonstrations of the engine take place at the site several times per year.⁵¹

Old Mill

A National Register Eligible property originally built in 1852, the Old Mill at McConnells Mill State Park was destroyed by fire then rebuilt in 1868. The waterwheel was replaced with water turbines and the grinding stones with rolling mills in 1875, making this "one of the first rolling mills in the country" according to the Recreational Guide for the park. The mill processed corn, oats, wheat and buckwheat until closing in 1928. Corn grinding demonstrations take place at the park during its annual Heritage Festival.52

Old Stone House

This stagecoach inn and tavern, reconstructed in 1963, was originally built in 1822 to service those traveling on the newly built Pittsburgh to Erie Pike. It also served as a local post office and muster point during the Civil War. Open to the public, the house is furnished with authentic furniture and artifacts and includes local history exhibits.

Jacksville Esker

This natural history feature formed over 23,000 years ago as the last of the glaciers retreated from what is today the area just north of Moraine State Park. At six miles in length, it is considered the best preserved esker in Pennsylvania.53

Wolf Creek Narrows

This natural history area, located near McConnells Mill State Park, is believed to have been created by glacial activity during the last ice age.⁵⁴

War Memorials and Military Honor Rolls

Memorials and honor rolls commemorating the sacrifice of local watershed citizens are located at:

- Grove City (Grove City Memorial Park)
- Slippery Rock (Main Street)
- Boyers (State Route 308)

History and Heritage Trails: In addition to the recreational trails highlighted, the watershed also includes historic and cultural trails of national, state and local significance. These trails are generally designed to be travelled by automobile, linking destinations point-to-point. They include:

⁵⁰ Butler County Tourism & Convention Bureau, *Experience History*, p 14.

⁵¹ Ibid.

⁵² Pennsylvania DCNR, *McConnells Mill State Park* (accessed October 21, 2010); available from http://www.dcnr.state.pa.us/stateparks/parks/mcconnellsmill.aspx 53 Pennsylvania DCNR, *Jacksville Esker, Butler* County (accessed September 1, 2010); available from

http://www.dcnr.state.pa.us/topogeo/parkguides/pg4_9/Esker.aspx 54 Western Pennsylvania Conservancy, *Milestones in Land Protection – Wolf Creek Natural* Area (accessed September 1, 2010); available from http://www.paconserve.org/75th/wolf.htm

Butler County Barn Trail

This cultural driving tour through Butler County includes stops at two historic barns in the watershed: Miller Barn, built in the late 1800s and located on West Liberty Road in Worth Township and Wimer Barn, built in 1893 and located on West Park Road in Portersville. To learn more about these features, request or download the trail brochure, visit the following website: http://www.visitbutlercounty.com/component/option.com_forme/Itemid,54/lang,en/.

Military History Trail

This Pennsylvania Trail of History passes through the watershed on its path from Washington's Crossing to Erie, PA. To learn more about the Military History Trail, visit the following website: <u>http://www.portal.state.pa.us/portal/server.pt/community/trails_of_history_sites/1800/military_history_trail/275666</u>.

Pennsylvania Trail of Geology

This geologic history trail located in Butler and Lawrence Counties includes stops at eight natural features in both Moraine and McConnells Mill State Parks, including the Jacksville Esker detailed above. To learn more about the Pennsylvania Trail of Geology, download the trail guide at: http://www.dcnr.state.pa.us/topogeo/parkguides/Pg4_9/mmpgver.aspx.

Washington's Trail

This driving route through western Pennsylvania retraces George Washington's first military and diplomatic venture from Williamsburg, VA to Fort LeBeouf, which took place in the fall and winter of 1753-1754. Additional information about Washington's Trail can be accessed at the following website: <u>http://www.co.butler.pa.us/butler/cwp/view.asp?a=1407&Q=604922</u>.

<u>Historical & Cultural Events</u>: Finally, the Slippery Rock Creek Watershed plays host annually to several established heritage-themed programs and events, including:

Cherry Pie Hike

This annual event, commencing at the Old Stone House and continuing along the North Country Trail, commemorates George Washington's expedition through Butler County. Additional information is available at: <u>http://oldstonehousepa.org/2010-special-events/</u>.

Civil War Weekends

These weekends of drills and reenactments take place at the Old Stone House each year. Additional information is available at: <u>http://oldstonehousepa.org/2010-special-events/</u>.

McConnells Mill Heritage Festival

This annual festival, held the last full weekend in September at McConnells Mill State Park, features Old Mill tours with corn grinding demonstration, a Civil War encampment, old time games and crafts, as well as artisans, craftsmen and food vendors. Information is available at: http://www.dcnr.state.pa.us/stateparks/parks/mcconnellsmill.aspx.

A Taste of History

These hands-on, interactive events illustrate local history through the role of food and cooking and take place throughout the year at the Old Stone House. Additional information is available at: http://oldstonehousepa.org/taste/.





SECTION 7—MANAGEMENT OPTIONS

A. INTRODUCTION

Management Options include the development of actions focused on the restoration, maintenance, or enhancement of the watershed. These options have been identified using input from individuals and municipalities in addition to a review of available county and municipal plans and information. This input has been discussed in more detail in Section 2 – Issues, Concerns, and Constraints. Completed surveys are available online for viewing:

Citizen Survey Report: <u>http://www.surveymonkey.com/sr.aspx?sm=DScHOBE34_2f_2fSTYsIOJPIDDu3TuhZZR_2bZ_2bLI_2fct97vp4_3d</u> Key Persons Survey Report: <u>http://www.surveymonkey.com/sr.aspx?sm=5mmcx_2fOAf8kL3B2jvHRTc9u1b3IUcokIBw_2fYjCdNBpA_3d</u> Municipal Survey Report: <u>http://www.surveymonkey.com/sr.aspx?sm=aC7JXDCx69a4sS30mtTLooRIzXtQyNd5rngOYYXBACE_3d</u>

Implementation of the proposed action items requires a sustainable commitment by individuals and organizations; therefore, public outreach and education, including dissemination of compiled information, is an integral part of all action items proposed.

Watershed planning is inherently holistic: Actions made by people (cultural) impact the land, which in turn impact the water and those cultural actions impact biological resources of both the land and water. In order to restore, maintain and enhance the watershed, specific actions are required in all four resource categories.



Figure 7.1: Interrelationship of Watershed Resources
B. GOALS & OBJECTIVES

Land

Goal: For the natural scenic beauty of the watershed to be available for current and future generations.

Objectives:

- Eliminate impact of historic mining legacy
- Eliminate impact of illegal dump sites
- Expand recycling efforts
- Increase public awareness of unique land resources
- Provide ready access to information for current and future restoration and planning efforts
- Coordinate sustainable residential and industrial development
- Enhance open space quality and quantity

<u>Water</u>

Goal: For streams to achieve designate use.

Objectives:

- Reduce impact of abandoned mine drainage
- Increase public awareness of water quality issues
- Eliminate accelerated erosion and siltation
- Address stormwater runoff and flooding issues
- Encourage agricultural practices that prevent water quality impacts
- Assist local communities in abating sewage issues
- Develop dialogue among citizens, academia, industry, and government to address current and future water quality issues

Biological

Goal: For terrestrial and aquatic habitats to support vibrant and diverse wildlife populations.

Objectives:

- Increase public awareness of biological resources
- Enhance and expand wildlife habitat
- Preserve unique habitat
- Restore natural stream characteristics

<u>Cultural</u>

Goal: For the public to have access to recreational opportunities that showcase land, water, and biological resources.

Objectives:

- Increase public awareness and utilization of outdoor recreational facilities
- Expand hiking and outdoor recreation opportunities
- Develop water trails
- Increase historical awareness

C. <u>ACTION ITEMS</u> (A list of acronyms for organizations and abbreviations is available at the end of this section.)

<u>Action Items (Projects)</u>	Potential Partners and Responsible Parties	<u>Priority</u>	<u>Cost</u> Estimate			
Objective: Eliminate impact of historic mining legacy						
Reclaim AML sites especially "Priority 1, 2 & 3" sites (as defined by BAMR)	BAMR	High \$25M				
Develop public-private partnership efforts to reclaim abandoned mine sites	WSOs, DMO	High \$0-\$10				
Objective: Eliminate impact of illegal dump sites						
Continue to identify illegal dump sites	KPB	High \$15K				
Cleanup illegal dump sites (assumes volunteers and donated services)	KPB	High	\$1K/ea.			
Objective: Expand recycling efforts						
Conduct public awareness campaign	CRCs, PROP	P Medium \$1K/ea				
Increase curbside programs	CRCs	Medium \$5K/ea				
Initiate more drop-off events	CRCs	Medium \$1K/ea				
Objective: Increase public awareness of unique land resources						
Highlight land resources in local newsletters	WSOs	Medium Minimal				
Objective: Provide ready access to information for current and future	restoration and	planning	efforts			
Compile GIS Dataset for Mercer & Venango Counties	CPCs	High \$200K				
Post GIS data on DCNR Rivers Registry website	SRI, DCNR	High Minima				
Post GIS data on PASDA website	ta on PASDA website SRI, PASDA					
Post GIS data and/or links on websites	WSOs	Medium	Minimal			
Objective: Coordinate sustainable residential and industrial developm	ent					
Hold annual planning coordination meetings	CPCs	Low Minimal				
Develop multi-municipal plans	CPCs	Medium \$200K/ea				
Objective: Enhance open space quality and quantity						
Conduct public awareness campaign for CREP	CREP, FSA	Low \$1K/ea				
Increase land area under CREP	CREP, FSA	Low TBD				
Expand land managed by PA Game Commission	PGC	Low TBD				
Expand State Parks & Forests	DCNR, 3MJC	Low TBD				

Land Resources

Water Resources

Action Items (Projects)	Potential Partners and Responsible Parties	<u>Priority</u>	<u>Cost</u> Estimate		
Objective: Reduce the impact of abandoned mine drainage					
Install passive treatment systems for remaining untreated discharges	BAMR, DMO, SRWC	High	\$2.1M+		
Operate and maintain treatment systems (includes annualized replacement of existing and future systems every 20 years)	SRWC	High \$140K/			
Objective: Increase public awareness of water quality issues					
Conduct public awareness campaign regarding AMD issues	SRWC	High \$1K/e			
Provide AMD and water quality curriculum to educators and public	JEEC	High	\$5K/yr.		
Implement SRCW-specific environmental education programs	WC, SRU, GCC, PCEE	Medium \$2K/ea			
Provide hands-on volunteer wetland planting opportunities	SRWC	Medium	Minimal		
Objective: Eliminate accelerated erosion and siltation					
Install stream bank stabilization for West Park Road Bridge site	SRWC	High	\$30K		
Identify stream bank erosion sites	CCDs, WSOs	Medium Minima			
Implement stream bank stabilization projects	SRPCA,WSOs	Medium \$30K/e			
Objective: Address stormwater runoff and flooding issues					
Develop and implement stormwater management plans	CPCs	Medium \$300K/			
Evaluate and address flooding issues in Slippery Rock Creek headwaters	CCD, SRWC	High \$500K			
Objective: Encourage agricultural practices to prevent water quality in	npacts				
Provide on-site technical assistance to agricultural operations	CCDs, FSA, NRCS	Low Minimal			
Provide financial incentives to encourage sustainable agriculture	CREP	Low TBD			
Objective: Assist local communities in abating sewage issues					
Identify and prioritize sewage related issues	NWRO	Medium \$150K			
Assist citizens and municipalities to improve sewage facilities	PV	Medium TBD			
Objective: Develop dialogue among citizens, academia, industry, & government to address current & future water quality issues					
Facilitate public meetings to address water quality issues including Marcellus Shale	NWRO	High Minimal			

Biological Resources

Action Items (Projects)	<u>Potential</u> Partners and <u>Responsible</u> <u>Parties</u>	<u>Priority</u>	<u>Cost</u> Estimate	
Objective: Increase public awareness of biological resources				
Post summary of biological resources on websites	WSOs, SRI, SRWC	High	Minimal	
Promote awareness of biological diversity	BAS	Medium	Minimal	
Provide watershed-wide based biological resource programs	JEEC	Low	\$1K/ea.	
Objective: Enhance and expand wildlife habitat				
Purchase and maintain open space for wildlife	PGC	High	TBD	
Perform habitat assessments and coordinated improvement projects	PFBC, PAS	Medium	\$5K/ea.	
Implement stream habitat improvement projects	WSOs, MPF	Medium	\$15K/ea.	
Acquire and maintain forested area for public use	BF	Low	TBD	
Objective: Preserve unique habitat				
Purchase and preserve open space with unique habitat, especially BDAs	WWC	Medium	TBD	
Objective: Restore natural stream characteristics				
Remove run-of-the-river dams	SRWC, WWC	High \$200K/e		

Cultural Resources

Action Items (Projects)	Potential Partners and Responsible Parties	<u>Priority</u>	<u>Cost</u> Estimate		
Objective: Increase public awareness and utilization of outdoor recreat	ional facilities				
Conduct public awareness campaign promoting outdoor recreation	CLTB, BRC Low		Minimal		
Objective: Expand hiking and outdoor recreation opportunities					
Acquire easements and complete North Country Trail Construction	NCTA	High \$200K			
Objective: Develop water trails					
Develop trail and install put-in points	PRBC, SRWC Medium \$15				
Objective: Increase historical awareness					
Conduct educational historical programs	OSH	Low \$1K/ea.			
Promote watershed-based history	BCHS, PHMC	Low	v Minimal		

The above priorities were developed based on a review of public input and guidance from the Advisory Committee. The cost estimates provided are extremely approximate. (Abbrev.: M - million, K - thousand, ea. - each; yr. - year.)

D. GENERAL TIMEFRAME

Implementation of Action Items will be dependent on the interest and level of effort of various lead organizations as well as the interest by other stakeholders not specifically identified. Generally speaking, most projects listed above are ready for immediate implementation. AMD/AML issues were raised as two of the largest issues to be addressed. As the federal Abandoned Mine Land Fund, which can be a major source of funding, is only guaranteed through 2022, a ten-year plan is presented. A projected completion date for each objective is provided; however, the actual completion of individual action items will vary depending on support, experience, capability, and commitment.

	<u>Objective</u>	Projected Completion Date								
<u>Resource</u>		.12	'1 3	[,] 14	·15	·16	47,	,19 ,19	' 20	'22
DNP	Eliminate impact of historic mining legacy									
	Eliminate impact of illegal dump sites									
	Expand recycling efforts									
	Increase public awareness of unique land resources									
Ľ	Provide ready access to information for current and future restoration and planning efforts									
	Coordinate sustainable residential and industrial development									
	Enhance quality and quantity of open space									
	Reduce impact of abandoned mine drainage									
	Increase public awareness of water quality issues									
£	Eliminate accelerated erosion and siltation									
ATE	Address stormwater runoff and flooding issues									
Ň	Encourage agricultural practices to prevent water quality impacts									
	Assist local communities in abating sewage issues									
	Develop dialogue among citizens, academia, industry & govt. to address current & future water quality issues									
BIOLOGICAL	Increase public awareness of biological resources									
	Enhance and expand wildlife habitat									
	Preserve unique habitat									
	Restore natural stream characteristics									
CULTURAL	Increase public awareness and utilization of outdoor recreational facilities									
	Expand hiking and outdoor recreation opportunities									
	Develop water trails									
	Increase historical awareness									

The projected implementation date does not necessarily indicate priority or recommended order of implementation, some projects may take the entire 10-year period or longer to complete.

E. CONTINUING EFFORTS

As identified in Section C, Action Items, there is much work that needs to be done throughout the Slippery Rock Creek Watershed to reach the goals listed above. Much has already been accomplished, however, and there are numerous projects currently underway at the time of report preparation. Below is a "snapshot" of projects that represent the continuing efforts of groups and individuals within the Slippery Rock Creek Watershed and is by no means a complete or comprehensive list.

Summary of Selected Completed Projects

- 46 sq. miles of publically-accessible open space (State, Municipal & Private Parks, & SGL)
 >11% of total watershed area
- 750 acres of abandoned mine lands reclaimed by BAMR
- 14 OSM Priority Sites reclaimed by BAMR
- 170 acres of AML and coal refuse reclaimed by SRWC
- 18 Passive Treatment Systems installed by the SRWC, DEP & Butler CCD
- 5 tracts of open space preserved by WWC
- 3 Run-of-the-River Dams removed
- SRWC Monthly Newsletter, The Catalyst, over 1,000 copies distributed monthly
- Accepting the Challenge, a primer on the history, cause, and solutions to AMD
 - SRWC and JEEC published and distributed over 6,000 copies
 - o Online 2011 with funding by the Foundation for PA Watersheds
- Deployment of Datashed, web-based database, for monitoring restoration sites www.datashed.org
- Development of AMD and watershed-based curricula and prairie preservation at JEEC
- Education and interpretive programs facilitated by McConnells Mills & Moraine State Parks
- Lawrence County Greenways Plan & Beaver County Greenways and Trails Plan
- Venango County Comprehensive Recreation, Parks & Open Space Plan
- Venango County Illegal Dump Survey & Southern Venango Co. Regional Comprehensive Plan

Summary of Selected Projects Currently Underway (Projected Completion Date)

- SRC Streambank Stabilization Project Robison Lane/West Park Road Project (July 2011)
 - Slippery Rock Creek Watershed, Worth Twp., Butler Co.
 - Grant funded through FPW, currently in design phase
- McIntire Passive Treatment System (September 2011)
 - o Blacks Creek Subwatershed, Marion, Twp., Butler Co.
 - o Project funded, design completed, currently in construction phase
- Web-based version of <u>Accepting the Challenge</u> (June 2011)
- JEEC & SRI preparing a web-friendly version to be posted on internet
- Clean Creek Products (on-going)
 - SRI recovers, processes and sells materials from AMD systems to support SRWC O&M
- Ohio River Watershed Celebration (on-going, fall event)
 - Annual watershed awareness event with approximately 1,000 attendees
- SRU "Weather Observatory" on-line "real time" climate and weather information (TBD)
- SRU long-term stream recovery research program (on-going)
- Annual SRWC & Westminster College Student Symposium, related research (on-going)
 Westminster College, Grove City College, SRU, high school students
- Butler County Act 167 County-Wide Watershed Stormwater Management Plan (TBD)
- Lawrence County Act 167 County-Wide Watershed Stormwater Management Plan (TBD)
- Butler County Hazardous Waste & Electronics Collections (on-going)

F. POTENTIAL PROJECT LEAD GROUPS ACRONYMS & ABBREVIATIONS

<u>Acronym</u>	Organization
3MJC	Moraine, McConnells Mills, and Jennings Commission
AMD	Abandoned Mine Drainage
AML	Abandoned Mine Land
BAMR	DEP, Bureau of Abandoned Mine Reclamation
BAS	Bartramian Audubon Society
BCHS	Butler County Historical Society
BDA	Biological Diversity Areas
BF	DCNR Bureau of Forestry
BRC	DCNR – Bureau of Recreation and Conservation
CCDs	County Conservation Districts (Beaver, Butler, Lawrence, Mercer & Venango)
CLTB	County/Local Tourist Bureaus
CPCs	County Planning Commissions (Beaver, Butler, Lawrence, Mercer & Venango)
CRCs	County Recycling Coordinators (Beaver, Butler, Lawrence, Mercer & Venango)
DCNR	PA Department of Conservation and Natural Resources
DEP	PA Department of Environmental Protection
DMO	DEP, Bureau of District Mining Operations, Knox Office
FSA	Farm Service Agency
GIS	Geographic Information System
JEEC	Jennings Environmental Education Center
KPB	Keep Pennsylvania Beautiful Affiliates
MPF	Moraine Preservation Fund
NCTA	North County Trail Association, Butler County Chapter
NRCS	US Department of Agriculture, Natural Resources Conservation Service
NWRO	DEP, Northwest Regional Office
OSH	Old Stone House
O&M	Operation and Maintenance of Passive Treatment Systems
PAS	Pennsylvania Audubon Society
PASDA	Pennsylvania Spatial Data Access
PCEE	PA Center for Environmental Education
PFBC	PA Fish & Boat Commission
PGC	PA Game Commission
PHMC	PA Historic & Museum Commission
PROP	Professional Recyclers of Pennsylvania
PV	PA Infrastructure Investment Authority (Pennvest)
SGL	PA State Game Land
SMCRA	Surface Mine Control and Reclamation Act
SRCW	Slippery Rock Creek Watershed
SRWC	Slippery Rock Watershed Coalition
SRPCA	Slippery Rock Park Civic Association
SRI	Stream Restoration Incorporated
SRU	Slippery Rock University
TBD	To Be Determined
WSOs	Watershed Organizations
WWC	Wild Waterways Conservancy, Inc.

