

DRAFT JANUARY 2007

# Redbank Creek

WATERSHED CONSERVATION PLAN



The Pennsylvania Rivers Conservation Program

# Redbank Creek Watershed Conservation Plan

*Draft January 2007*

Prepared for:

Redbank Creek Watershed Community

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- North Fork Creek Watershed Association
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- Pennsylvania Department of Conservation and Natural Resources
- Pennsylvania Department of Environmental Protection
- Pennsylvania Fish and Boat Commission
- Redbank Valley Municipal Authority
- Sandy Lick Conservation Initiative

- Redbank Creek Watershed Conservation Plan Steering Committee

Dave Beale	Craig Coon	Barry Mayes	Amber Sires
Jim Berry	Kristin Friend	Tim Murray	Mike Tharan
Jessica Coil	Linda Makufka	Erika Riker	

- Redbank Creek Watershed Conservation Plan Advisory Committees

Cheryl Burkett	Gary Gilmore	Robin Orris
Ken Burkett	John Kaskan	Deb Simko
Patrick Connors	Harry Kehr	Jack Theisen
Don Crytzer	Mike Makufka	

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Cheryl Burkett	David Gordon	Jerry Sharpe	Scott Young
Ken Burkett	George Kutshel	Deb Simko	
Don Crytzer	Mike Makufka	Steven Siple	

Photographs provided by Western Pennsylvania Conservancy unless otherwise noted.

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## ACRONYMS

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AMD	Abandoned Mine Drainage
ASA	Agricultural Security Areas
ATV	All Terrain Vehicles
BDA	Biological Diversity Area
BMP	Best Management Practices
BWP	Brookville Wood Products
CAFO	Concentrated Animal Feeding Operation
CNHI	County Natural Heritage Inventory
CREP	Conservation Reserve Enhancement Program
CSO	Combined Sewage Overflow
CWF	Cold Water Fishery
DA	Dedicated Area
DCNR	Pennsylvania Department of Conservation and Natural Resources
DEP	Pennsylvania Department of Environmental Protection
DMAP	Deer Management Assistance Program
EAC	Environmental Advisory Committee
EPA	United States Environmental Protection Agency
EV	Exceptional Value
GFCCP	Government Financed Construction Contract Program
HQ	High Quality
HRS	Hazard Ranking System
HUC	Hydrologic Unit Code
IPM	Integrated Pest Management
LCA	Landscape Conservation Area
LHR	Lumber Heritage Region
NABBS	North American Breeding Bird Survey
NFIP	National Flood Insurance Program
NHI	Natural Heritage Inventories
NOMA	Nutrient and Odor Management Act
NO <sub>x</sub>	Nitrogen Oxides
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRCS	Natural Resource Conservation Service
OSM	Office of Surface Mining
PACE	Purchase Agricultural Conservation Easements
PASS	Pennsylvania Archaeological Site Survey
PDA	Pennsylvania Department of Agriculture
PDE	Pennsylvania Department of Education
PENNVEST	Pennsylvania Infrastructure Investment Authority
PFBC	Pennsylvania Fish and Boat Commission
PGC	Pennsylvania Game Commission
PHMC	Pennsylvania Historic Museum Commission
PIF	Partners in Flight
PNMP	Pennsylvania Nutrient Management Program
SFHA	Special Flood Hazard Areas

SMCRA	Surface Mining Control and Reclamation Act
SSO	Sanitary Sewage Overflow
TMDL	Total Maximum Daily Load
TSF	Trout Stocked Fishery
USDA	United States Department of Agriculture
USGS	United States Geological Survey
WPC	Western Pennsylvania Conservancy
WWF	Warm Water Fishery

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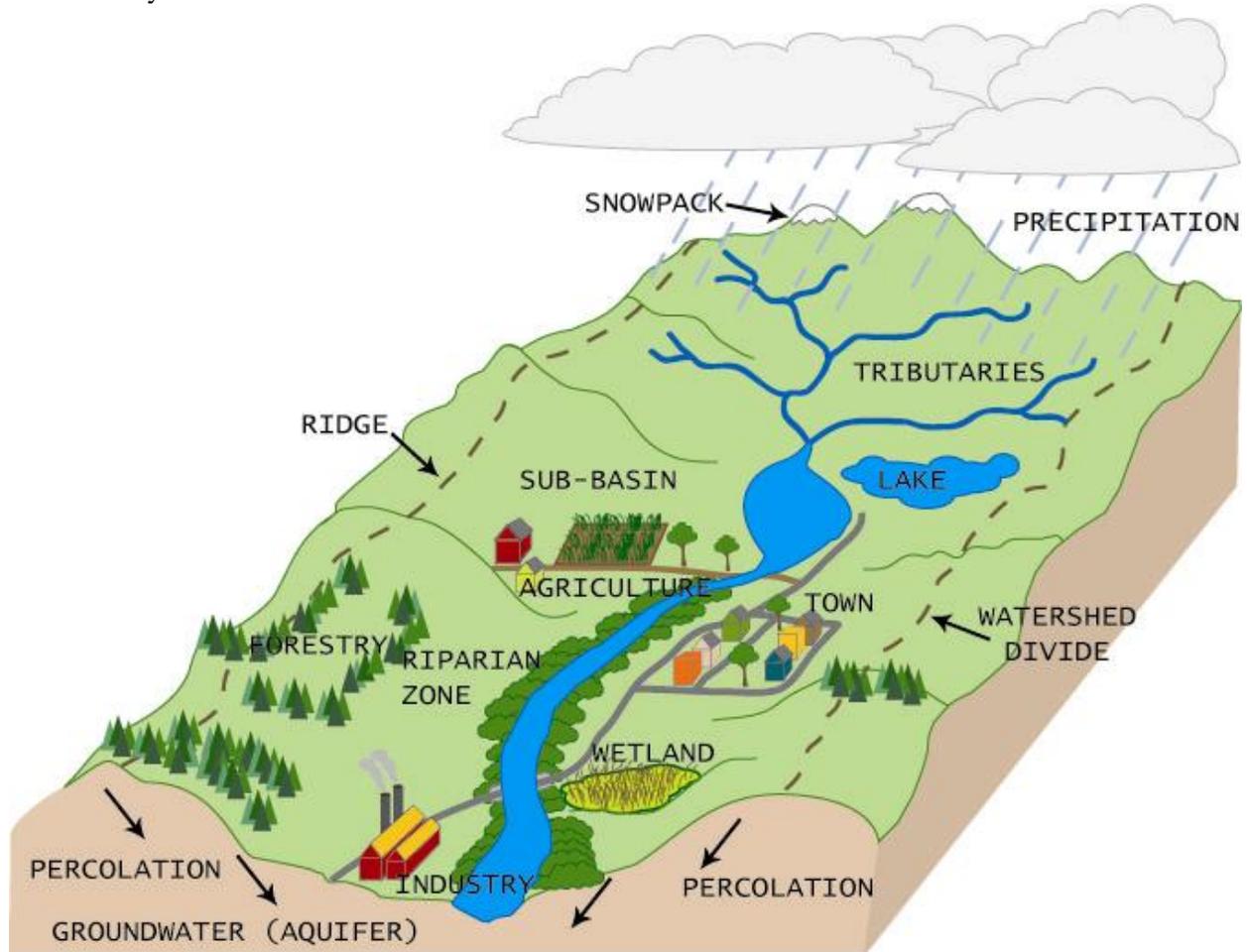
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## WATERSHED DEFINITION

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A watershed can be defined as the area of land that drains to a particular point along a stream. Each stream has its own watershed. Land use is the key element affecting this area of land. The highest elevation surrounding the stream defines the boundary of its watershed. A drop of water falling outside of the boundary will drain to another watershed.



## CHAPTER 1. PROJECT AREA CHARACTERISTICS

### Project Area

#### Location and Size

The Redbank Creek watershed is located within north-central Pennsylvania in Armstrong, Clarion, Clearfield, Elk, and Jefferson counties. It encompasses 575 square miles and portions of 45 municipalities are located within the boundaries. The municipalities are listed in Table 1-1, Figure 1-1, and Figure 1-2.



*Sandy Lick and North Fork Redbank creeks merge to form Redbank Creek in Brookville*

#### Sandy Lick Creek

Sandy Lick Creek originates in Sandy Township, Clearfield County, and flows west through the city of DuBois, Winslow Township, Reynoldsville Borough, and forms the border between Knox and Pine Creek townships. It travels 35.9 miles until it meets with North Fork Redbank Creek. The Sandy Lick Creek subwatershed accounts for 229 square miles, or 40 percent, of the project area.

#### North Fork Redbank Creek

North Fork Redbank Creek begins in Polk Township and flows 22.2 miles in a southwesterly direction through the townships of Warsaw, Eldred, and Pine Creek until it meets with Sandy Lick Creek in Brookville. North Fork Redbank Creek subwatershed accounts for 99 square miles, or 17 percent, of the project area.

Redbank Creek

Sandy Lick Creek and North Fork Redbank Creek meet in Brookville, Pa. to form Redbank Creek. Redbank Creek flows in a southwesterly direction for 50.7 miles through the boroughs of Summerville, Hawthorn, and New Bethlehem. It meets the Allegheny River approximately five and a half miles south of East Brady, Pa.

**Table 1-1. Municipalities**

<b>Municipality</b>	<b>Sq Miles</b>	<b>Percent</b>	<b>Municipality</b>	<b>Sq Miles</b>	<b>Percent</b>
<b>Armstrong County</b>			<b>Jefferson County</b>		
Madison Township	11.01	1.9%	Beaver Township	21.43	3.7%
Mahoning Township	7.37	1.3%	Brookville Borough	3.24	0.6%
Redbank Township	9.35	1.6%	Clover Township	16.13	2.8%
South Bethlehem Borough	0.16	0.0%	Corsica Borough	0.34	0.1%
<b>Clarion County</b>			Eldred Township	16.13	2.8%
Hawthorn Borough	1.09	0.2%	Falls Creek Borough	0.89	0.2%
Limestone Township	3.96	0.7%	Heath Township	0.88	0.2%
Madison Township	15.92	2.8%	Henderson Township	0.50	0.1%
Monroe Township	1.21	0.2%	Knox Township	31.57	5.5%
New Bethlehem Borough	0.38	0.1%	McCalmont Township	12.03	2.1%
Porter Township	41.83	7.3%	Oliver Township	29.70	5.2%
Redbank Township	29.62	5.1%	Perry Township	5.51	1.0%
Rimersburg Borough	0.17	0.0%	Pine Creek Township	28.59	5.0%
Toby Township	3.78	0.7%	Polk Township	27.57	4.8%
<b>Clearfield County</b>			Reynoldsville Borough	1.49	0.3%
Brady Township	8.41	1.5%	Ringgold Township	11.39	2.0%
DuBois, City of	3.36	0.6%	Rose Township	19.01	3.3%
Falls Creek Borough	0.04	0.0%	Snyder Township	14.84	2.6%
Huston Township	0.26	0.0%	Summerville Borough	0.62	0.1%
Sandy Township	47.35	8.2%	Union Township	6.53	1.1%
Union Township	7.93	1.4%	Warsaw Township	51.36	8.9%
<b>Elk County</b>			Washington Township	41.40	7.2%
Horton Township	0.23	0.0%	Winslow Township	41.17	7.1%
Spring Creek Township	0.14	0.0%	Worthville Borough	0.35	0.1%

Climate

Climates without temperature or precipitation extremes are known as temperate climates. There are two types of temperate climates, maritime and continental. A maritime temperate climate is influenced by maritime airflow from the oceans, and is characterized by cool summers and mild winters (Buchdahl & Hare, 2000). A continental temperate climate experiences cold winters and warm summers, which is characteristic of the study area and of Pennsylvania (Buchdahl & Hare, 2000).

The average temperature ranges from a low of 14 degrees Fahrenheit in January, the coldest month by average, to 80 degrees Fahrenheit in July, the warmest month by average (The Weather Channel, 2005). The highest recorded temperature occurred in 1988 at 103 degrees Fahrenheit, while the lowest recorded temperature occurred in 1994 at -32 degrees Fahrenheit (The Weather Channel, 2005).

Precipitation occurs year round, averaging 35 to 60 inches per year (The Weather Channel, 2005). The majority of the precipitation comes in the summer months, during growing season, when moisture demands are high. June is typically the wettest month, averaging about five inches (The Weather Channel, 2005).

### Topography

Located within the Appalachian Plateaus Geomorphic Province and the Pittsburgh Low Plateau Section, the area is characterized by its smooth to irregular undulating surface, narrow and relatively shallow valleys, strip mines, and reclaimed lands (Sevon, 2000). The strip mines and reclaimed lands



*Overview of the Redbank Creek valley and the Allegheny River*

within the region are not geomorphic characteristics, but rather they are human impacts to the land as a result of coal mining. Siltstone, shale, sandstone, conglomerates, and coal underlay the Pittsburgh Low Plateau Section (Sevon, 2000).

The Eastern Broadleaf Forest (Oceanic) Province, of the Humid Temperate Domain ecoregion, possesses topography of diverse nature and origin, including the Appalachian Plateaus. Sedimentary formations are nearly horizontal, but are elevated and dissected, characteristic of the hilly and mountainous terrain (McNab & Avers, 1994). Within the province, the project area is located within the Southern Unglaciaded Allegheny Plateau.

The Southern Unglaciaded Allegheny Plateau has high hills, sharp ridges, and narrow valleys. The water follows a dendritic, or branching, drainage pattern due to fluvial erosion, mass wasting—or the gravitational pull of rock and surrounding material, transportation and deposition, and karst topography—or the distinctive dissolution patterns characterized by underground drainages in areas where layers of soluble bedrock such as limestone and dolomite exist (McNab & Avers, 1994). Lands that have been strip-mined gouge the topography and are a minor, but notable, landform (McNab & Avers, 1994). Elevation ranges from 650 to 1,300 feet above sea level and the local relief generally ranges from 160 to 325 feet.

The Laurentian Mixed Forest Province, also of the Humid Temperate Domain ecoregion, includes the headwaters of Sandy Lick Creek, near Treasure Lake, and the northernmost headwaters of North Fork Redbank Creek. Rolling hills occur in many places, despite the low relief that is characteristic of this province (McNab & Avers, 1994).

Located within the boundaries of the Northern Unglaciaded Allegheny Plateau section of the Laurentian Mixed Forest Province, sharp ridgetops and narrow valleys characterize this maturely dissected plateau (McNab & Avers, 1994). The broad, low amplitude, northeast to southwest trending folds barely tilt the horizontal sedimentary layers and lend a slight grain to the topography (McNab & Avers, 1994). The elevation ranges from 1,000 to 2,000 feet above sea level and the local relief generally ranges from 100 to 670 feet. The water follows a dendritic drainage pattern due to fluvial erosion, transportation and deposition, and mass wasting (McNab & Avers, 1994).

## Major Tributaries

There are 63 named tributaries, of which 21 enter directly into Redbank Creek. Four of these are considered major tributaries; they include North Fork Redbank Creek, Sandy Lick Creek, Little Sandy Creek, and Leatherwood Creek.

Sandy Lick Creek, from the headwaters to the confluence with North Fork Redbank Creek, is designated as a Trout Stocked Fishery (Pennsylvania Code, 1997c). North Fork Redbank Creek, from the headwaters to the confluence with Sandy Lick Creek, is designated as a High Quality Cold Water Fishery (Pennsylvania Code, 1997c). Redbank Creek is designated as a Trout Stocked Fishery from the mainstem, where North Fork Redbank Creek and Sandy Lick Creek join, to the confluence with the Allegheny River (Pennsylvania Code, 1997c). Little Sandy Creek and Leatherwood Creek are designated as Cold Water Fisheries. Tributaries will be discussed further in the Water Resources chapter.



*Sandy Lick Creek from State Game Lands 244 in Winslow Township*

## Air Quality

According to the Pennsylvania Department of Environmental Protection (DEP), there are nearly 200 million tons of toxic emissions polluting the air in the United States each year, making air pollution the nation's largest environmental risk (DEP, 2003a). Any substance in the air that causes damage to life, ecosystems, or property is an air pollutant. Natural and man-made processes can lead to air pollution. Over 90 percent of the pollutants originate from industry, power plants, vehicles, and other human influences (DEP, 2003a). In 1970, the Clean Air Act was passed, setting a national goal to have clean and healthy air for everyone. The act was amended in 1977 and 1990.

Airborne pollutants can travel very long distances. They can fall to the ground in raindrops, fog and dew, dust, or simply due to gravity. Identifying sources of airborne pollutants to a body of water can be complicated. Pollutants can enter waterways through direct deposition (falling directly into waterways) or through indirect deposition (falling onto land and being washed into waterbodies as runoff). Researchers developed the concept of airsheds to assist in the study of atmospheric deposition, which is the process of airborne pollutants falling to the ground [United States Environmental Protection Agency (EPA), 2003a].

Airsheds are geographic areas responsible for emitting 75 percent of the air pollution reaching a body of water (EPA, 2003a). Different pollutants have different airsheds because of their varying behaviors in the atmosphere (EPA, 2003a). Airsheds are determined using mathematical models of atmospheric deposition, as opposed to watersheds, which utilize physical features of the landscape (EPA, 2003a).

### Atmospheric Deposition

Atmospheric deposition is the process of airborne pollutants falling to the ground. There are two types of atmospheric deposition—dry and wet. Dry deposition refers to gases and particles that fall to the earth. They deposit on buildings, cars, homes, and trees, where the particles can be washed away as runoff during storm events.

Rain, fog, and snow are examples of wet deposition. One type of wet deposition is acid precipitation, which typically occurs when nitrous oxides and sulfur dioxide react in the atmosphere with water, oxygen, and other chemicals to form various acidic compounds.

Atmospheric deposition can affect water quality in lakes and streams, terrestrial and aquatic wildlife, forests, human health, visibility, and materials, such as automobiles, statues, and buildings. This is a major concern within the North Fork Redbank Creek subwatershed. More information about the effects of acid precipitation is located in the Water Resources chapter.

### Critical Pollutants

Six critical pollutants have been identified nationally for affecting air quality. They include carbon monoxide, lead, nitrogen oxides, ozone, particular matter, and sulfur dioxide.

#### Carbon Monoxide

Carbon monoxide is a poisonous compound that results from the incomplete burning of fuels, such as motor vehicle exhaust, industrial processes, and wood stoves (DEP<sup>4</sup>). It can impair vision, alertness, and other mental and physical functions when inhaled (DEP<sup>4</sup>). Individuals suffering from cardiovascular disease are at the highest risk, but healthy individuals can also be affected. Carbon monoxide poisoning can be fatal when high enough levels are present, because it replaces the oxygen in blood and inhibits the delivery of oxygen to body tissues (DEP<sup>4</sup>).

#### Lead

Lead is emitted into the atmosphere through the burning of leaded fuel and industrial processes, such as battery manufacturing and lead smelting (DEP<sup>4</sup>). Metal processing is the major source of lead emissions. Lead poisoning reduces mental abilities, damages blood, nerves, and organs, and raises blood pressure when ingested or inhaled (DEP<sup>4</sup>). Lead is highly toxic and accumulates in the body; even small doses are harmful.

#### Nitrogen Oxides

Nitrogen oxides (NO<sub>x</sub>) are produced when fossil fuels are burned at temperatures greater than 1,200 degrees Fahrenheit (DEP<sup>4</sup>). Automobiles, trucks, buses, airplanes, industries, and power plants emit NO<sub>x</sub> into the atmosphere. They contribute to the deposition of nitrogen in soil and water through acid rain and play a major role in the formation of ground-level ozone (DEP<sup>4</sup>). Human health is impacted when NO<sub>x</sub> enter the lungs and make breathing more difficult.

#### Ozone

Ozone is a colorless, odorless gas that forms in the atmosphere. Depending on where it is located in the atmosphere it can be beneficial or harmful. When located in the upper atmospheric layer, it is called the ozone layer and it filters the sun's harmful ultraviolet rays. When it is located in the lowest atmospheric layer it is called ground-level ozone. Ground-level ozone is a secondary pollutant—a pollutant that is formed in the atmosphere instead of being emitted from a specific source. It forms when NO<sub>x</sub> combine and react with volatile organic compounds in the presence of sunlight and warm temperatures (DEP<sup>4</sup>). Ozone, and the pollutants that cause it, can be transported from hundreds of miles away.

When inhaled, ozone reacts with tissues in our lungs making breathing difficult. People with asthma and lung disease are most seriously impacted, but even healthy individuals are at risk with prolonged exposure.

#### Particular Matter

Particulates are tiny drops of liquid or small particles of dust, metal, or other materials that float in the air (DEP<sup>4</sup>). A mixture of these particles is known as particular matter. Four different types and sizes of particular matter exist. These particles travel in the lungs and become trapped. They can cause respiratory ailments and can carry cancer-causing chemicals, producing greater health problems (DEP<sup>4</sup>).

**Total suspended particulates** vary in size up to 45 micrometers in diameter. They can remain suspended in the air for a few seconds to several months (DEP<sup>4</sup>). There are no federal or state air quality standards for total suspended particulates.

**Particular matter 10 (PM<sub>10</sub>)** is solid matter or liquid droplets from smoke, dust, fly ash, or condensing vapors that can be suspended in air for long periods of time. They are less than 10 micrometers in diameter.

**Particular matter 2.5 (PM<sub>2.5</sub>)** are fine particles with diameters less than 2.5 micrometers. They can accumulate in the respiratory system and are associated with numerous adverse health effects, especially among children, the elderly, and individuals with asthma or cardiopulmonary disease (DEP<sup>4</sup>).

**Sulfates and nitrates** are classified together as a critical pollutant. Both have a role in reducing visibility. Sulfates are one of the key components in the formation of acid rain. Nitrates are currently being studied to determine if they have an impact on the formation of acid rain.

#### Sulfur Dioxide

Sulfur dioxide is emitted into the atmosphere by industrial processes burning coal or oil containing sulfur. Trees, plants, and agricultural crops are damaged by sulfur dioxide and it can accelerate the corrosion of materials, such as monuments, buildings, and iron-containing metals (DEP<sup>4</sup>). Sulfur dioxide is the main component of acid rain, joining with water vapor in the atmosphere to form sulfuric acid. Children, the elderly, and individuals with asthma, chronic lung disease, and cardiovascular disease, are more susceptible to negative health effects from this pollutant.

#### Mercury

Although mercury is not identified as a national critical pollutant, it is an important one. Mercury occurs naturally in air, water, and soil. Many rocks, including coal, release mercury into the atmosphere when burned. It is estimated that half of all mercury deposition within the United States comes from sources within the United States (EPA, 2005). Approximately 40 percent of the domestic mercury released is from coal-burning power plants. Of the mercury emissions from coal-burning power plants, only one-third is deposited in the United States.

Mercury emitted into the atmosphere eventually settles in water or on land, where it can be carried to waterbodies by runoff. Once deposited, certain microorganisms can change it into methylmercury, a highly toxic form that builds up in fish, shellfish, and animals that eat fish (EPA, 2005). Some species of fish and shellfish build up more methylmercury than others and, depending on what they eat, how long they live, and where they are located within the food chain, the level of methylmercury varies.

Humans are exposed to methylmercury primarily through the consumption of fish and shellfish. At high levels, mercury exposure can harm the brain, heart, kidneys, lungs, and immune system (EPA, 2005). In unborn babies, newborns, and young children, high levels of methylmercury can impact the development of the nervous system and impair learning.

The EPA, United States Food and Drug Administration, and individual states work together to establish local fish advisories for certain types of commercially harvested fish and shellfish. These advisories suggest how often pregnant women and those who may become pregnant, nursing mothers, and young children should eat certain types of fish. Advisories for men, women, and children of all ages are also issued when appropriate.

The only advisory that is in place in Pennsylvania is the statewide advisory recommending that individuals eat no more than eight ounces of sport fish caught in the state's waterways per week (DEP, 2006f).

### Impacts of Air Pollution

Air pollution not only impacts the quality of the air, but the economy, health, and environment as well. It contributes to land and water pollution by altering the chemical makeup of streams and soils. It can also lead to impairment or destruction of habitats (through the loss of trees, plants, and animals), decreasing property values and incomes, and increasing medical expenses and employee absenteeism (Kling & Wuebbles, 2003).

## **Socioeconomic Profile**

### Land-Use Planning and Regulation

The majority of municipalities are not utilizing land-use regulation control powers granted to them by the state legislature in the Pennsylvania Municipalities Planning Code (2002). Land-use regulation control powers granted include comprehensive planning, subdivision regulation, and zoning. Unwanted land uses may result from uncontrolled industrial, commercial, or residential development. Table 1-2 and Figure 1-4 identify which municipalities are utilizing land-use regulation control.

### Comprehensive Plans

Comprehensive plans are created to serve as a guide for actions and decisions to ensure the development of public and private property supports the greater good of the community. Municipalities and counties recognize that, without formal plans, they may be vulnerable to undesirable land uses through uncontrolled industrial, commercial, or residential development.

Comprehensive planning efforts have occurred in each of the counties involved in the study area. Jefferson County updated their comprehensive plan in 2005, while Clarion and Armstrong counties updated their plans in 2004 and 2003, respectively. Elk County completed the latest version of their plan in 1999. Clearfield County updated their 1991 version of the plan in 2006. It is recommended that comprehensive plans be updated every 10 years to address ever-changing circumstances.

Only 36 percent of the municipalities have comprehensive plans. Municipalities that do not have a local comprehensive plan should consider establishing a plan individually or jointly with neighboring municipalities. Planning for the future helps municipalities understand how to best meet the needs and desires of the local citizenry while preserving the most desirable aspects of their communities.

### Subdivision Regulations

Subdivision regulations are an important tool in controlling growth, protecting natural resources, and maintaining community character (Vermont Conservation Education, 2002). Subdivision regulations authorize a planning commission, or review board, to review and approve the division of a parcel of land into two or more smaller parcels, based upon standards and criteria that are set for the community (Vermont Conservation Education, 2002).

These regulations are effective in defining new development patterns. They do this by ensuring that new developments do not overburden local infrastructure. They provide stormwater management, erosion control, protect natural resources from fragmentation, and protect a community's special character and sense of place.

Jefferson and Elk counties are the only counties that do not utilize subdivision regulations. However, these counties should consider establishing subdivision regulations to be proactive in establishing the foundation for their county, as opposed to reactive, when new, controversial businesses and land uses become established.

Zoning

Zoning is a legal mechanism by which governmental bodies, for the sake of protecting public health, safety, morals, and the general welfare, can limit a landowner’s right to use privately owned land. This is done through the development of zoning ordinances. Zoning ordinances divide the land within a governing body’s area into districts, and create regulations that apply generally to the governing body as a whole, as well as specifically to individual districts.

**Table 1-2. Land-Use Controls**

Municipality	Comp Plan	Subdivision Ordinance	Zoning	Municipality	Comp Plan	Subdivision Ordinance	Zoning
<b>Armstrong County</b>				<b>Jefferson County</b>			
	<i>Yes</i>	<i>Yes</i>	<i>No</i>		<i>Yes</i>	<i>No</i>	<i>No</i>
Madison Township	No	No	No	Beaver Township	No	No	No
Mahoning Township	No	No	No	Brookville Borough	Yes	No	Yes
Redbank Township	No	No	No	Clover Township	No	No	No
South Bethlehem Borough	No	No	No	Corsica Borough	Yes	No	No
<b>Clarion County</b>					<i>Yes</i>	<i>No</i>	<i>No</i>
	<i>Yes</i>	<i>Yes</i>	<i>No</i>	Eldred Township	No	No	No
Hawthorn Borough	No	No	No	Falls Creek Borough	Yes	No	Yes
Limestone Township	No	No	No	Heath Township	No	No	Yes
Madison Township	No	No	No	Henderson Township	Yes	No	No
Monroe Township	Yes	No	No	Knox Township	No	No	No
New Bethlehem Borough	Yes	Yes	Yes	Mc Calmont Township	No	No	No
Porter Township	No	No	No	Oliver Township	No	No	No
Redbank Township	No	No	No	Perry Township	No	No	No
Rimersburg Borough	No	No	No	Pine Creek Township	No	No	No
Toby Township	No	No	No	Polk Township	No	No	No
<b>Clearfield County</b>					<i>Yes</i>	<i>No</i>	<i>No</i>
	<i>Yes</i>	<i>Yes</i>	<i>No</i>	Reynoldsville Borough	Yes	No	No
Brady Township	Yes	Yes	No	Ringgold Township	No	No	No
DuBois, City of	Yes	Yes	Yes	Rose Township	Yes	No	No
Falls Creek Borough	Yes	No	Yes	Snyder Township	Yes	No	No
Huston Township	No	No	No	Summerville Borough	Yes	No	No
Sandy Township	Yes	Yes	Yes	Union Township	No	No	No
Union Township	No	Yes	No	Warsaw Township	No	No	No
<b>Elk County</b>					<i>Yes</i>	<i>No</i>	<i>No</i>
	<i>Yes</i>	<i>No</i>	<i>No</i>	Washington Township	Yes	No	Yes
Horton Township	No	No	No	Winslow Township	Yes	No	No
Spring Creek Township	No	No	No	Worthville Borough	No	No	No

Only 16 percent of the municipalities currently utilize zoning (Pennsylvania Center for Local Government Services, 2005). Municipalities should consider establishing zoning ordinances to protect valuable resources while maintaining landowner rights.

#### Environmental Advisory Committees

Municipalities have the option to establish environmental advisory committees (EACs). EACs are created to advise municipal officials about issues of environmental importance to the community, and recommend ways to protect, preserve, and enhance the natural environment. Committees could be formed for an individual municipality or could encompass several municipalities. Municipalities should consider establishing EACs.

#### Smart Growth

Increasing efforts to boost the economy, protect the environment, and enhance the quality of life are the foundation for establishing the Smart Growth Network. In 1996, EPA partnered with governmental bodies and non-profit organizations including environmental, historical preservation, and professional organizations to form the network.

Sprawl, the movement of people from cities and towns into suburbs and rural landscapes, is one item that Smart Growth Network looks to address. It is not economically feasible to abandon infrastructure in the cities and towns just to rebuild it further out (Smart Growth Network, 2005). Smart growth focuses on the issues of quality of life, economics, environment, health, housing, transportation, and design. Ten strategies have been established, and are recommended to address the smart growth issues. These strategies include:

- Mixing land uses;
- Taking advantage of compact building designs;
- Creating a range of housing opportunities and choices;
- Creating walkable neighborhoods;
- Fostering distinctive, attractive communities with a strong sense of place;
- Preserving open space, farmland, natural beauty, and critical environmental areas;
- Strengthening and directing development toward existing communities;
- Providing a variety of transportation choices;
- Making development decisions predictable, fair, and cost-effective; and
- Encouraging community and stakeholder collaboration in development decisions.

#### Demographics and Population Patterns

The watershed population was calculated using data from the United States Census Bureau. Census block group information from the 1990 and 2000 censuses was used in calculating the population. Table 1-3 and Figures 1-5 and 1-6 illustrate population and the population changes.

Between 1990 and 2000, the population increased by 1,991 residents. The population within Armstrong County decreased, while the populations within Clarion, Clearfield, and Jefferson counties increased. Clearfield County had the largest increase in population with the addition of 1,008 people while Clarion County experienced the largest percentage of population change, increasing by 19.5 percent.

There are several population centers: the City of DuBois and Treasure Lake in Clearfield County; Reynoldsville, Falls Creek, Summerville, Worthville, and Brookville boroughs in Jefferson County; New Bethlehem and Hawthorn boroughs in Clarion County; and South Bethlehem Borough in Armstrong County. Overall, the population within these centers is decreasing as people move out of smaller towns into the countryside.

DuBois

Founded in 1914, the City of DuBois was named after John DuBois, an early industrialist. The community contains more than 3,500 houses on 2,176 acres (U.S. Census Bureau, 2000). The population within the City of DuBois decreased by two percent through the 1990s, with an annual rate of decline of less than one percent (Pennsylvania Profile, 2006). In 1990, there were 8,286 residents (U.S. Census Bureau, 1990). By 2000, the population decreased to 8,123 residents (U.S. Census Bureau, 2000).

**Table 1-3. Population**

County	1990	2000	Percent change
Armstrong County	939	927	-1.28%
Clarion County	5118	6116	19.50%
Clearfield County	17345	18353	5.81%
Jefferson County	22356	22399	0.19%
Total	45758	47795	4.45%

Treasure Lake

Treasure Lake is a private, residential community that was established around three lakes in the early 1970s. The community consists of 9,000 acres of wooded land, three private lakes, and over 2,000 homes (Treasure Lake Property Owners Association). The population within this region has been steadily growing, and increased by 106 percent through the 1990s (Pennsylvania Profile, 2006). There are 4,507 people that reside at Treasure Lake (Pennsylvania Profile, 2006). In addition to the permanent residents at Treasure Lake, there are numerous timeshares and vacation homes.

Reynoldsville

Founded in 1900, Reynoldsville Borough was named after Woodward Reynolds, a settler. The community contains 1,117 homes on 896 acres (U.S. Census Bureau, 2000). The population within the borough decreased by four percent through the 1990s, with an annual rate of decline of less than one percent (Pennsylvania Profile, 2006). In 1990, there were 2,818 residents (U.S. Census Bureau, 1990). By 2000 the population decreased to 2,710 residents (U.S. Census Bureau, 2000).

Falls Creek

Founded in 1900, Falls Creek Borough straddles Jefferson and Clarion counties. The community contains 414 homes on 576 acres (U.S. Census Bureau, 2000). The population within the borough decreased by 10 percent through the 1990s, and has an annual rate of decline of less than one percent (Pennsylvania Profile, 2006). In 1990, there were 1,087 residents, and in 2000 there were 983 (U.S. Census Bureau, 1990; U.S. Census Bureau, 2000).

Summerville

Founded in 1887, Summerville Borough was named after Summers Baldwin, a settler. The community contains 209 homes on 384 acres (U.S. Census Bureau, 2000). The population within the borough decreased by 22 percent through the 1990s. The annual rate of decline is less than one percent (Pennsylvania Profile, 2006). In 1990, there were 675 residents within the borough, and in 2000 there were 525 residents (U.S. Census Bureau, 1990; U.S. Census Bureau, 2000).

Worthville

Founded in 1878, Worthville Borough contains 31 homes on 128 acres (U.S. Census Bureau, 2000). The population within Worthville increased by 31 percent through the 1990s, with an annual rate of decline of less than one percent (Pennsylvania Profile, 2006). In 1990, there were 65 residents, and in 2000 there were 85 residents.

Brookville

Founded in 1843, Brookville Borough is a 19<sup>th</sup> century lumber town. The community contains 1,849 homes on 2,048 acres (U.S. Census Bureau, 2000). The population within the borough grew by one

percent through the 1990s. The annual rate of decline is less than one percent (Pennsylvania Profile, 2006). In 1990, there were 4,184 residents, and in 2000 there were 4,230 residents (U.S. Census Bureau, 1990; U.S. Census Bureau, 2000).

#### New Bethlehem

Founded in 1853, New Bethlehem Borough has 489 homes on 320 acres (U.S. Census Bureau, 2000). The population within the borough declined by seven percent through the 1990s, and has been declining at an annual rate of 1.2 percent (Pennsylvania Profile, 2006). In 1990, there were 1,151 residents, and in 2000 there were 1,057 residents (U.S. Census Bureau, 1990; U.S. Census Bureau, 2000).



*Community volunteers planting flowers in downtown Brookville*

#### Hawthorn

Founded in 1916, the Borough of Hawthorn has 213 homes on 704 acres. The population within the borough increased by 11 percent through the 1990s, and has an annual rate of decline of less than one percent (Pennsylvania Profile, 2006). In 1990, there were 528 residents, and in 2000 there were 587 residents.

#### South Bethlehem

Founded in 1887, South Bethlehem Borough has 194 homes on 128 acres (U.S. Census Bureau 2000). The population within the borough declined by seven percent through the 1990s. The annual rate of decline is one percent (Pennsylvania Profile, 2006). In 1990, there were 479 residents, and in 2000 there were 444 residents (U.S. Census Bureau, 1990; U.S. Census Bureau, 2000).

### Infrastructure

Sanitary sewer systems, public water supplies, and transportation usually determine how much development a given area can support. The existence of infrastructure is important for the development and redevelopment of communities. The lack of clean water and sewage disposal can hinder the redevelopment process, and send potential jobs to other locations. Planning for development and redevelopment is key to the future.

#### Sanitary Sewer Systems

Every municipality within Pennsylvania is required to have an Act 537 Pennsylvania Sewage Facility Plan. This plan identifies how the municipality will manage sewage. Twenty percent of the Act 537 plans within the study area are five years old or less. Sixty percent of the plans are over 20 years old, with the majority of them being over 30 years old. Updating older plans is essential, especially in areas where development may occur in the future.

Urbanized areas have more sanitary sewer services than do rural areas. There are three types of sewer systems: storm, sanitary, and combined. Stormwater systems carry stormwater runoff through pipes and ditches where they eventually enter into streams. Sanitary systems carry raw sewage from homes and businesses to wastewater treatment facilities. Combined systems carry a combination of raw sewage and stormwater runoff to wastewater treatment facilities.

Sewage overflows are a common problem in urbanized areas. When sanitary systems malfunction and cause raw sewage to enter nearby streams, it is known as sanitary sewage overflow (SSO). When the flow exceeds the capacity of the sanitary system and allows untreated wastewater to be discharged to the

stream, it is referred to as a combined sewer overflow (CSO). CSOs typically occur during large storm events. The overflows from SSOs and CSOs flush human and industrial waste, oil, toxic metals, pesticides, and litter into streams. More information about sewage disposal is identified in the Water Resources chapter.

### Stormwater Management

Stormwater is water that runs off the land into surface waters during and immediately following periods of precipitation. A stormwater management plan is a comprehensive and practical implementation plan that provides uniform technical standards and criteria throughout the watershed for managing stormwater runoff to help limit flooding.

Act 167 requires Pennsylvania counties to prepare and adopt stormwater management plans for each county, as designated by DEP. Sandy Lick Creek is the only watershed that currently has a stormwater management plan.



*Aerial photo of Interstate 80 crossing  
North Fork Redbank Creek in  
Brookville*

### Public Water Supply

Access to clean water is very important. There are seven public water suppliers providing drinking water to residents of urban areas. Rural residents are less likely to have public water, and rely on springs or well water for their daily needs. More information about drinking water is presented in the Water Resources chapter.

### Transportation

#### Major Roadways

Major roadways, the primary source of transportation in the area, include Interstate 80, United States highways, Pennsylvania highways, and municipal-owned roadways.

Interstate 80 is the only interstate in the area and the major east to west corridor. U.S. Route 322 is an alternate east to west corridor traveling through the region, entering in Corsica and exiting south of DuBois. There also are several state routes traveling east to west, they include State Routes 255, 536, 830, 839, and 950.

U.S. routes 119 and 219 are major north to south corridors, but they are only two-lane highways. State Routes 28, 36, 66, and 310 also are a part of the north to south highway network.

### Airports

Airports have a vital role in transportation in today's society, moving passengers and goods all around the world. The DuBois-Jefferson County Airport is the only airport within the boundaries of the study area. A cargo hauler and commercial carrier, it provides a major link for north-central Pennsylvania, offering daily scheduled commuter service from DuBois to Pittsburgh International Airport. Owned and operated by the Clearfield-Jefferson Counties Regional Airport Authority, the DuBois-Jefferson County Airport provides aircraft fueling, maintenance, and flight instruction.

Although not located within the boundaries of the study, there are several other airports that benefit the area. There are four regional airports: Clarion County Airport in Shippensburg, Pa.; Punxsutawney Regional Airport in Punxsutawney, Pa.; Clearfield-Lawrence Airport in Lawrence Township, Clearfield County; and St. Marys Airport in St. Marys, Pa. Although there is no commercial passenger service available at these locations, some offer flight instruction, sightseeing and aerial tours, and aircraft rentals.

Pittsburgh International Airport is the closest major airline carrier located approximately 120 miles in a southwest direction.

Railroads

Railroads provide transportation of goods through the region. There are 137 miles of active rail lines operating along four railroads. The Mt. Laurel Railroad, with its five segments, is the largest railroad accounting for 54 percent of the rail lines. The Pittsburgh and Shamut Railroad is the second largest railroad with three segments and 29 percent of the rail lines. The third largest railroad is the Buffalo and Pittsburgh Railroad. Its five lines account for 16 percent of the rail lines. Conrail is the smallest railroad, operating one segment that travels 1.4 miles.

There are six abandoned railroads accounting for 21 miles of rail lines. The Armstrong Rail Trail owns 5.8 miles, which it acquired from Conrail. It has been converted into a rail trail and made available for recreation. Clearfield County Rails to Trails owns 6.2 miles of railroad that was abandoned by the Buffalo and Pittsburgh Railroad. Pennsylvania Department of Transportation owns 3.2 miles, abandoned by the Falls Creek Railroad. An additional six miles of rail lines have been abandoned by Lake Erie, Franklin, and Clarion Railroad; Baltimore and Ohio Railroad; and Penn Central Railroad.

Economy

The unemployment rate is one tool used to monitor economic conditions. The seasonally adjusted unemployment rate, the indicator typically used, is a statistical technique to determine whether employment changes from month to month are due to normal seasonal patterns or changing economic conditions.

According to the United States Department of Labor-Bureau of Labor Statistics, in August 2005, the seasonally adjusted unemployment rate of the United States was 4.9 percent. In Pennsylvania, the seasonally adjusted unemployment rate was above the national rate at 5.0 percent (BLS). The four counties making up the study area were all above the state and national unemployment rate in August 2005. Table 1-4 displays the unemployment rate changes from August 2003 to August 2005.

Household income is another indicator used to manage the economy. In 1999, the national median household income was \$41,994 (U.S. Census Bureau, 2000). Sandy Township, Clearfield County, and Heath Township, Jefferson County, were the only municipalities within the study area above the national median household income. The other 39 municipalities were below the national median household income in 1999.

Employment

According to the 2000 census, manufacturing was the leading employment industry, providing 24 percent of employment. The second leading employment sector, at 20 percent, was education, health, and social services. Other than retail trade, the third leading industry at 13 percent, the remaining industries account for less than 10 percent each. Table 1-5 shows the breakdown of employment within Armstrong, Clarion, Clearfield, Elk, and Jefferson counties.

**Table 1-4. Unemployment Rate  
(Source: Bureau of Labor Statistics)**

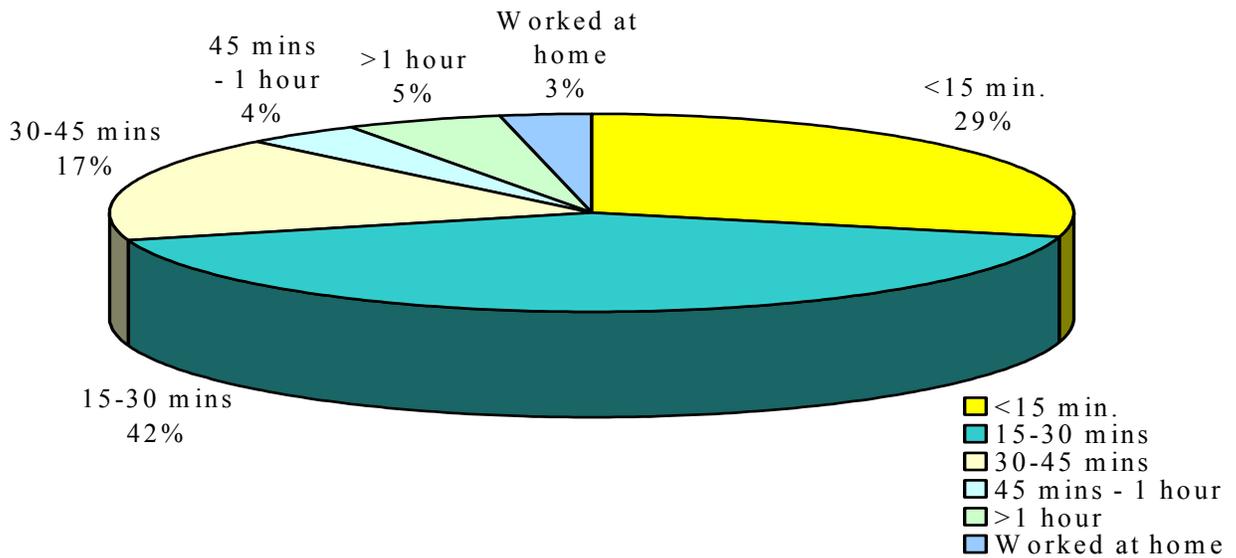
Location	August 2003	August 2004	August 2005
United States	6.1	5.4	4.9
Pennsylvania	5.6	5.6	5.0
Armstrong County	6.2	6.8	6.2
Clarion County	5.5	5.4	5.2
Clearfield County	6.3	6.2	5.9
Elk County	6.2	5.3	6.2
Jefferson County	5.7	5.6	5.4

**Table 1-5. Breakdown of Employment in Armstrong, Clarion, Clearfield, Elk, and Jefferson Counties**

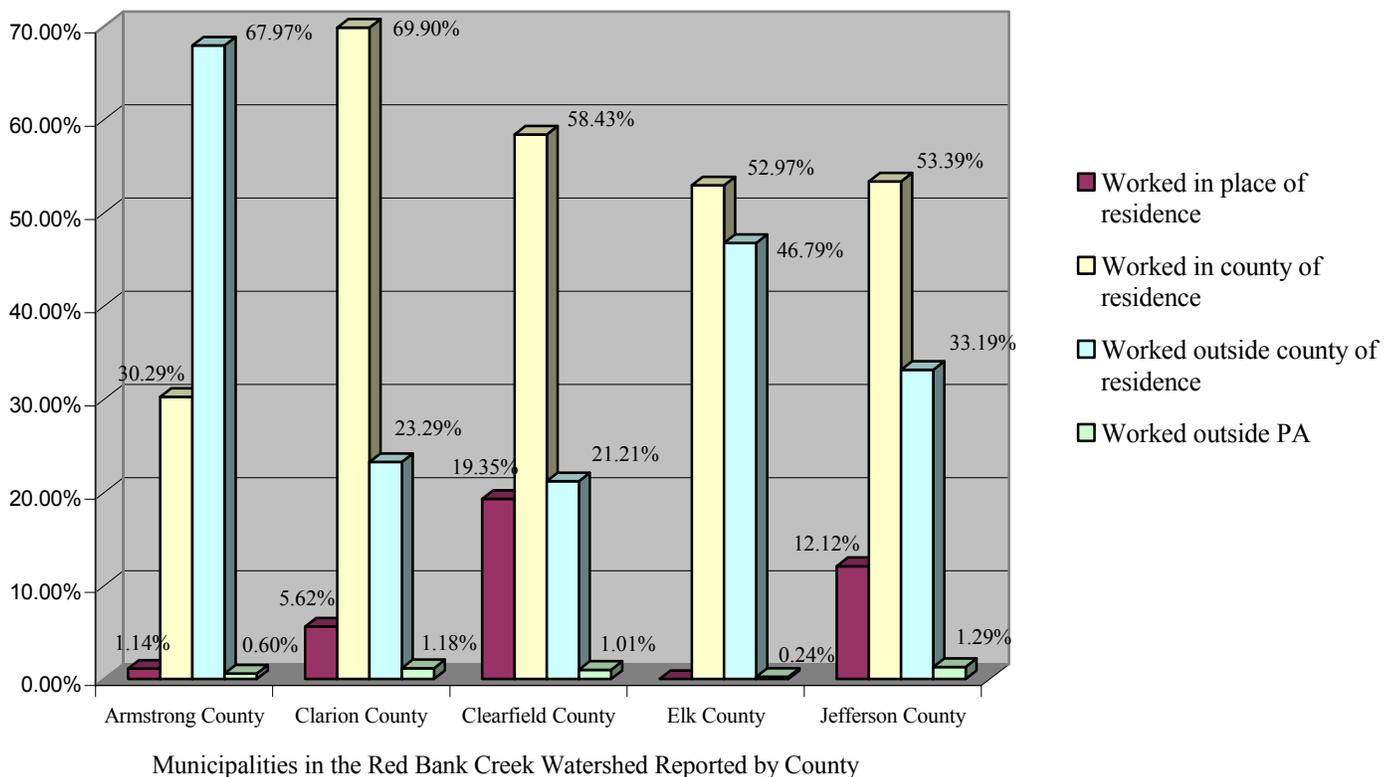
Industry	Armstrong		Clarion		Clearfield		Elk		Jefferson		Total	
	Absolute Employment	Percent										
Agriculture, forestry, fishing, hunting, and mining	1,279	4	629	3.5	1,170	3.3	217	1.3	705	3.6	3,295	3%
Construction	2,146	7.1	1,156	6.4	2,422	6.8	686	4.1	1,329	6.7	6,410	6%
Manufacturing	6,586	21.7	3,133	17.4	6,626	18.6	7,365	44	4,635	23.4	23,710	24%
Wholesale trade	903	3	457	2.5	1,463	4.1	367	2.2	648	3.3	3,190	3%
Retail trade	3,792	12.5	2,538	14.1	5,333	15	1,540	9.2	2,502	12.6	13,203	13%
Transportation and warehousing, and utilities	2,072	6.8	1,147	6.4	2561	7.2	637	3.8	1,504	7.6	6,417	6%
Information	533	1.8	225	1.3	558	1.6	221	1.3	260	1.3	1,537	2%
Finance, insurance, real estate, and rental and leasing	1,006	3.3	592	3.3	1,369	3.8	156	2.7	584	2.9	3,123	3%
Professional, scientific, management, administrative, and waste management services	1,473	4.9	673	3.7	1,552	4.4	430	2.6	868	4.4	4,128	4%
Educational, health, and social services	5,914	19.5	4,456	24.8	7,200	20.2	2,939	17.6	3,708	18.7	20,509	20%
Arts, entertainment, recreation, accommodations, and food service	1,967	6.5	1,565	8.7	2,055	5.8	843	5	1,382	7	6,430	6%
Public administration	911	3	566	4.6	1,524	4.3	421	2.5	710	3.6	3,422	3%
Other services	1,726	5.7	832	3.1	1,826	5.1	623	3.7	1,011	5.1	5,007	5%
<b>Total</b>	<b>30,308</b>	<b>100</b>	<b>17,969</b>	<b>100</b>	<b>35,659</b>	<b>100</b>	<b>16,445</b>	<b>100</b>	<b>19,846</b>	<b>100</b>	<b>100,381</b>	<b>100%</b>

The majority of residents, 75 percent, work near their homes, traveling 30 minutes or less to work. Figure 1-8 shows how much time residents travel to get to work. Figure 1-9 displays the percentage of residents that work in their municipality, county, other counties, and other states, confirms that the majority of residents work close to home.

**Figure 1-8. Time Traveled to Work**



**Figure 1-9. Work Location (Percent)**



A major employer is designated as a company having a minimum of 200 employees. These employers have a profound effect on the community, because they provide jobs and resources to the community’s residents. There are 19 major employers including the largest employer, DuBois Regional Medical Center, which employs 1,200 people (Harris Infosource, 2005). All major employers are identified in Table 1-6.

In order for new businesses to become established in an area, they require supportive infrastructure including water, sewage, and accessible roadways. A number of the major employers in the region are located near Interstate 80 and its interchanges.

**Table 1-6. Major Employers**

<b>Employer</b>	<b>Employees</b>	<b>Location</b>	<b>Employer</b>	<b>Employees</b>	<b>Location</b>
DuBois Regional Medical Center	1,200	DuBois	Carrier Commercial	250	Brookville
DuBois Area School District	600	DuBois	Owens-Illinois Closure, Inc.	250	Brookville
Brookville Hospital	367	Brookville	Owens-Illinois, Inc.	250	Brookville
Christ the King Manor	302	DuBois	Paris Cleaners, Inc.	241	DuBois
Invensys Energy Metering Corp.	300	DuBois	Triangle Suspension Systems	225	DuBois
Trail King Industries	300	Brookville	DuBois Continuum of Care Com.	200	DuBois
WRC Senior Services	295	Brookville	Miller Welding & Machine Shop	200	Brookville
Brookville School District	293	Brookville	Penn Traffic Company	200	DuBois
O I Plastic Products FTS, Inc.	270	Brookville	Wal-Mart Stores, Inc.	200	DuBois
Jefferson Manor	255	Brookville			

**Education**

There are a number of educational opportunities available. There are portions of seven school districts, two vocational schools, and seven other institutions of higher learning. Table 1-7 identifies the educational opportunities available. The enrollments listed include the entire school and school district jurisdiction, not just the watershed portion.

**Table 1-7. Educational Opportunities**

<b>Schools and School Districts</b>	<b>Enrollment</b>
<i>Brookway Area School District, Jefferson County</i>	<i>1,230</i>
Brookway Elementary School	663
Brookway Junior-Senior High School	567
<i>Brookville Area School District, Jefferson County</i>	<i>1,939</i>
Brookville Junior-Senior High School	945
Hickory Grove Elementary School	612
Northside Elementary School	122
Pinecreek Elementary School	260

**Table 1-7. Educational Opportunities (continued)**

<b>Schools and School Districts</b>	<b>Enrollment</b>
<i>Clarion-Limestone School District, Clarion and Jefferson Counties</i>	<i>1,121</i>
Clarion-Limestone Elementary School	629
Clarion-Limestone Junior-Senior High School	492
<i>DuBois Area School District, Clearfield and Jefferson Counties</i>	<i>4,728</i>
CG Johnson Elementary School	383
DuBois Area Middle School	1,176
DuBois Area High School	1,437
Highland Street Elementary School	201
Juniata Elementary School	378
Luthersburg Elementary School	152
Oklahoma Elementary School	407
Penfield Elementary School	125
Sykesville Elementary School	135
Wasson Ave. Elementary School	334
<i>Punxsutawney Area School District, Jefferson and Indiana Counties</i>	<i>2,967</i>
Banks Cove Elementary School	84
Bell Township Elementary School	119
Big Run Elementary School	133
Jenks Hill Elementary School	84
Longview Elementary School	102
Mapleview Elementary School	265
Parkview Elementary School	99
Punxsutawney Area Middle School	802
Punxsutawney Area High School	933
West End Elementary School	131
<i>Redbank Valley School District, Armstrong and Clarion Counties</i>	<i>1,499</i>
Mahoning Elementary School	193
New Bethlehem-South Bethlehem Elementary School	284
Redbank Valley High School	737
Redbank-Hawthorn Elementary School	285
<i>Union School District, Clarion County</i>	<i>798</i>
Rimersburg Elementary School	219
Sligo Elementary School	260
Union High School	388
<i>Vocational Schools</i>	<i>861</i>
Jefferson County-DuBois Area	410
Lenape Area	451

**Table 1-7. Educational Opportunities (continued)**

Schools and School Districts	Enrollment
<i>Institutions of Higher Education</i>	
	1,876
Clarion County Career Center	343
DuBois Business College	268
Jefferson County-DuBois Area Vocational Technical School	34
Lenape Area Vocational Technical School	91
Penn State DuBois Campus	922
Pennsylvania Academy of Cosmetology	52
Triangle Tech (DuBois)	291

## Management Recommendations

### Goal 1-1. Increase communication and cooperation among municipalities and counties within the region and eliminate the mentality that each community is separate.

Educate elected officials about impacts to the local environment.	High
Increase lobbying and funding support for the environment in federal and state budgets.	High
Create and enforce stricter guidelines for environmental laws.	Medium
Municipalities within the watershed should establish an environmental advisory council to encourage local communities and government to work together.	Medium

### Goal 1-2. Become proactive, as opposed to reactive, when planning for the future.

Establish or update municipal comprehensive plans for municipalities that currently do not have plans or plans that are 10 years or older. Plans can be established individually or jointly with neighboring municipalities.	High
Utilize responsible zoning to protect agricultural and other lands, without significantly impeding landowner rights.	High
Encourage municipalities and counties to be proactive, rather than reactionary, through the development of land-use ordinances or subdivision regulations protecting the character of the communities and valuable resources.	High
Establish zoning regulations, controlled by local municipalities, in urban areas.	Medium
Strengthen the regulation of land-use ordinances so they are not changed easily.	Low

### Goal 1-3. Plan for future infrastructural needs including transportation, water, and sewage services.

Repair failing water and sewage lines, and add new infrastructure in growth areas as identified in County and Municipal Comprehensive Plans.	High
Continue improving and upgrading roadways including secondary or rural roadways.	Medium
Upgrade and maintain technology, such as high-speed internet, to enable the region to be competitive and attract new businesses.	Medium
Establish an emergency management plan to control hazardous spills along Interstate 80 and prevent water contamination.	Medium
Encourage municipalities with older Act 537 Sewage Facility plans to update their plans to prepare for future development.	Medium
Investigate the possibility of widening one of the north to south travel corridors to attract new businesses to the region.	Low

**Goal 1-4. Utilize natural and historical resources to improve the economy, while increasing awareness of potential impacts that businesses may have on the region.**

Conduct a study of impacts new businesses have on local communities, streams, groundwater, and their effects downstream.	Medium
Utilize available nature-based tourism opportunities to increase revenue.	Medium
Revitalize industrial base with historical businesses.	Low

**Goal 1-5. Utilize methods to control sprawl when planning new developments.**

Encourage the use of smart-growth principles or conservation by design practices when development opportunities arise, to maintain the natural setting prized by residents and tourists.	Medium
Carefully plan urban development to ensure economic enhancement without sprawl.	Medium
Consult and implement county and municipal land-use plans.	Medium
Limit the amount of development, based upon limitations of the region, including water quantity and soil type.	Medium

**Goal 1-6. Increase the number of well-paying jobs and diversify the types of jobs in the area.**

Establish a regional economic development plan.	Medium
Diversify the local job market by offering incentives and tax breaks to new businesses.	Medium
Revitalize downtown areas, following the example of Brookville, to encourage the establishment of new businesses.	Medium
Encourage redevelopment of brownfield and old industrial sites, as opposed to the development of green sites, such as agricultural lands.	Medium

**Goal 1-7. Increase local services available to community residents.**

Increase fire protection services within the area through additional funding, upgraded equipment, and well-trained, volunteer and professional responders.	Medium
Educate taxpayers about the connection between taxes and available services, and how their tax dollars are being spent.	Medium
Increase funding for libraries, so that services can be expanded, providing more opportunities to utilize the local resource.	Medium

## CHAPTER 2. LAND RESOURCES

### Geology

When studying land resources, a good place to begin is with the region’s geology, which can provide information about the land’s history, composition, and structure.

From a geological standpoint, land areas are divided into physiographic provinces. These provinces are regions where landforms are similar in geologic structure. Pennsylvania is divided into six physiographic provinces. The project area is entirely within the Appalachian Plateau Physiographic Province (Sevon, 2000), which stretches from Alabama to New York, and encompasses a significant portion of western Pennsylvania.



*A scenic view of the Redbank Creek watershed*

The Appalachian Plateau Province is further divided into 10 physiographic sections. Located entirely within the Pittsburgh Low Plateau section, the area is characterized by a smooth to irregular, undulating surface, with narrow, relatively shallow valleys. The underlying rock in this section is typically comprised of shale, siltstone, sandstone, limestone, and coal, all of which are present in the region (Sevon, 2000). A significant amount of coal mining has occurred, because of the abundance of coal found in this section, which in most cases has altered the natural geology.

Beyond physiographic provinces, an area also can be categorized by formations. Geologic formations of a region are continuous rock units with a distinctive set of characteristics that make it possible to recognize and map. There are seven geologic formations present. These formations are listed in Table 2-1 and can be seen in Figure 2-1. The most prevalent formation is the Allegheny Formation, which contains significant amounts of coal, and is the focus of much of the watershed’s coal mining activities. The formation also contains significant amounts of sandstone and shale. The Pottsville Group is the other most common geologic formation. The Pottsville Group is dominated by sandstone, and also contains discontinuous layers of coal. Because of the discontinuous nature of the coal in the region, mining is not a common practice within the Pottsville Group.

**Table 2-1. Geologic Formations**

Allegheny Formation
Burgoon Sandstone through Cuyahoga Group
Casselman Formation
Glenshaw Foundation
Huntley Mountain Formation
Pottsville Group
Shenango Formation through Oswayo Formation

### Soils

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.” There are over 20,000 soils in the United States alone. Soils are named and classified on the basis of physical and chemical properties.

#### Soil Associations

Soil associations are comprised of two or three major soils and a few minor soils. There are 20 soil associations present. Descriptions of the soil associations are below, with brief overviews found in Table

2-2 (Hallowich, Topalanchik, Jensen, Braker, and Ellenberger, 1988; Martin and Haagan, 1977; Loughry et al., 1958; NRCS, 2006; Zarichansky et al., 1964).

1. **Rayne-Gilpin-Ernest** soil association contains well drained and moderately well drained, deep and moderately deep, gently sloping to very steep soils on hilltops, ridges, hillsides, and foot slopes. Land uses associated with these soils are primarily forested, mostly mixed hardwoods. Some areas on hillsides are used for pasture and hay, and some hilltops and benches are used for cultivated crops, hay, and pasture. Use limitations include steep slopes, erosion, and a seasonal high water table.
2. **Cookport-Hazleton-Clymer** soil association consists of moderately well drained and well drained, deep, nearly level to moderately steep soils on broad uplands, ridges, and on hillsides. Land uses associated with these soils are typically forested, mixed hardwoods. Use limitations are slope, erosion, surface stones, and a seasonal high water table.
3. **Udorthents-Gilpin-Rayne** soil association includes well drained to somewhat poorly drained, shallow to deep, nearly level to very steep soils on hilltops, ridges, benches, and foot slopes. Land uses associated with these soils in the watershed are mostly areas disturbed during surface mining. Most unmined areas are forested, with some areas used for pasture and hay. The land is typically suited for farming. Use limitations include slope, erosion, and a seasonal high water table.
4. **Atkins-Philo-Monongahela** soil association can be found in areas of poorly drained to moderately well drained, deep, nearly level and gently sloping soils on floodplains and terraces. Land uses associated with these soils are forested areas or areas of urban development. Some agricultural uses, such as crops, hay, and pasture are present. Use limitations mainly are the high seasonal water table and flooding.
5. **Cavode-Brinkerton-Armagh** soil association contains poorly drained and somewhat poorly drained soils, moderately deep or deep, nearly level or gently sloping areas on uplands. Strip mining is common in this association, as is dairy farming, pasture, cultivated crops and hay. Small wetlands are common, and artificial drainage is often needed before development can occur.
6. **Cookport-Hartsells-Dekald** soil association consists of moderately drained or well drained, moderately deep or deep, and found on ridgetops and slopes. Much of the association is forested while dairy and beef cattle farms are also present. Use limitations include large boulders that are often present at the surface and the coarse nature of the soils.
7. **Dekalb-Leetonia** soil association includes well drained soils found along steep slopes and is rare in the area. The vast majority of the association is forested. Use limitations include large boulders that are often present at the surface and very steep slopes that make agricultural operations nearly impossible.
8. **Gilpin-Montevallo-Ernest** soil association can be found in shallow to moderately deep areas on rolling uplands, steep hillsides, and lower slopes. It is often found within floodplains as well. Strip mining is extensive within this association. Dairy farms, pastures, and Christmas tree farms are also found within the association. Use limitations include possible flood impacts.

9. **Gilpin-Wellston-Ernest** soil association contains well drained and moderately well drained, shallow to deep soils and is found on rolling plateaus, long slopes, and the lower parts of slopes. Coal mining is extensive within this association. Dairy farms and some pasture also can be found within the association.
10. **Guernsey-Westmoreland** soil association contains moderately well drained and well drained soils, and is generally sloping and moderately steep. Typically found in uplands, dairy and beef cattle farms are a common use within this association. Other farming does occur, but artificial draining is sometimes needed. Another use limitation is land slippage that is somewhat common in this association.
11. **Monongahela-Holston** soil association contains moderately well drained and well drained, deep soils, and often is found along stream terraces. This association is common along Redbank Creek. About half of this association within the watershed is farmed, whereas the rest is forested or in urban development. Gravel is common in this association, and some gravel mining does occur.
12. **Purdy-Tyler-Zoar** soil association includes soils that are poorly drained to moderately well drained, and found along stream terraces of waterbodies such as Sandy Lick Creek. Some farming can be found in this association, with the main crop being hay. Much of the association remains forested.
13. **Weikert-Gilpin** soil association contains well drained, shallow to moderately deep soils found on steep and very steep upland areas. Most of this association is forested, with much of it having been logged in the past. Coal mining is a use often found within this soil association. A use limitation includes very steep slopes.
14. **Rainsboro-Melvin-Steff** soil association contains moderately well drained to poorly drained deep soils found in nearly level to gently sloping areas on terraces and floodplains. Urban development is a major land use within this association, as towns such as South Bethlehem are situated within this association. Use limitations include a seasonal high water table.
15. **Rayne-Ernest-Hazelton** soil association consists of well drained to moderately well drained, deep, gently sloping to moderately steep soils found in low-lying areas on ridgetops, and on hillsides. Agriculture is the main land use; however, urban development is often found within this association. Use limitations include a seasonal high water table.
16. **Wharton-Rayne-Cavode** soil association includes well drained to somewhat poorly drained, deep, nearly level to moderately steep soils, found on ridges, benches, and hillsides. Agriculture is common within this association, as it is well suited for crops. Pooling water during wet periods and a seasonal high water table are use limitations within this association. In some parts of the association, artificial drainage is needed for agricultural and urban development.
17. **Dekalb** soil association consists of moderately deep, well drained, moderately steep to very steep, stony soils. The vast majority of the association is forested. The major use limitations in this association are steepness, depth to bedrock, and surface stones. Residential development and agricultural operations are very rare within this association.
18. **Gilpin-Ernest** soil association contains poor to moderately well drained, sloping to steep soils. Agriculture, particularly dairy farms, is common within this association. The majority

of the non-farmed portions of this soil are forested. Timber cutting has been conducted through portions of this association, and erosion is often moderate to severe within the cleared areas.

19. **Gilpin-Rayne-Ernest** soil association consists of well drained, fairly deep, sloping to steep soils found on uplands. Dairy farms and coal mining, typically strip mining, are common land uses within the association. With good drainage and gentle, moderate slopes, there are few natural use-limitations within the soil. Disturbances from past mining practices are one of the few limitations found within the association.
20. **Wheeling-Scioto** soil association consists of poorly drained to well drained, nearly level soils. With few use limitations, this association is accustomed to seeing more development than many other associations. Farming and urban development are common, and the association is less forested than most.

**Table 2-2. Brief Soil Association Descriptions**

<b>Soil Association</b>	<b>Description</b>
Rayne-Gilpin-Ernest	Originates from shale, siltstone, and sandstone. Well drained to moderately drained soils. Found on hills and ridges.
Cookport-Hazleton-Clymer	Originates from sandstone. Moderately drained and well drained soils. Found on uplands, ridges, and hillsides.
Udorthents-Gilpin-Rayne	Originates from shale, siltstone, and sandstone. Well drained to poorly drained soils. Found on hills and ridges.
Atkins-Philo-Monongahela	Originates from sandstone, siltstone, and shale. Poorly to moderately well drained soils. Found on floodplains and terraces.
Cavode-Brinkerton-Armagh	Originates from shale. Somewhat poorly drained and poorly drained soils. Found on broad uplands and gentle slopes.
Cookport-Hartsells-Dekalb	Originates from sandstone. Moderately well drained. Found on broad ridgetops and on slopes.
Dekalb-Leetonia	Originates from sandstone. Well drained soils. Mainly found on steep slopes.
Gilpin-Montevallo-Ernest	Originates from shale, siltstone, and sandstone. Mainly well drained soils. Found on rolling uplands and steep hillsides.
Gilpin-Wellston-Ernest	Originates from siltstone, shale, and sandstone. Well drained and moderately well drained soils. Found on rolling plateaus and long slopes.
Guernsey-Westmoreland	Soils that contain some lime. Moderately well drained and well drained. Found on uplands.
Monongahela-Holston	Moderately well drained and well drained soils. Found along Redbank Creek.
Purdy-Tyler-Zoar	Poorly drained to moderately well drained soils. Mainly found on terraces along older and larger streams. Common along Sandy Lick Creek.

**Table 2-2. Brief Soil Association Descriptions (continued)**

<b>Soil Association</b>	<b>Description</b>
Weikert-Gilpin	Originates from shale, siltstone, and limestone. Well drained soils. Typically found on uplands in close proximity to rivers and creeks.
Rainsboro-Melvin-Steff	Moderately well drained to poorly drained soils. Mainly found on terraces and within floodplains. The soils are typically underlain by stream sediment.
Rayne-Ernest-Hazelton	Originates from shale and sandstone. Well drained and moderately well drained soils. Found in low-lying areas on ridgetops and hillsides.
Wharton-Rayne-Cavode	Originates from clay, shale, siltstone, and sandstone. Well drained to somewhat poorly drained soils. Found on uplands that are bisected by small streams.
Dekalb	Originates from sandstone and quartzite. Well drained soils. Only a small area within the watershed, found along Redbank Creek.
Gilpin-Ernest	Originates from shale and sandstone. Poor to moderately well drained soils. Prevalent along the bank of Redbank Creek in Clarion County.
Gilpin-Rayne-Ernest	Originate from shale and sandstone. Well drained soils. The dominant association in the Clarion portion of the watershed, located just off the river.
Wheeling-Sciotoville	Originates from sandstone. Poorly drained to well drained soils. The association can be found on gravelly benches along a small portion of Redbank Creek.

### Prime Agricultural Soils

Soils that meet certain physical, chemical, and slope characteristics are identified as prime agricultural soils or prime farmland soils. Based upon a predetermined set of criteria, they are designated by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) in each county. These soils are important in meeting the country's short-term and long-term needs for food. Ultimately these soils will produce the highest yields with minimal input of energy and economic resources (Hallowich et al., 1988). The criteria typically include level to near level slopes, a well drained structure, deep horizons, an acceptable level of alkaline or acid components, and the capacity for producing food or crops. Figure 2-2 depicts the areas that have prime agricultural soils. As shown on the map, the soils are scattered throughout the watershed. The soils are typically found close to waterbodies. These soils are also often found closely associated with established urban areas, signifying the importance of farming to the earliest settlements in the area.

The majority of prime agricultural soils are located in Jefferson County. There are 28 soils within Jefferson County that qualify as prime agricultural soils (Zarichansky et al., 1964). As displayed on Figure 2-2, these soils are spread throughout the entire county, with a significant presence along the mainstem of Redbank Creek, North Fork Redbank Creek, and along Sandy Lick Creek.

A small portion of the watershed within Clearfield County contains nine soils that qualify as prime farmland. As shown on Figure 2-2, some of the densest areas of prime agricultural soils within the project area are found within Clearfield County. They are found within Rayne-Gilpin-Ernest, Cookport-Hazelton-Clymer, and Udorthents-Gilpin-Rayne soil associations. Despite the dense presence of prime farmland, the continued loss of soils to surface mining and urban development has resulted in less than 17 percent of the entire Clearfield County land area now meeting the requirements for prime farmland (Hallowich et al., 1988).

Within the Armstrong County portion, six soils qualify as prime farmland (Martin & Haagen, 1977). Only a small percentage of the land is currently in active agriculture. The majority of the prime agricultural soils are found in the eastern portion of the county near South Bethlehem.

Just across Redbank Creek, in Clarion County, there are 25 prime farmland soils scattered throughout a relatively small portion of the project area (Loughry et al., 1958). This area also contains large reserves of coal, and much of the prime farmland soils are intermingled with both active and abandoned mines. The majority of the prime farmland soils in the county are found in two locations, along the river near New Bethlehem and Hawthorn, and towards the mouth of the river where Redbank Creek empties into the Allegheny River.

Within the small portion that stretches into Elk County, there is one area of prime agricultural soils, as shown on Figure 2-2. This small area stretches into the southern part of Elk County from Clearfield County.

### Farmland of Statewide Importance

Soils important to agriculture also can be designated as farmland of statewide importance. The soils, in addition to prime agricultural soils, are critical to the region's agriculture. These soils are designated by the State Rural Development Committee as being of statewide importance for the production of food, feed, fiber, and forage. Typically, farmlands of statewide importance include those that do not meet the requirements to be designated prime farmland, but produce economically profitable, high yields of crops when treated and managed according to acceptable farming methods. Some may produce yields as high as prime farmlands if conditions are favorable.

Significant pockets of farmland of statewide importance are present. These areas are identified by soils within each county. Eighteen soils classified as farmland of statewide importance are present within Clearfield County (Hallowich et al., 1988), 15 within Armstrong County (Martin & Haagen, 1977), 38 within Jefferson County (Zarichansky et al., 1964), and 23 in Clarion County (Loughry et al., 1958). Throughout the project area, these soils are relatively evenly scattered, with no one geographic area containing a dominant amount of farmland with this designation.

## **Land Use**

Observing the land use of a specific region can reveal a significant amount about that region. Land uses can provide clues about the major economic catalysts in a region, and offer a glimpse into its past. Looking at a region's land use can even identify trends that are not seen from everyday observation, such as insights into possible sources of environmental degradation. It is important to continually monitor land-use changes in a region in order to inform decision makers regarding planning and natural resource protection.

Open space dominates the landscape, with just over three percent of the land area being occupied by urban development. Most of this development is located in the few population centers, including DuBois, Treasure Lake, Brookville, Summerville, and New Bethlehem. Forested lands and agriculture are the two major land uses; combined they comprise over 78 percent of the total land area. Barren lands, primarily comprised of mined area, make up over 17 percent and small patches of wetlands and open water are also found. Table 2-3 and Figure 2-3 depict the existing land use.

Forestry

In 1630, an estimated 95 percent of Pennsylvania was covered with forest. Harvesting the timber to support a growing nation reduced the forest coverage of Pennsylvania to an amazing 30 percent by 1907. Over the past century, the number has rebounded, and today 58 percent of the land area in Pennsylvania is forested. Among the forests throughout the state, private interests hold 69 percent, while 31 percent are owned by public agencies (DCNR, 2004b).

Throughout western Pennsylvania, forestry is a key component to both the history and future of many communities. Before the region was settled, nearly the entire Redbank Creek valley was forested. As displayed in Table 2-3, the amount of forestland has dramatically declined, but still represents over half of the project area. The majority of forest, 85 percent, is deciduous, while 11 percent is coniferous forest, and four percent is mixed forest. The densest forests can be found along North Fork Redbank Creek. Around the mainstem of Redbank Creek and Sandy Lick Creek, the forested areas are interspersed with large expanses of coal-mined land, hay and row crop agricultural operations, and regional population centers including Brookville, DuBois, and Reynoldsville. Most of the region has been logged at least once in the past, so the vast majority of forests are second- or third-growth forests. Forest stands are comprised of species such as oak, maple, hickory, white pine, and hemlock (Zarichansky et al., 1964).

Historically, timber was sent by raft to Pittsburgh, via the Allegheny River. Rafting timber began out of DuBois in the 1850s (Gilmore, personal communication, 2006). The slow and sinuous nature of the creek made the trip a slow journey; it took a week to raft from DuBois to Reynoldsville, just a few miles downstream.

Today, the lumber industry, while scaled back from its height of production over 100 years ago, is still a major component of the local economy. According to a Penn State University study using data from 1997, Jefferson County had the highest timber harvest (most timber harvested) of any county in Pennsylvania for that year. The county also has the tenth-highest amount of standing timber in the commonwealth (Jacobson & Seyler, 2004). One of the largest employers is Brookville Wood Products, Inc. (BWP) a lumber company. BWP’s lumber mill produces 30,000 board feet per day (Brookville Wood Products, 2006). BWP is a supporter of the Sustainable Forestry Initiative, which means that they strive to develop efforts that combine harvesting of trees with the protection of wildlife and water quality.



*Brookville Wood Products, Inc., located in Jefferson County*

**Table 2-3. Current Land Use**

Land-Use Type	Square Miles	% of Land Area
<b>Water</b>	<b>1.35</b>	<b>0.23</b>
Open Water	1.35	0.23
<b>Development</b>	<b>18.86</b>	<b>3.26</b>
Low-Density Urban	16.59	2.87
High-Density Urban	2.27	0.39
<b>Agriculture</b>	<b>159.53</b>	<b>27.64</b>
Hay Pasture	64.00	11.09
Row Crops	95.53	16.55
<b>Forest</b>	<b>293.06</b>	<b>50.78</b>
Coniferous Forest	30.99	5.37
Mixed Forest	13.68	2.37
Deciduous Forest	248.39	43.04
<b>Wetlands</b>	<b>2.42</b>	<b>0.41</b>
Woody Wetland	2.07	0.35
Emergent Wetland	0.35	0.06
<b>Barren</b>	<b>101.77</b>	<b>17.62</b>
Quarries	4.76	0.82
Coal Mined Areas	65.28	11.31
Transitional	31.73	5.49
<b>Total</b>	<b>577</b>	<b>100</b>

The region's forestry history has been recognized through its inclusion in the Pennsylvania Lumber Heritage Region (LHR). The LHR is one of 11 heritage regions covering much of the Pennsylvania landscape. The designation recognizes the forested landscapes that dominate much of the project area.



*One of the many farms in the Redbank Creek watershed*

### Agriculture

Like the forestry industry, many livelihoods are based on the agricultural industry. As mentioned previously in this chapter, agriculture is the other major land use within the watershed. Eleven percent of the region is currently in pasture and 16 percent is currently under row crop agriculture production. Chief crops include hay, corn, oats, and wheat. Livestock operations include dairy cattle and beef cattle. The agricultural areas are fairly evenly spread, with many agricultural operations located adjacent to major waterbodies.

Due to surface mining and residential development, much of the agricultural lands are under threat. The various pressures facing agricultural lands have led to a reduction in the number of farms and the acreage of land farmed. When the region was first settled, agriculture grew rapidly. In 1880, there were 2,576 farms working 154,636 acres in Jefferson County alone. By 1959, those numbers had dropped to 1,203 farms and 138,415 acres. They have continued to decrease, and the trend is moving towards fewer farms working larger acreages (Zarichansky et al., 1964). Opportunities for preserving agricultural lands are available, but the available programs could be greatly expanded. The vast majority of townships do not have farmland preservation ordinances, but should adopt them to preserve this occupation and land use.

There are two management types of farms within the watershed—family farms and factory farms. **Family farms** are typically smaller farms that have been in operation for several generations. For the most part, owners of family farms manage and work on their farms following sustainable agricultural practices. The majority of the farms in the Redbank Creek valley are locally owned family farms.

**Factory farms** are larger, corporate-based industries. Many of these farms control production from animal breeding, processing, and to the market shelf. Factory farms emphasize high volume and profit. Several different types of farming operations are considered factory farms, including concentrated animal feeding operations, confined animal feeding operations, conventional farming, industrial agricultural operations, and industrial livestock operations.



*Scene from a family farm in the Redbank Creek watershed*

Several programs are offered to farmers to promote the protection of natural resources on agricultural lands. The Pennsylvania Department of Agriculture (PDA) promotes the sound use of pesticides through integrated pest management (IPM) efforts. Through the PDA, all licensed pesticide applicators are educated about the safe and effective use of pesticides.

New to western Pennsylvania is the Conservation Reserve Enhancement Program (CREP), an incentive-based program, which pays farmers to implement best management practices (BMPs) on their land. BMPs are methods, structures, and practices, which prevent or reduce water pollution in an economical manner. CREP is administered through the USDA, and is available throughout the project area.

**Oil and Gas Exploration**

For over a century, oil and gas exploration has been a common fixture in the region. As the demand for oil and natural gas grows around the world, exploration for these resources expands as well. In 2005, the Pennsylvania Department of Environmental Protection (DEP) issued 6,046 oil and gas well-drilling permits throughout the state, a 32.4 percent increase over the record 4,567 permits that were issued in 2004 (DEP<sup>4</sup>, 2006).

Significant oil and gas fields can be found throughout the project area. The Jefferson County portion is home to several large fields that contain dozens of wells, mostly producing natural gas. There are also some wells scattered throughout the county in areas where large fields are not present. The northwest Clearfield County portion of the project area has several natural gas fields. Much of the gas comes from deep reservoirs (Hallowich et al., 1988).

Permits for 9,681 wells have been issued in the region since 1890. A total of 7,000 gas wells makes up a vast majority of these wells. Approximately 100 wells have been producing oil or a combination of oil and gas. The remaining wells fall into a range of categories including uncompleted wells, dry wells, and storage wells (Harper, personal communication, 2006). Drilling in the region was a fairly consistent practice between 1900 and 1989, as displayed in Table 2-4. Over the past couple of decades drilling has greatly accelerated, and based upon statewide data, drilling activity is predicted to continue to increase. Between 2000 and 2006, in just six years, more wells were permitted than in any previous decade.

There are some impacts associated with oil and gas drilling. The actual construction of wells and the access roads developed to reach the well sites can cause increased erosion and siltation to occur. This problem is most prevalent among the wells that have been drilled closest to waterbodies. Another problem associated with oil and gas well development is fragmentation of forestlands. As more wells are developed, important forests that serve as critical habitat to many species will be further fragmented, by the well sites and by roads used to access the sites. Wildlife is impacted by the loss of habitat through forest fragmentation, when interior habitats are reduced and the amount of edge habitat increases. Fragmented forests make some wildlife more susceptible to predators and can put wildlife at risk while traveling, as they become temporarily vulnerable when they leave the protection of the forest.

**Table 2-4. Oil and Gas Wells Permitted by Decade**

<b>Decade</b>	<b>Number of Wells Drilled</b>
1890–1899	29
1900–1909	608
1910–1919	286
1920–1929	640
1930–1939	234
1940–1949	461
1950–1959	506
1960–1969	408
1970–1979	709
1980–1989	789
1990–1999	1,127
2000–2006	1,286

Abandoned wells also pose a threat to natural resources. To address the issue of abandoned oil and gas wells, the commonwealth has several options available to aid in remediation. Through the state’s Growing Greener program, funding is available to seal abandoned wells to ensure that they do not pollute local waterways. During the 2005 round of Growing Greener grants, two awards were given to projects addressing abandoned well plugging. In previous years (1999–2004), 15 grants were awarded throughout the state to address abandoned wells.

### Active Mines

As was mentioned in the geology section of this chapter, significant reserves of coal are prevalent here. Due to this abundance, there is a long history of coal mining that continues today. Abandoned mines have left behind a legacy of water quality problems that many are striving to correct. A number of active mining operations also are present. These operations work under stricter regulations than those preceding them, but still raise concerns among area residents.

According to permits received through the DEP, currently there are 92 active coal mines. Of those, five are underground mines, while 87 are surface mines. As shown on Figure 2-4, coal mines are scattered over most of the project area. All areas, with the exception of the area around North Fork Redbank Creek, have a significant amount of mining activity. Associated with the active coal mines are 72 discharge points, which also can be seen on Figure 2-4.

While coal is the major mineral commodity throughout the Redbank Creek valley, other mining operations exist including clay, shale, sandstone, and limestone mines are also present (Hallowich et al., 1988).



*Mining remnants: Coal bony piles*

### Industrial/Commercial

Excluding active mining operations and timber operations, there are only limited areas of industrial and commercial development. The majority of which is closely associated with areas of residential development. One of the largest industries in the region is glass manufacturing, which is centered around Brookville. For many generations, glass manufacturing has been a significant part of the local economy. The presence of limestone and sandstone, both used in glass processing, makes this area a suitable location for glass manufacturing plants.

### Waste Disposal

Waste disposal, while often a small percentage of land use, can be a major issue because of the controversy that often surrounds the practice. Waste-disposal sites are often situated in areas away from population centers, which can push the sites into areas that are environmentally critical. Proper waste disposal positioning must be approached in a way that balances the desires of a community with the protection of its watershed's natural resources.

### Landfills

While recognizing the need for the proper disposal of waste, landfills are typically on the bottom of the list of land uses that residents would want to see on nearby property. According to the DEP, there are currently no active landfills within the project area. The closest landfill is located in southern Elk County, within the Clarion River watershed (DEP, 2006b).

One municipal waste transfer facility is located in the project area in Falls Creek, Jefferson County. A transfer facility is a place where waste is collected and stored until it is transferred to its final destination, such as a landfill (DEP, 2006b).

### Recycling

One practice that can limit the need for municipal landfills is recycling. There are multiple opportunities for recycling. Voluntary curbside recycling programs are required within Pennsylvania communities with populations that exceed 5,000 people, as mandated by the state legislature in 1988 (DEP, 2006e). DuBois, with a population of over 7,000 residents, is the only community in the watershed that qualifies for this mandate, and the borough currently has a curbside recycling program.

Smaller communities rely on drop-off locations for residents to utilize. Presently, there are 14 drop-off locations within the Jefferson County portion, two within the Clarion County portion, and two within the Clearfield County portion. County solid waste departments administer drop-off recycling programs. The various locations accept a variety of items to be recycled, ranging from everyday household items such as cans and bottles, to potentially hazardous items such as batteries and used motor oil (DEP, 2006e). It is essential to inform these smaller communities of this resource that is available to them and how and where to utilize it.



*Sign at the Brookville recycling site*

Agricultural interests have also started participating in recycle/reuse opportunities. Many local farmers are now collecting and shredding old newspapers, and using them for animal bedding. This practice keeps newspapers from ending up in the landfill and saves farmers money. Currently, there are 10 newspaper collection locations throughout Jefferson County.

## **Agricultural Land Preservation**

As described earlier, agriculture is a major land use and economic component. But, similar to many areas, agricultural uses are under increasing pressure to convert to residential development and other land uses. According to the USDA's Natural Resources Inventory, conducted between 1992 and 1997, more than 11 million rural acres in the country were converted to a developed use, and over half of that acreage was agricultural land (NRCS, 1997). That conversion translates to a loss of over one million acres of agricultural lands each year, or more than 3,250 acres every day.

Pennsylvania has been aggressively pursuing farmland preservation, since 1988 when the Farmland Protection Program was formed by the state legislature. Since its inception, the program has preserved over 300,000 acres through more than 2,500 conservation easements. With these impressive numbers, Pennsylvania leads the nation in both acres and number of farms preserved. Through the passage of the Growing Greener II referendum in 2005, an additional \$80 million was made available through the program. To qualify for the Farmland Protection Program, farms must first be designated in Agriculture Security Areas (PDA, 2006).

### Agricultural Security Areas

The Agriculture Security Area (ASA) program was created by the Pennsylvania legislature, and is administered at the township level. ASAs are rural, agricultural areas that are targeted for protection from urban development. They receive special consideration regarding local ordinances affecting normal farming practices, state agency rules and regulations, and in eminent domain condemnation proceedings. To be eligible for an ASA designation, at least 250 acres must be nominated. The 250 acres do not have to be contiguous, but individual parcels must be no less than 10 acres. Lands eligible for the program include pasture, hayland, woodland, or cropland (PDA, 2006).

Through the ASA program, farmers are eligible for the Purchase Agricultural Conservation Easement (PACE) program. This program authorizes the state to purchase conservation easements from willing farmers who are already within an ASA, allowing agricultural operations to continue. Farmers who participate in this program receive economic benefits in return for the conservation easement. The PACE program has not been active in the region.

To date, the ASA program has not been heavily utilized in the project area. While surrounding townships have been able to reap the benefits of this program, there are only four ASAs in the boundaries of the project area. One is located in Jefferson County, while the other three are located in Clearfield County.

Clean and Green Program

Pennsylvania administers the Clean and Green program, which provides incentives to landowners for the preservation of agricultural lands and forestland. The program provides real estate tax benefits by taxing land based on its “use value” rather than its market value. The program is available to landowners who either own 10 or more acres of qualifying land or earn an annual gross income of more than \$2,000 from farming.

**Land Ownership**

The majority of land is privately owned. Of the 557 square miles, only about 41 square miles, or 7.4 percent, is held in public ownership as conservation lands. This public land consists of state games lands, state forestland, and municipal parks. There are no federal conservation lands within project area. Acreages of the public lands are displayed in Table 2-5 and Figure 2-5. Public lands are concentrated on State Game Lands, as over 88 percent of the conservation lands are within the Pennsylvania State Game Lands system.

**Table 2-5. Public Lands**

<b>Public Land</b>	<b>Acreage</b>	<b>% of Public Lands</b>
<b>State Game Lands</b>	<b>23,461.4</b>	<b>88.6</b>
State Game Lands 244	4,826.8	18.2
State Game Lands 54	9,663.5	36.5
State Game Lands 77	2,528.3	9.5
State Game Lands 93	109.8	0.4
State Game Lands 31	5,168.7	19.5
State Game Lands 137	1,164.3	4.4
<b>State Forest</b>	<b>2,464.7</b>	<b>9.3</b>
Clear Creek State Forest	2,464.7	9.3
<b>Municipal Parks</b>	<b>558.0</b>	<b>2.1</b>
	558.0	2.1
<b>Total</b>	<b>26,484.1</b>	<b>100</b>

Public lands are managed by different agencies with various management goals and regulations. The mix of public lands allows for a variety of uses for both visitors and residents of the Redbank Creek valley.

**Critical Areas**

Various areas deserve increased attention and recognition. Some of these areas are naturally formed, while others are critical areas because of human impact. The areas outlined below can fall into several categories, some of which pose threats to humans and wildlife, while others are critical to human and natural populations in the watershed, and therefore deserve increased attention and protection.

### Landslides

Western Pennsylvania is the area of the state most susceptible to landslides. The entire region has a high to moderate risk of landslides. The hilly terrain found here is under the biggest landslide threat. Landslides occur most often in areas with loose soils or where old landslide debris is found on steep slopes. Landslides cause damage to transportation routes, utilities, and buildings. They can create travel delays and other side effects. The threat of landslides should always be assessed while planning any development project. Proactively avoiding a landslide is much cheaper in the long run than the clean up and repair that is required after a landslide. If development within a landslide-prone area is ultimately chosen, additional precautionary measures during development, such as additional drainage features and proper site planning are essential to minimize the risk of a landslide (DCNR, 2006a).

### Erosion and Sedimentation

Erosion and sedimentation is a very serious issue with the potential to cause significant degradation to an area's waterbodies. Streambank erosion occurs when the banks of a creek or river erode and deposit sediment into a waterway. Typically, the erosion is caused by improper land uses and a lack of vegetation along the streambank. Vegetation anchors soil in place, preventing it from washing away during high stream levels or heavy rains. However, if the vegetation is removed, the soil is easily washed into the waterbody. A lack of vegetation also leaves soils vulnerable to high winds, which can induce erosion.

An increase in sediment in the waterbody itself is a cause for concern, as it alters native aquatic habitats. Excessive sedimentation clouds the water, which reduces the amount of sunlight reaching aquatic plants. It covers fish spawning areas and food supplies, and may clog their gills. Other pollutants attach to soil particles and are deposited in waterbodies with the sediment. Downstream, the sediment settles out of the water and is deposited in a new location, which can significantly alter the channel and flow of the stream.



*Eroding streambank along  
Redbank Creek*

Erosion occurring through the terrestrial portion of a watershed can also have a negative impact on the region's waterbodies. Soil eroded off of construction sites, timber operations, or agricultural operations eventually reaches nearby streams, further exacerbating sedimentation problems. In an effort to combat this problem in the state of Pennsylvania, any disturbance over 5,000 square feet must have a soil and erosion control plan on site. It is critical that these plans are implemented and monitored to ensure their effectiveness.

### Floodplains

Floodplains are land areas that lie adjacent to waterbodies such as Redbank Creek and its tributaries. Floodplains are delineated by the frequency of flooding events that cover them with water. For example, an area that is covered during a 100-year flood, a flood of such magnitude that it usually occurs only once every 100 years, encompasses the 100-year floodplain. Floodplains often contain rich sediments, as occasional flooding leaves behind nutrients from the floodwaters. As can be seen on Figure 2-3, the majority of prime agricultural soils present are found adjacent to Redbank Creek and its tributaries. Floodplains are also inhabited by unique plants and wildlife accustomed to the periodic inundation. Many species found within floodplains are seldom seen in other areas.

The steep slopes along the banks of many waterbodies limit the size of floodplains (Figure 2-5). These limited floodplains are especially prone to flooding during storm events. Floodplains are critical areas that absorb stormwater during large storm events. Building within the floodplains not only places

the built structures in the path of future storm events, but also lessens the floodplain's ability to dissipate large amounts of stormwater, and actually increases the harm realized downstream. The loss of a floodplain's ability to dissipate floodwaters forces the water into a smaller area, thereby increasing the velocity of the waterbody during storm events. This increased velocity can further impact downstream areas by increasing erosion along the streambank and sedimentation within the waterbody.

### Wetlands

Wetlands play an important role in maintaining a healthy watershed, because they filter pollutants from water before it reaches rivers or streams, and minimize flooding impacts by absorbing excess flow during storm events. For wildlife, wetlands provide important habitat for a multitude of fish and wildlife species throughout various stages of growth and development.



*Wetlands at the headwaters of North Fork Redbank Creek*

Wetlands are mostly small, isolated areas scattered throughout the project area (Figure 2-5). Some larger wetlands are associated with Redbank Creek and its tributaries. These larger wetlands can be found around Falls Creek, straddling the Jefferson County and Clearfield County line, and just outside of DuBois. Both wetland areas are along Sandy Lick Creek. A few other larger wetland areas can be found in the upper reaches of North Fork Redbank Creek and along its tributaries. Unfortunately, particularly in the past, wetlands were seen as useless areas in part because of the lack of understanding of their important functions. Therefore, wetlands were often sacrificed during development projects ranging from mining operations to residential development. Wetlands still become degraded through various land-development practices that can continue today. The cumulative

loss of wetlands and their functions can cause long-term problems that are not easily corrected. See the Biological Resources and Water Resources chapters for more information about the characteristics of wetlands.

### Fish and Wildlife Habitat

Large areas of undeveloped land provide habitat for a diverse array of species. From large expanses of forested areas to isolated riparian wetlands, large areas of open space are available for fish and wildlife. There are several protected species that are currently present within the area. Habitat degradation is typically the biggest threat to protected species; therefore it is critical that key areas of habitat are protected. The presence of protected species will be discussed in greater detail in the Biological Resources chapter of this plan.

## **Hazardous Areas**

Hazardous areas can have profound impacts on land resources and land use. The areas can significantly degrade resources, while excluding many of the most desirable land uses from a region. Below is an overview of the various hazardous areas that can be found throughout the project area.

### Illegal Dumpsites

The problem of illegal dumping is evident in several areas. The practice of illegally dumping waste, rather than properly disposing of it, is a major concern among many stakeholders. The impact of illegal dumps on the scenic value is obvious, but these dumps can also severely degrade habitat in the area, and can cause water-quality degradation.



*Old tires are common items found at illegal dumpsites along roads and streams*

Some steps have been taken to reduce and eliminate the practice of illegal dumping. PA CleanWays, a non-profit organization dedicated to fighting illegal dumping and littering, is active within Jefferson, Clarion, and Clearfield counties. The group also has had some activity in Armstrong County. They strive to clean up and prevent illegal dumping. Through the end of 2003, PA CleanWays had removed over 508 tons of trash and collected over 12,000 tires to be recycled at various events (Jefferson County, 2005). Armstrong County is currently not covered by a chapter of PA CleanWays. The struggle for PA CleanWays is that they depend on local sources to fund their valuable work. Currently, the PA CleanWays effort around the region is not adequately funded.

### Industrial Waste Sites

There are two main types of hazardous waste sites that persist after former industrial practices and can cause significant long-term environmental degradation if not remediated. The first is Comprehensive Environmental Response Compensation and Liability Act, or Superfund, sites. The Superfund program is a federal program that was created in 1980 to locate, investigate, and clean up the worst hazardous waste sites in the nation. Potential Superfund sites are reviewed using the Environmental Protection Agency's (EPA) Hazard Ranking System (HRS). Through this process, limited investigations are conducted to determine if a potential site poses a hazard to humans or the natural environment. Sites that are determined to be hazardous are then listed on the National Priorities List (NPL). Once sites are listed on the NPL, plans are developed to address remediation of the site.

One site from this study area is listed on the NPL, the Jackson Ceramix, Inc. site in Falls Creek is listed due to lead-contaminated wastewater that was discharged onsite while the plant produced china from 1917 to 1985. China waste piles, waste drums, and contaminated soils have all been removed from the site, but approximately 20 acres of contaminated wetlands remain at the site.

The second, more common type of hazardous waste site is brownfields. Brownfields are more general sites that have their expansion, redevelopment, or reuse complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.

To address brownfield issues in the state, DEP has created a Brownfields Action Team. The DEP also developed a joint program with the EPA called the "One Cleanup Program" in 2004. The purpose of the program is to ensure that brownfields recovered under the Pennsylvania brownfields program also satisfy requirements under federal regulations (DEP, 2004a). According to the DEP (2005a), there are only two brownfields (listed in Table 2-6) in the project area where remediation is either complete or in progress. Since many areas comparable in size to the project area have more brownfields sites, it should be determined whether additional brownfields exist that have not yet been detected or reported.

**Table 2-6. DEP Recognized Brownfields**

Site Name	County	Municipality	Subwatershed	Cleanup Standard	Status
Equimeter Rockwell PLT 2	Clearfield	DuBois	Sandy Lick Creek	Site-specific	Completed
Equimeter Rockwell PLT 1	Clearfield	DuBois	Sandy Lick Creek		In Progress

In addition to hazardous waste sites left behind by former industrial practices, there are 148 locations regulated by the Resource Conservation and Recovery Act (RCRA). This act is a federal statute that regulates the transportation, handling, storage, and disposal of solid and hazardous waste materials. Regulatory responsibilities including obtaining permits, identifying and listing hazardous waste, adhering to proper procedures when transporting or disposing of waste, developing risk management plans, and maintaining records, may be controlled by federal facilities (EPA, 2002). Requirements for underground storage tanks including cover tank design, operation, cleanup, and closure, are also contained in RCRA. Sites within the project area are identified in Appendix E.

#### Abandoned Mines

Once the economically recoverable coal is removed from a mine, the mine is shut down, and the mine operator moves on to another site. However, the story and effects of the coal mine often live on long past its closing. Abandoned coal mines pose a significant hazard throughout western Pennsylvania. Prior to 1971, reclamation of closed coal mines was not required. As shown on Figure 2-4, significant coal mining has occurred throughout the region. Only the north-central portion of the project area, around North Fork Redbank Creek, has not experienced extensive mining activities. Of the 368,000 acres, 41,451 have been surface mined for coal.

In total, there are 338 inactive surface mines, and 163 abandoned mines. As shown in Figure 2-4, the mines are scattered throughout the project area. Also illustrated are the 258 inactive discharge points associated with these mines. According to DEP, only two mines are categorized as having their reclamation completed. Some of the most potent legacies of abandoned mines are the discharges of polluted water that significantly degrade nearby waterways. The discharges can contain heavy metals, sulfates, and/or acids. Acid mine discharges are located in the Clearfield, Jefferson, Clarion, and Armstrong county portions.

Early coal mining operators gave little thought to the long-term environmental impacts that would occur from the practice, but as awareness of the environmental harm that was caused by the mining increased, regulations to address the issue improved. In 1971, the Pennsylvania legislature enacted the Surface Mining Conservation and Reclamation Act; and in 1977 the federal government passed the Surface Mining Control and Reclamation Act, which closely modeled the Pennsylvania regulation. With the creation of these regulations, mining activities had guidelines and standards to follow and state and federal oversight (DEP, 2005b).

To address the abandoned mine problem, the state created its Reclaim PA initiative. The four objectives of the initiative are:

- To encourage private and public participation in abandoned mine reclamation efforts
- To improve reclamation efficiency through better communication between reclamation partners
- To increase reclamation by reducing re-mining risks
- To maximize reclamation funding by expanding existing sources and exploring new sources

To accomplish these goals, Reclaim PA includes a set of policy, management, and legislative initiatives geared toward erasing the abandoned mine problem in the state. With more than a quarter-million acres of abandoned mine lands throughout the state, the initiative is ambitious and necessary (DEP, 2005b).

In 2003, DEP completed the reclamation of 42 acres of abandoned mine lands in Beaver Township, Jefferson County. The mine was abandoned in 1980, and spent nearly 20 years as a hazard to both the people and the natural environment surrounding it. The project consisted of regrading the area to eliminate a dangerous highwall, and replanting the site with natural vegetation.

Overall, Pennsylvania has created numerous programs to address all types of abandoned mine problems including: Operation Scarlift, the 10% Set-Aside Program, the United States Department of Interior Office of Surface Mining (OSM) Emergency Reclamation Program, the Bond Forfeiture Program, the Mine Subsidence Insurance Fund, reclamation in lieu of civil penalties, surety reclamation, the Landowner Reclamation Program, EPA Section 319 grants, and the Government-Financed Construction Contract Program (GFCC).

Earthquakes

Although rare, earthquakes do occasionally occur in Pennsylvania. The majority of earthquakes within the state occur in the Reading/Lancaster area in eastern Pennsylvania, and the strongest earthquake in Pennsylvania occurred in 1998 near Jamestown, Crawford County close to the Ohio border. The Redbank Creek valley is within the area of the state with the lowest risk of earthquake activity (DCNR 2006).

**Management Recommendations**

**Goal 2-1. Preserve agricultural lands and lifestyles while encouraging sustainable practices.**

Encourage additional townships to participate in the Agricultural Security Area program, to protect the dwindling acreage of agriculture remaining within the watershed.	High
Encourage agricultural landowners to enroll in land preservation programs to protect lands and maintain agricultural uses on the land.	Medium
Encourage landowners to enroll in cost-incentive programs such as the Environmental Quality Incentives and Conservation Reserve Enhancement Programs.	Medium
Increase technical and financial assistance to agricultural community for implementation of best management practices.	Medium
Lobby for additional funding for the Environmental Quality Incentives and Conservation Reserve Enhancement Programs.	Medium

**Goal 2-2. Protect forest resources.**

Enforce existing erosion and sedimentation regulations placed on the logging industry.	High
Encourage the development and use of forest stewardship or forest management plans and participation in the Pennsylvania Forest Stewardship Program and/or the Tree Farm Program.	High
Maintain natural beauty of the region by encouraging forestland owners to protect their land from development through the purchase of a conservation easement.	High
Educate forestland owners by providing them with accurate information regarding sound silviculture practices, forest management plan development, and insect and disease problems that can affect forest health.	Medium
Decrease forest fragmentation by maintaining contiguous forest tracts and/or by maintaining travel corridors between existing non-contiguous forest tracts.	Medium

**Goal 2-3. Minimize impacts from commercial and industrial sources.**

Encourage tree plantings as one method to reclaim abandoned and unreclaimed mine lands.	High
Conduct a demonstration project to determine the effect land liming of agricultural, forest, and strip-mined lands has on water quality through neutralization of acidic waters.	Medium
Inventory abandoned wells and mines and plan for remediation.	Medium
Establish better government oversight on gas-well exploration including the impacts and interests.	Medium
Complete remediation of the Jackson Ceramix Superfund site by addressing lead pollution in the 20-acre contaminated wetland located on the site.	Medium

**Goal 2-4. Decrease the amount of illegal dumping.**

Increase enforcement and penalties for individuals caught dumping illegally.	High
Encourage increased participation in recycling programs through education and incentives for citizens, regular receptacle maintenance and collection by service provider.	High
Host annual cleanups to eliminate illegal dump sites and establish surveillance monitoring to decrease the re-occurrence of dumping.	High
Local private and public interests should work together to ensure that PA CleanWays efforts to identify and remove illegal dumpsites are adequately funded.	High
Educate residents about the impacts illegal dumping has on water quality, aesthetics, and the economy.	Medium

**Goal 2-5. Decrease erosion and sedimentation issues through the utilization of land-use ordinances and best management practices.**

Strictly enforce current regulations designed to prevent erosion and sedimentation problems.	High
Establish and/or strengthen land-use planning tools limiting development in floodplains and other critical areas subject to erosion and sedimentation problems.	Medium
Implement agricultural best management practices to control erosion and improve herd health.	Medium

**Goal 2-6. Improve herd health and decrease sedimentation through the implementation of best management practices.**

Encourage agricultural landowners to develop and implement nutrient management plans.	High
Implement a streambank fencing program to fence cattle out of streams, provide crossings, alternative watering sources, and riparian corridors.	Medium
Stabilize and properly manage barnyards and other livestock areas.	Medium

**Goal 2-7. Reduce the number of unlicensed vehicles in residential areas.**

Encourage residents to dispose of unlicensed vehicles by educating them about the impacts on safety and the environment.	Low
Remove unlicensed vehicles from abandoned properties.	Low
Encourage municipalities to establish and enforce land-use ordinances regarding the maintenance of unlicensed vehicles at residential properties.	Low

## CHAPTER 3. WATER RESOURCES

Redbank Creek and its tributaries have been central to the history and livelihood of the surrounding area. Local towns, such as Summerville, New Bethlehem, South Bethlehem, Hawthorn, Worthville, Brookville, Reynoldsville, and DuBois, developed along its length to utilize the many resources available for purposes such as drinking water, industry and commerce, and transportation. The underlying geology of the region provided opportunities for both mining and lumber industries, which had key roles in fueling the local economy. These activities continue to be important today.



*A view of Redbank Creek from the town of Climax*

Unfortunately, many of the existing state and federal regulations to protect waterways were not developed until the 1970s. The watershed is still recovering from the historical lack of protections to govern mining, timbering, floodway development, agricultural practices, and other activities. Despite these obstacles, unique natural features and areas of high water quality still exist. However, the current lack of land-use planning makes many areas vulnerable to development and poor management practices. A challenge for the future will be to restore degraded areas and to protect those areas of existing high quality. This will involve balancing the importance of property rights with a desire to protect the watershed's water quality and natural heritage for future generations.

### Location

#### Drainage

Part of the 11,600-square-mile Allegheny River watershed, Redbank Creek meets the Allegheny River, near Wattersonville, which flows southwest until it joins the Monongahela River to form the Ohio River near Point State Park in Pittsburgh, Pa. The Ohio River flows into the Mississippi River in Cairo, Illinois and continues south until it empties into the Gulf of Mexico.

#### Watershed Address

The United States Geological Survey (USGS), in cooperation with many other federal agencies through the United States Water Resources Council, has developed a system to better catalog and describe the locations of water resources in the United States. This system divides and subdivides the U.S. into successively smaller units of water drainage, with the result being a specific Hydrologic Unit Code (HUC) that is essentially a watershed's "address." The USGS describes all major watersheds in the United States as one of eighteen water resource regions. Each is given a name and two-digit number (Seaber & Knapp, 1987). Pennsylvania is drained by three of these regions: the Great Lakes, Ohio, and Mid-Atlantic. The regions are further divided into subregions, then accounting units, and finally into cataloging units. When there is no breakdown of the subregion before the cataloging unit, the accounting unit 00 is given, and the area encompassed is the same as the subregion. The HUC code for the area including Redbank Creek and the Middle Allegheny watershed is 05010006, which can be described as follows:

**Region 05:** All waterways draining into the Ohio River Basin, excluding the Tennessee River Basin

**Subregion 01:** All waterways in the Allegheny River Basin (in Pennsylvania and New York), total area 11,600 square miles

**Accounting Unit 00:** All waterways in the Allegheny River Basin.

**Cataloging Unit 06:** Middle Allegheny River and Redbank watersheds, Pa. (1,680 square miles)

The Pennsylvania Department of Environmental Protection (DEP) uses a different cataloging system, generally based on the HUC coding system, which delineates six drainage basins that are further divided into watersheds, each named for their major streams. The Redbank Creek watershed is located in the Central Allegheny Sub-basin (17), which comprises the portion of the Allegheny River between Emlenton and Clinton. Within this sub-basin, the 728-square-mile Redbank watershed is considered to be watershed C. Therefore, it is referred to as watershed 17 C using this system (DEP<sup>2</sup>).

## Major Tributaries

Brookville represents the nexus of the two major headwater tributaries of the Redbank Creek watershed, North Fork Redbank and Sandy Lick creeks. The headwaters of North Fork Redbank Creek originate near Clear Creek State Forest and flow in a southerly direction. The headwaters of Sandy Lick Creek begin east of DuBois and flow in a westerly direction. The last major tributary entering the watershed is Little Sandy Creek, which merges with the mainstem near the convergence of the Jefferson, Armstrong, and Clarion county lines.

### Sandy Lick Creek

Sandy Lick Creek originates near the City of DuBois and flows westward until it meets North Fork Redbank Creek at Brookville. Sandy Lick Creek is notable for its wetland habitats, the most prevalent being the floodplain forests. Unfortunately, many have been altered by development, or are dissected by roads and railroads. A number of smaller tributaries have been impounded to provide recreational opportunities and water supply. Mining has taken place near tributaries, such as Soldier Run and Pentz Run. The total area of the Sandy Lick Creek subwatershed is over 200 square miles.

**Table 3-1. Major Tributaries of Sandy Lick Creek**

<b>Name of Tributary</b>	<b>Area (Acres)</b>	<b>Drainage (Sq. Miles)</b>	<b>Name of Tributary</b>	<b>Area (Acres)</b>	<b>Drainage (Sq. Miles)</b>
Sandy Lick Creek Mainstem	26,719.80	41.68	Wolf Run	17,766.60	27.72
Coal Run	2,149.55	3.35	Panther Run	1,275.26	1.99
Muddy Run	723.05	1.13	Pitchpine Run	1,202.04	1.88
Narrows Creek	4,673.80	7.29	Soldier Run	8,268.63	12.9
Gravel Lick Creek	1,247.49	1.95	Trout Run	6,865.16	10.71
Laborde Branch	10,625.04	16.58	Schoolhouse Run	2,402.72	3.75
Reisinger Run	1,715.55	2.68	O'Donnell Run	2,404.04	3.75
Pentz Run	3,105.84	4.85	Camp Run	4,636.01	7.23
Beaver Run	999.96	1.56	Fuller Run	990.28	1.54
Juniata Run	777.46	1.21	Cable Run	626.2	.978
Clear Run	5,216.67	8.14	Mill Creek	32,695.44	51
Slab Run	1,799.48	2.81	Fivemile Run	11,295.31	17.62
			<b>Total</b>	<b>149,555.35</b>	<b>233.39</b>

North Fork Redbank Creek

The 94-square-mile North Fork Redbank Creek subwatershed is the most pristine and undeveloped portion of the Redbank Creek watershed, and nearly the entire watershed is designated High Quality or Exceptional Value (discussed later in this chapter). Part of the headwaters of Redbank Creek originate in this area, primarily from wetland areas formed as a result of topographic depressions and the build-up of organic matter over time. Unique to this area is a number of naturally acidic blackwater swamps, consisting largely of eastern hemlock trees, and interspersed with areas of shrub and grassland wetlands. Streams originating from these wetlands have a naturally dark, rust-colored appearance as a result of the tannic acids from hemlock needles. These unique wetlands are located along streams such as South Branch North Fork Creek, Windfall Run, and Clear Run. These habitats are discussed more thoroughly in the Biological Resources chapter.



*North Fork Redbank Creek*

**Table 3-2. Major Tributaries of North Fork Redbank Creek**

Name of Tributary	Area (Acres)	Drainage (Sq. Miles)	Name of Tributary	Area (Acres)	Drainage (Sq. Miles)
North Fork Redbank Creek Mainstem	15,737.54	24.6	Windfall Run	3,716.54	5.8
Williams Run	1,151.2	1.79	Clear Run	2,360.64	3.68
Muddy Run	743.92	1.16	Tarkiln Run	1,111.45	1.74
Bearpen Run	1,170.89	1.83	Shippen Run	2,270.58	3.54
Manners Dam Run	1,321.85	2.06	Craft Run	1,939.76	3.03
Mammy Hi Run	3,198.63	4.99	Pekin Run	6,420.06	10.02
Lucas Run	2,023.56	3.16	Red Lick Run	2,176.64	3.4
South Branch North Fork Creek	6,901.47	10.77	Sugarcamp Run	2,221.94	3.47
			<b>Total</b>	<b>54,456.67</b>	<b>85.04</b>

**Table 3-3. Major Tributaries of Redbank Creek**

Name of Tributary	Area (Acres)	Drainage (Sq. Miles)	Name of Tributary	Area (Acres)	Drainage (Sq. Miles)
Sandy Lick Creek	149,555.35	233.39	Patton Run	1,558.95	2.44
North Fork Redbank Creek	54,456.67	85.04	Little Sandy Creek	46,538.16	72.6
Redbank Creek Mainstem	42,453.70	66.34	Pine Creek	7,511.84	11.74
Coder Run	5,082.80	7.94	Town Run	6,125.16	9.57
Rattlesnake Run	1,183.21	1.85	Middle Run	1,483.40	2.32
Simpson Run	1,307.75	2.04	Leisure Run	4,158.02	6.5
Welch Run	2,624.53	4.1	Long Run	1,666.74	2.6
Runaway Run	2,237.25	3.5	Leatherwood Creek	13,638.06	21.31
Carrier Run	632.5	0.988	Middle Run	1,244.49	1.94
Beaver Run	6,280.11	9.81	Rock Run	1,223.03	1.91
Tarkiln Run	1,394.55	2.18	Wildcat Run	9,055.17	14.15
			<b>Total</b>	<b>361,411.44</b>	<b>564.26</b>

Redbank Creek

Sandy Lick Creek merges with North Fork Redbank Creek in Brookville to form Redbank Creek. For the remainder of its length, the watershed is comprised mainly of smaller tributaries directly entering Redbank Creek.

Mining has occurred throughout the region, but is generally more extensive below Interstate 80. Several of the naturally occurring wetlands are impaired due to abandoned mine drainage (AMD) pollution, which also degrades many stream segments. A dam on Redbank Creek near New Bethlehem is a significant feature affecting water flow of Redbank Creek. Tributaries, such as Leatherwood Creek, are likely impaired due to agricultural impacts based on land use.

Little Sandy Creek

The headwaters of Little Sandy Creek originate in Oliver Township and flow northwest until it meets Redbank Creek near the convergence of Clarion, Armstrong, and Jefferson counties. The subwatershed has been heavily mined and farmed. Tributaries, such as Big Run, Ferguson Run, and Middle Branch, are impaired due to AMD. However, more than 50 percent remains forested and small tracts of intact northern hardwood forest can be found. The total area of the Little Sandy Creek watershed is 72.60 square miles.

**Table 3-4. Major Tributaries of Little Sandy Creek**

<b>Name of Tributary</b>	<b>Area (Acres)</b>	<b>Drainage (Sq. Miles)</b>
Little Sandy Creek Mainstem	14,099.65	22.00
Middle Branch	1,432.40	2.23
Clutch Run	4,826.62	7.53
Indiancam Run	3,742.00	5.84
Hickok Run	1,091.65	1.70
Lick Run	1,731.17	2.70
Big Run	11,272.58	17.59
Ferguson Run	2,513.24	3.92
Cherry Run	3,466.36	5.41
Brocius Run	426.10	0.66
Nolf Run	1,936.41	3.02
<b>Total</b>	<b>46,538.16</b>	<b>72.60</b>

**Important Components of Water Quality**

Surface Water

Surface water refers to water found about the land surface, in rivers, streams, lakes, reservoirs, ponds, wetlands, and seeps. Surface water is in constant interaction with water stored below the surface in openings in rock material, called groundwater. It is, therefore, influenced by the quality of the groundwater, as well as inputs from land-use practices associated with farming, forestry, mining, and other activities.

Streams and Rivers

Many of the smaller streams in the project area originate from higher elevation wetlands created from depressions in the topography of the landscape, that form tributaries as the water makes its way to lower elevations. Larger streams are influenced by the water quality of these originating wetlands, as well as pollution from acid rain and land-use activities.

Lakes, Ponds, and Reservoirs

Lakes are inland bodies of water that form through natural processes. These processes include geologic events, such as the movement of tectonic plates, which disrupt the flow of a river to form a lake. In the United States, most natural lakes formed by glaciations thousands of years ago, when the advance of the glaciers caused great depressions to form and fill with water. There is no clear-cut difference between a lake and a pond, however lakes have more visible waves than ponds, are deeper, have rooted plants that are only able to grow close to the shore, and have water temperatures that vary with depth.

True lakes are actually rather uncommon and, in Pennsylvania, they occur only in the northwestern and northeastern portion of the state. Private ponds are present as well, but the locations of these are not well documented.

Reservoirs are quite common in Pennsylvania. Also known as impoundments, because they involve the “impounding” of a stream or river using a dam, reservoirs have been built across the state for recreation, flood control, and water supply. These bodies of water are not true lakes, but they share many features with lakes and are often referred to as lakes. Although no natural lakes exist in the project area, there are many reservoirs.



*In addition to water supply and flood control, dams also provide recreational resources, such as this swimming area at the Dr. Walter Dick Memorial Park below the North Fork Dam*

Reservoirs can negatively and positively impact the areas in which they are located. They serve the important functions of flood control and drinking water supply. Reservoirs also attract many species of wading and shorebirds, mammals, and other organisms that utilize a standing water environment during breeding or migration. They can also support some species of fish and, therefore, increase fishing opportunities. Unfortunately, dams can impact the movement of nutrients, aquatic life, and sediment in a river, particularly when they are not managed to mimic seasonal flows. Unnaturally high water releases may physically scour mussels and other aquatic organisms with sediment, and low flows may leave stranded insects, fish, and other aquatic organisms. Fish and insects may not be able to swim upstream past the dam, and breeding may be impeded. Aquatic life downstream of the dam may be affected by the warming of the water and decreased levels of dissolved oxygen from the reservoir. The shape of the stream or river above

and below the reservoir may also change, contributing to stream erosion and/or flooding (American Rivers, 2002). Economic, and other, costs and benefits should be carefully analyzed before deciding to build or repair a dam.

AMD and other pollution sources can negatively impact the water quality of reservoirs, sometimes affecting the drinking water supply. Special measures, which can be costly, must be taken to treat water that is high in metals or acidity. This potentially is a concern because mining activities are ongoing within the project area.

One of the most significant reservoirs serving communities within the Redbank Creek watershed actually lies outside of the watershed boundary and is even within a different drainage basin. Anderson Creek, which supplies the DuBois Reservoir, is located on the eastern side of the Continental Divide, draining into the Chesapeake Bay, while Redbank Creek is on the western side, draining into the Ohio River, and ultimately the Mississippi River. Water from the DuBois Reservoir is utilized in the Redbank Creek watershed communities of DuBois, Sandy Township, and Sykesville, as well as the Anderson Creek community of Rockton. Some concern exists in the environmental community about the ramifications of transferring water from one side of the Continental Divide to the other, and how this might disrupt the water budget of the two drainages. Although it may not have a significant impact on a basin-wide scale, it may have more localized impacts on groundwater and stream flow within the Anderson Creek and Redbank Creek watersheds. Further research is needed to understand the potential consequences of this water transfer. Because so many people rely on reservoirs, the health of these systems is essential. Table 3-5 lists reservoirs located within the project area.

Although the Anderson Creek watershed is seriously polluted with mine drainage, AMD is not prevalent in the headwaters, which supplies the DuBois Reservoir. However, acid rain has lowered the pH significantly, to the point where water quality standards are exceeded more than 50 percent of the time in the reservoir (The Eads Group, Inc., 2001). The metal content of the water, which includes iron and manganese, also exceeds drinking water standards much of the time. These naturally occurring components are leached from rock by the abnormally high acid content of the rainwater. Water in the reservoir must be treated to remove these components to meet drinking water standards.

**Table 3-5. Reservoirs of the Redbank Creek Watershed**

Name of Waterbody	Water Source	Location
<i>Jefferson County Reservoirs</i>		
Kyle Lake	Kyle Run	Falls Creek
Reynoldsville Reservoir	Pitchpine Run	Reynoldsville
Brookville Reservoir	North Fork Redbank Creek	Brookville
<i>Clearfield County Reservoirs</i>		
Treasure Lake	Narrows Creek/Wolf Run	Sandy Township
Bimini Lake	Narrows Creek/Wolf Run	Sandy Township
Lake Sabula	Unnamed tributary, Sandy Lick	Sandy Township
Juniata Lake	Juniata Run	DuBois
<i>Clarion County Reservoirs</i>		
Redbank Creek Dam	Redbank Creek	New Bethlehem

Floodplains

Floodplains refer to areas of land adjacent to streams onto which water spills when the water level in the stream rises. Figure 2-6 (Chapter 2) shows significant floodplain areas. Floodplains increase the stream’s capacity to handle flood events by dissipating energy from high flows and absorbing water. Building or other alterations on floodplains can increase flooding downstream and cause streambank failures.

The National Flood Insurance Program (NFIP), administered through the Federal Emergency Management Agency (FEMA, 2002), was established in 1968 with the National Flood Insurance Act. Property owners can purchase insurance as a protection against flood loss if communities agree to adopt ordinances that reduce flood damage including limiting building in floodplain areas. Ordinances must meet minimum regulatory standards of both NFIP and PA Act 166, the PA Floodplain Management Act. Residents from non-participating communities can still purchase insurance, but at a much higher rate (FEMA, 2002).

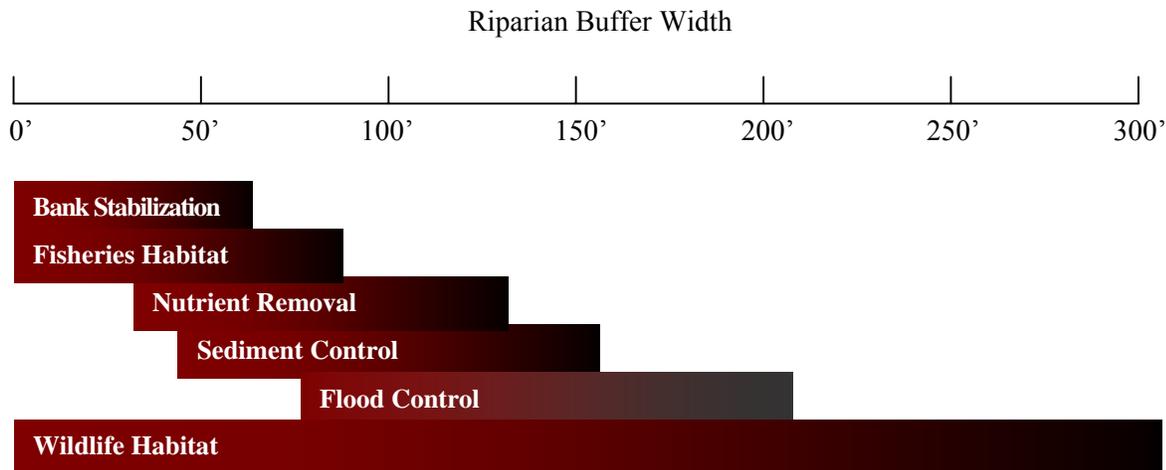
In communities that adopt such ordinances, building in Special Flood Hazard Areas (SFHA) may occur only if the owner agrees to purchase flood insurance. SFHAs are areas within the 100-year flood zone, which means that there is a one percent chance of a flood reaching this zone each year. Special subsidies are available for existing structures built before the adoption of ordinances. Future structures built in 100-year floodplains must meet certain requirements. During declared national disasters, FEMA may also make grants and loans available to those not participating in the program (FEMA, 2002). Many communities in Pennsylvania have adopted a riparian buffer approach to floodplain management. These “total prohibition” ordinances encourage the reduction of construction and development in the floodplain.

Floodplains can be considered “sensitive” areas because they are both inappropriate for building purposes and important for protection of streams and wildlife. Currently, most municipalities have floodplain ordinances, though these provisions may not be adequately enforced.

**Riparian Zones**

Riparian zones, or buffers, are vegetated areas along streams, rivers, and lakes that filter runoff and provide a transition between water and land. A functioning riparian zone can reduce flooding and erosion by retaining water in its vegetation and holding soil in plant roots, and promote the retention of groundwater during dry periods. Riparian zones also provide important corridors for wildlife, enhance recreational activities, and create fish habitat. Studies have shown that the wider and more substantial a riparian zone is, the better it can perform these functions (Klapproth & Johnson, 2000). Some of the streams in agricultural and developed areas do not have adequate riparian zones. This has created severe bank erosion in some areas, as well as the introduction of invasive species, which thrive in disturbed land. Figure 3-4 shows recommended riparian zone widths for bank support, fisheries habitat, nutrient removal, sediment control, flood control, and wildlife habitat.

**Figure 3-4. Recommended Riparian Buffer Widths**



Retaining existing buffers is a cost-effective method of protecting waterways from sediment, streambank erosion, and flooding. A number of tools are available in Pennsylvania for landowners and communities to protect and enhance these important riparian zones and other important green areas, such as:

- Pennsylvania stream releaf plan (DEP, 1997) and forest buffer tool kit (Alliance for the Chesapeake Bay & DEP, 1998);
- Stream corridor restoration: principles, processes, and practices (Federal Interagency Stream Restoration Working Group, 1998);
- Chesapeake Bay riparian handbook: A guide for establishing and maintaining riparian forest buffers (Palone & Todd, 1997);
- Riparian forest buffers: Function and design for protection and enhancement of water resources (Welsch); and
- Pennsylvania’s Conservation Reserve Enhancement Program (USDA Farm Service Agency).

**Groundwater**

Groundwater is stored beneath the land surface in pores and openings of soil and rock formations. Although groundwater is commonly considered separate from the surface water found in streams and lakes, the two are constantly interchanging as groundwater emerges to the surface in valleys and seeps and surface water percolates downward into underground storage areas of rock and soil, called aquifers. As a result of this dynamic, the quality of streams and lakes can directly impact the quality of groundwater.

The pattern of water movement is controlled primarily by topography, which is highly dissected by major and minor valleys into bedrock “islands”. Water moves from areas of high elevation to lower elevation, and from shallow to deeper aquifers. Water levels are most affected by precipitation patterns, with levels generally highest in early spring and fall and lowest during late spring, summer, and early winter (Buckwalter, Dodge, Schiner, & Koester, 2004).

**Table 3-6. Municipalities Utilizing Public Water Supplies (2006)**

Supply Agency	Municipalities	Source
Brookville Municipal Authority	Brookville Borough, Pine Creek Township	Surface Water (North Fork)
Corsica, Rose, and Union townships	Corsica Borough, Union Township, Rose Township	Purchase (Brookville)
Falls Creek Municipal Authority	Falls Creek Borough, Washington Township	Surface Water (Anderson Creek)
Henderson Township Municipal Authority, Pennsylvania American Water Company	Henderson Township	Groundwater/Surface Water
Knox Township Municipal Authority	Knox Township	Groundwater
Pennsylvania American Water Company	McCalmont Township	Groundwater
Reynoldsville Water Authority	Reynoldsville Borough	Surface Water (Tributary to Sandy Lick)
Rose Township Municipal Authority	Rose Township	Purchase (Brookville)
Summerville Borough Municipal Authority	Summerville Borough	Groundwater
Redbank Valley Municipal Authority	New Bethlehem, South Bethlehem, and Porter Township, Redbank Township (Clarion Co.), Mahoning Township (Armstrong Co.)	Surface Water (Redbank)

The yields of wells depend upon the ease of water movement through rock and the amount of water the rocks can release. Groundwater is found in two types of openings in rock—primary and secondary. Primary openings are spaces between fine mineral grains. Though the space between individual grains may be small, collectively the primary openings are capable of generating large amounts of water. In contrast, secondary openings occur from fractures in the rocks. Any one fracture will likely generate more

water than a primary opening, but because secondary openings are usually less abundant, they are not capable of yielding much water.

Wells in the project area generally have medium to high yields, with layers of siltstone and limestone containing primary openings between those of more impermeable sandstone. However, wells with the highest yields are commonly found in areas that are most prone to contamination, such as rocks of the lower Mississippian Age or Pottsville Group, found in stream valleys. The quality of groundwater in this group is poor, averaging concentrations of 2-mg/L iron and .50-mg/L manganese. Some of this contamination comes from naturally occurring coal and iron deposits. Groundwater quality decreases in valley areas where AMD and abandoned oil and gas wells are most common. It is highest in forested areas where little AMD is present. Underground mining may have disrupted groundwater capacity and movement in some areas, in which case little or no groundwater may be available. The acid rain impacts can significantly impact groundwater quality by lowering pH and increasing leached metals (Buckwalter et al., 2004). Because groundwater in the project area is so prone to contamination, it will be important to consider the impact of future mineral infraction and development activities on water quality. Table 3-6 lists some public sources of drinking water.

The quality of groundwater in an area can generally be determined by sampling streams at base flow, which are flows low enough that all of the flow can be considered to come from groundwater. The average percentage of stream flow from groundwater is around 50 percent. In streams that are greatly affected by mine drainage, sulfates and metals such as iron and manganese can be found at unnaturally high levels, particularly at base flows. Similar to AMD, acid from rain is also able to dissolve the metals found in bedrock and causes those metals to be leached out into groundwater, and eventually streams (Buckwalter et al., 2004).

The majority of residents get their water from public water suppliers. However, most of the public water comes from reservoirs that have been formed from streams, or from high-yielding wells. Therefore, all of the public water sources are affected by groundwater quality and quantity. Water suppliers within the project area may struggle to find clean drinking water free of contamination from AMD and other sources.



*Impervious surfaces, such as roads, can lead to stormwater management issues*

### Stormwater

The water running off streets, buildings, and land during storm events is referred to as stormwater. In addition to causing flooding, stormwater contributes a significant amount of pollution to waterways. Much of the unhealthy bacteria that enter streams from manure lots and faulty sewage systems do so during storm events.

In urban areas, impervious surface area is often linked to stream impacts, with significant impacts occurring at only 10 percent impervious surface (Schueler, 2003). Impervious surfaces are areas on the landscape where water cannot infiltrate directly into the ground including hard surfaces, such as asphalt, concrete, rooftops, and highly compacted soils. Water runs off the land until it reaches a place to enter the soil, or it is incorporated into man-made systems that funnel it to a body of water. This leads to increased amounts of water flowing into the stream, less groundwater flowing through the soil, and erosion of the streambed (because of faster water flow). These changes result in flooding, loss of habitat, erosion (which widens the stream channel), and physical changes in the stream. Small floods may increase by up to 10 times with increases in

imperviousness from urbanization (Hollis, 1975), and research in Pennsylvania has shown that brook trout are absent from streams in watersheds with only four percent impervious surface.

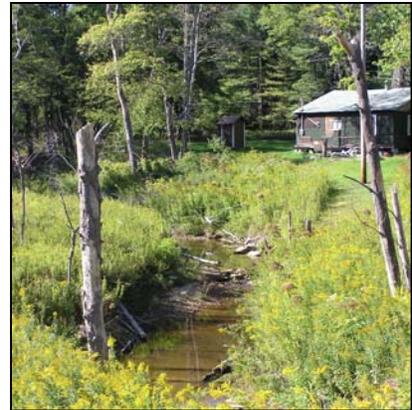
Minimizing the amount of impervious surface is a good way to approach water resource protection, by using tools such as performance zoning, residential design, and open space subdivision. Reducing impervious surface not only has environmental benefits, but also reduces social, economic, and development costs.

Pennsylvania's Stormwater Management Act of 1978 requires each county in Pennsylvania to develop stormwater management plans for each of its watersheds, though some counties have yet to do this. So far, a plan has been developed for Sandy Lick Creek. DEP provides model stormwater management ordinances and funding options for stormwater management plans on its website at <http://www.dep.state.pa.us> (Keyword: Stormwater).

## Wetlands

Wetlands are areas of land that have specific hydrological and natural features as a result of being covered in water during all or part of the year. These include anaerobic (non-oxygenated) soils, watermarks on trees and vegetation, or other signs of water presence, and wetland vegetation (tolerant of waterlogged conditions). Water does not have to be present in an area year-round for it to be considered a wetland.

Wetlands include vernal pools (isolated ponds that are created from rainwater in the spring), which provide breeding habitats for species such as spotted salamanders and wood frogs. They also include many areas along floodplains, open meadows, and shrub lands.



*The headwaters of North Fork Redbank Creek contain many wetlands*

### Wetland Loss

More than half of all wetland habitats that once occurred in Pennsylvania have been lost. The major causes of wetland loss have been impoundment, drainage for agriculture and development, and conversion to other uses. The loss of wetland areas not only results in the depletion of habitat, but also increases the distance between remaining wetlands, reducing the ability of animals to move from one wetland to another and to re-colonize. The stricter environmental regulations existing today prevent major wetland drainage and impoundment. However, recent federal court decisions have reduced the protections given to smaller, isolated wetlands under the Clean Water Act. Although smaller wetlands still receive some protection under Chapter 105 of the Pennsylvania Code, permits can often be acquired for their alteration or destruction (Pennsylvania Game Commission, 2005).

### Local Wetlands

Wetlands are dominant features in the region, which is located in the transition zone between the Low and High Allegheny Plateaus Physiographic provinces, (Figure 2-6). One type of wetland most characteristic of the area is the Hemlock-Mixed-Hardwood-Palustrine swamp. A swamp is essentially a forested wetland that is not directly part of a floodplain, though it is often near a stream or river and may be directly affected by changes in groundwater level that also affect a stream. The decomposition of hemlock needles over the years, which contain humic compounds (high in acidity) created low pH and a tea-colored, or "blackwater," appearance of the standing water in the swamps. The water from the

swamps travels slowly above and below ground until it enters streams, which as a result of these humic acids, also have a dark appearance and are called blackwater streams.



*Evidence of beaver activity*

Many of these wetlands are formed as a result of an elevated water table. Some contain old streambeds that have been slowly filled in with decomposing organic matter from the hemlock forests. Open shrub and meadow wetlands containing sphagnum moss are often adjacent to the swamps. It is unknown whether the open areas naturally occurred, or if they exist due to past logging activity, and because of an elevated water table the land never returned to forest after logging. However, these areas may also be an indication of beaver activity, which altered the hydrology of the area. It is known that beavers were once extremely abundant here, and they continue to affect these headwater areas even today.

The presence of hemlock and other conifer forests increases in the northern reaches of the state and, within the project area, this type of forested swamp is mostly present along tributaries such as Sandy Creek, Wolf Run, North Fork Redbank Creek, and South Branch North Fork Creek. Floodplain wetlands are also present in many areas of the watershed along rivers and streams in low-lying areas. These areas are affected by floodwaters from spring rains and snowmelt, but may be dry for much of the year (McPherson, 2004).

Many wetlands in this area are remote, but some are located along roads and developed lands. Increased pollutants, herbicides, and sediment may affect wetlands in these areas. Development of areas upstream of the wetlands can change the surface and groundwater hydrology and should be discouraged. For example, wetlands along Sandy Lick Creek near DuBois appear to be affected by changes in hydrology due to State Route 255 and by pollution caused by road salt applications (McPherson, 2004).

## Watershed Protection Laws

### Clean Water Act

The 1972 amendments to the Clean Water Act gave the United States Environmental Protection Agency (EPA) the authority to regulate pollution to waterways of the United States. This includes issuing permits for point sources of pollution, setting water quality standards, and implementing point source control measures (Elder, Killam, & Koberstein, 1999).



*Abandoned mine drainage within the Redbank Creek watershed, a type of non-point source pollution*

Further amendments to the Clean Water Act in 1987 established the 319 Non-point Source Management Program, which provides support primarily for local efforts to reduce non-point source pollution through activities such as technical assistance, financial assistance, education, training, demonstration projects, and monitoring (Elder et al., 1999).

### Point versus non-point source pollution

Point source pollution refers to discharges, or pollution inputs, that enter a stream or lake directly via a pipe, culvert, container, or other means. One of the ways the Clean Water Act is enforced is through the National

Pollutant Discharge Elimination System (NPDES), whereby DEP issues permits for point source discharges (DEP<sup>3</sup>). At least 90 NPDES permits have been issued in the project area (Appendix F). In Pennsylvania, the DEP and local conservation districts are responsible for issuing point source permits to industrial operations, municipal wastewater treatment plants, concentrated animal feeding operations, and households. In addition, any disturbance of land from one to five acres requires an NPDES permit, even if it is a non-point source. The exceptions are for tilling and agricultural practices that are not part of a concentrated animal feeding operation (CAFO), and most logging disturbances that are less than 25 acres. However, many of these activities still require a soil and erosion control permit (DEP<sup>3</sup>).

Non-point source pollution is pollution that enters a waterbody through an undefined source, usually in the form of runoff from places such as agricultural fields, logging operations, lawns, and city streets. Non-point sources comprise the majority of pollution, mainly because they cannot be as easily regulated. Usually, AMD is considered a non-point source because it is created in large, poorly-defined areas, often discharging into a stream in a diffuse manner. Efforts to reduce non-point source pollution are often conducted on a state or local level through programs to implement best management practices (BMPs) offered by conservation districts and other agencies and organizations. This will be discussed later in this chapter.

Existing and Designated Uses

The Clean Water Act is enforced through the assignment of existing and designated uses. Existing uses are any uses that a waterbody has been used for since November 1975. Designated uses are those that are currently recognized, regardless of whether they have been attained since 1975 (Elder et al., 1999). Examples of uses include aquatic life, shellfish harvesting, and agriculture. Discharges are not permitted to streams or lakes if they violate the existing uses for a stream or lake. The goal is to have all waterbodies attain the level of water quality that they had in 1975. If a point source will violate a current or designated use, a public hearing must be held to inform the public before a permit is issued. Citizens and non-profit organizations should gather historic information about their watersheds' existing uses, including photographs, newspaper articles, and personal letters, so that a stream can be protected for these uses.

**Table 3-7. High Quality Watershed or Watershed Stream Qualifications (DEP)**

Parameter	Description
Chemistry (meeting at least one condition)	The water has long-term water quality, based on a year of data, including being better than the water quality criteria in PA Code Chapter 93.7 at least 99 percent of the time.
	Additional chemical and toxicity information, which characterizes or indicates good water quality.
Biology (meeting at least one condition)	The surface water supports a high-quality macroinvertebrate community, as determined by biological and physical habitat procedures outlined in U.S. EPA's "Protocols for Use in Streams and Rivers" and has a score of at least 83 percent when compared to a reference stream or watershed of high quality.
	The surface water supports a high-quality aquatic community based on information gathered using approved biological assessment procedures.
	The surface water has been designated a Class A wild trout stream.

Watersheds designated as High Quality (HQ) and Exceptional Value (EV) are considered to satisfy all designated uses. Within Pennsylvania, a stream designated as HQ or EV meets a number of criteria including specific water quality and biological standards. Tables 3-7 and 3-8 identify the criteria. As with other designated uses, any proposed discharge that will degrade a HQ stream below these criteria can only occur if a special exception is granted and the public is informed. No special exceptions are typically granted for EV watersheds.

**Table 3-8. DEP Exceptional Value Watershed or Stream Qualifications**

<p>(in addition to High Quality requirements)</p> <p><i>The waterbody meets one or more of the following:</i></p> <ul style="list-style-type: none"> <li>▪ The water is located in a national wildlife refuge or a state game propagation and protection area.</li> <li>▪ The water is located in a designated state park natural area or state forest natural area, national natural landmark, federal or state wild river, federal wilderness area, or national recreational area.</li> <li>▪ The water is an outstanding national, state, regional, or local resource.</li> <li>▪ The water is a surface water of exceptional recreational significance.</li> <li>▪ The water achieves a score of at least 92% using approved biological assessment methods.</li> <li>▪ The water is designated as a "wilderness trout stream" by the Fish and Boat Commission following public notice or comment.</li> </ul> <p style="text-align: center;"><i>or</i></p> <ul style="list-style-type: none"> <li>▪ The water is a surface water of exceptional ecological significance.</li> </ul>
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The classifications of Warm Water Fishery (WWF) and Cold Water Fishery (CWF) describe the aquatic life that the waterbody is able to support. Warm-water streams support plants and animals, including fish species that can survive in waterbodies that are essentially warmer in temperature, while cold-water streams are able to support species that thrive at lower temperatures. In Pennsylvania, a WWF has a maximum healthy water temperature of 87° Fahrenheit versus 66° Fahrenheit for a CWF (PA Code, 1997a).

Typically, WWFs are warmer because less vegetation is present in the riparian area near the stream to cool the precipitation and cast shade over the stream. WWFs often occur in areas that have been more intensively developed or used for agricultural activities, while CWFs can be found in more forested areas. In Pennsylvania, many CWFs that would otherwise be pristine are impaired by AMD. As mentioned earlier, impoundments slow the water flow in streams, raising the temperature of the pooling water to be somewhat higher than that of the water in faster flowing segments.

Often, streams have temperature characteristics that are intermediate, between a CWF and WWF, and contain species characteristic of both types. Though there is

**Table 3-9. Redbank Creek Watershed Stream Designations**

Stream Section	Designation
<i>Sandy Lick Creek</i>	
Mainstem	TSF
Little Mill Creek	HQ-CWF
Schoolhouse Run	HQ-CWF
Falls Creek	HQ-CWF
All Other Tributaries	CWF
<i>North Fork Redbank Creek</i>	
Craft Run	EV-CWF
Shippen Run	EV-CWF
South Branch	EV-CWF
All Other Tributaries	HQ-CWF
<i>Redbank Creek Mainstem</i>	
Mainstem	TSF
All tributaries	CWF
<i>Little Sandy Creek</i>	
All Tributaries and Mainstem	CWF

no official classification, many people refer to these streams as “coolwater” streams. Trout Stocked Fisheries (TSF) are those that do not have high enough water quality to support naturally reproducing trout, but still have water quality to support trout stocked by the Pennsylvania Fish and Boat Commission (PFBC).

Most of the streams within the watershed are designated as CWFs, but some have also been given a HQ or EV designation (Table 3-9). HQ streams include most of the North Fork Redbank Creek subwatershed. EV streams include the following tributaries to North Fork Redbank Creek: South Branch North Fork Creek, Shippen Run, and Craft Run (PA Code, 1997b). The Water Quality section within this chapter further describes the designations of specific streams.

Impaired Waterways

As part of the Clean Water Act, EPA requires states and territories to develop water quality standards for all surface waters, to monitor these waters, and to develop a report of those not meeting water quality standards. Historically, this report has been called the 303(d) list, for the corresponding section of the Clean Water Act. The name was changed to the Integrated Waterbody List combining the 303(d) list and 305(b) report (DEP, 2004c). Streams are assigned to one of five categories based on their status on the list (Table 3-10).

Streams impaired due to non-point source pollution or an unidentified point source polluter require a Total Maximum Daily Load (TMDL) assessment. A TMDL is an analysis of the maximum level of pollutants that can enter a waterbody, while still meeting water quality standards. They help DEP to determine the types and kinds of pollution that can be permitted through NPDES, and what actions must be taken to decrease non-point source pollution (DEP, 2006c).

DEP is not required to develop a TMDL for streams that are meeting their designated uses or that can be made to meet these uses through enforcement of point source polluters. Streams requiring a TMDL are in Category 5 of the Integrated Waterbody List (DEP, 2006c).

DEP must report to EPA every two years on the state of its waterways by making updates to the Integrated Waterbody List. At least 145 miles of streams or stream sections within the Redbank Creek watershed are considered impaired (Figure 3-5). These are described further in the Water Quality section of this chapter.

**Table 3-10. Categories of the Integrated Waterbody List**

Category	Description
1	Streams in which all uses are attained
2	Streams in which at least one use is attained
3	Unassessed streams
4	Streams impaired for one or more designated uses not requiring a TMDL assessment
5	Impaired streams requiring a TMDL

Sedimentation and Erosion Control

Soil erosion is the natural process of removing soil from the land by wind or water. Though erosion is a natural process, it can be greatly increased by lack of vegetation, poor farming practices, and stormwater runoff. Sedimentation is the process by which the bottom of the stream becomes covered with eroded material from streambanks and land. This occurs if more sediment enters a stream than can be transported downstream, or if hydrologic alterations reduce the capacity of the stream to transport the sediment. Examples of severe bank erosion occur on the headwaters of Jack Run (a tributary to Leatherwood Creek) and just downstream of where Nolf Run enters Little Sandy Creek (Armstrong County Conservation District reports).

Pennsylvania's Clean Streams Act and regulations under the Pennsylvania Code create a role for local governments in protecting streams by developing erosion and sediment control plans, which include sediment control BMPs. BMPs are practices that help protect the quality of the land and the environment by preventing erosion and pollution. They include activities such as contour farming, filter strips, and silt fences (DEP<sup>5</sup>).

Contour farming: Tilling and planting that follows the slope of the land, creating ridges that slow the run of water.

Silt fences: A temporary barrier designed to retain sediment in a construction site by slowing water flow and promoting deposition on the uphill side of the fence, also decreasing the velocity of runoff.

Strip cropping: Partitioning a field into alternate bands of different crops, such as row crops, hay, and small grains, to allow infiltration and filtering of sediment.

Filter strips: Areas of grass planted next to cropland to filter out sediment, organic matter, nutrients, and chemicals carried in runoff.

#### Nutrient Management Program

The Pennsylvania State Conservation Commission, formed through the Pennsylvania Nutrient and Odor Management Act (NOMA), administers the Pennsylvania Nutrient Management Program (PNMP). The commission along with conservation districts, have approved delegated authority to control the program. CAFOs are required to participate in the program, as well as any operation that wishes to gain liability protection under the act, or has received financial assistance through NOMA for BMP installation. In addition, any agricultural operation in violation of the Pennsylvania Clean Streams Law may be required to submit a nutrient management plan that meets NOMA requirements (PNMP).

Farmers participating in NOMA must develop and implement approved nutrient management plans. Nutrient management planning is a series of BMPs designed to reduce nutrient pollution by balancing nutrient inputs with nutrient requirements. An approved nutrient management specialist, certified by the Pennsylvania Department of Agriculture, must develop these plans. The intent of NOMA is to address water quality issues from activities such as animal number and density, nutrient losses from manure storage and handling areas, nutrient runoff from animal concentrated areas, and manure fertilization. Questions about the program should be directed to the appropriate county conservation district. Financial and technical assistance is available (PNMP).

#### Pennsylvania Sewage Facilities Act

Sewage is a major cause of pollution in western Pennsylvania streams. Sewage pollution can come from municipal and non-municipal sewage treatment plants and from private septic systems. This pollution can occur from plants that have inadequate capacity due to population growth or poor design, and private systems that are not properly built or maintained. In some cases, both sewage waste and stormwater enter a municipal system through the same infrastructure, and the plant is not able to handle all of this waste. The overflow waste is deposited directly into the stream. When this happens, it is called a combined sewage overflow (CSO) event.

The main type of pollution entering streams from sewage treatment plants and septic systems is inorganic and organic nutrients, sediment, and bacteria. Nutrients can lead to excessive plant growth, which depletes the oxygen levels of streams. Sediment is responsible for clogging the gills of aquatic

organisms and affecting in-stream hydrology and habitat. Bacteria can be harmful, and sometimes fatal, to both stream life and humans.

Streams within the project area are so heavily impacted by mine drainage that the effects of other pollutants, such as septic systems and agricultural runoff, are not easily identified. In fact, these other pollutants can add pH and alkalinity to a stream, canceling some of the harmful effects of acidic mine drainage. Few streams in the watershed have a HQ or EV designation, which can put limitations on the types of pollutants entering a stream. Nonetheless, sewage pollution can have a significant negative impact on stream ecosystems and affect the use of the stream for recreation and water supply. Over 14 sewage treatment plants have permits to discharge treated wastewater to local streams. Depending on the capacity of the systems and the treatment methods used, the amount of waste matter entering streams from each of these plants may vary greatly. Sewage treatment plants located in the project area include Brookville, Corsica, Knox Township, Reynoldsville, Summerville, Falls Creek, Sandy Township, Southern Clarion Area, Redbank Valley, Rimersburg Borough, and Mahoning Township.

Within Pennsylvania, Act 537, or the Pennsylvania Sewage Facilities Act, requires that all municipalities develop and implement an official sewage plan addressing present and future sewage disposal needs. DEP reviews official plans and revisions, and issues necessary construction permits. DEP also provides grants and reimbursements for up to 50 percent of costs associated with Act 537 planning and permitting (DEP<sup>1</sup>).

Act 537 plans vary by municipality and may include plans for municipal sewage treatment facilities and upgrades to on-lot systems. Sewage enforcement officers, often located within Pennsylvania municipalities, are responsible for issuing permits for new systems and for repairs to old systems. Within Jefferson County, Jefferson County Sewage Association is responsible for much of the enforcement and permitting. All homes not serviced by a sewage treatment facility are required to have a functioning on-lot system that does not create an “obvious” discharge. Malfunctioning systems can be reported to DEP, as well as failure of municipalities to follow Act 537 plans (DEP<sup>1</sup>). PENNVEST, the Pennsylvania Infrastructure Investment Authority, offers loans and some grants to municipalities developing sewage treatment facilities. Loans are also available to individuals for development or improvement to on-lot systems. The United States Department of Agriculture through the Rural Development’s Water and Environment Program also provides loans, grants, and loan guarantees for drinking water, sanitary sewer, solid waste, and storm drainage facilities in rural areas having populations less than or equal to 10,000.

#### Abandoned Mine Drainage Legislation

The federal Surface Mining Control and Reclamation Act (SMCRA) of 1977 established mandatory uniform standards for coal mining activities on state and federal lands including environmental performance protection standards to reduce adverse effects on fish, wildlife, and other environmental values. An important component of this legislation is that mining companies are required to conduct remediation efforts for environmental degradation, such as mine discharges and coal refuse, caused after SMCRA’s passage. It gives companies an incentive to reduce environmental impacts in order to avoid the high costs of remediation. The act also created the abandoned mine land fund to help pay for the cleanup of mine lands abandoned before 1977, which are not covered by the new standards and regulations (Environmental Literacy Council, 2006).

SMCRA, along with the Clean Water Act, has important implications for mining activities throughout Pennsylvania. Future mining activities in the project area must comply with SMCRA, as well as the anti-degradation component of the Clean Water Act (Environmental Literacy Council, 2006).

### Intermittent, Ephemeral, and Perennial Streams

Not all streams flow year-round. However, all streams within Pennsylvania are protected under the Pennsylvania Clean Streams Law of 1931, which gave the state of Pennsylvania the power to enact legislation and regulations pertaining to the protection of streams.

According to the Pennsylvania Code (1997a):

#### Intermittent

An intermittent stream is a “body of water flowing in a channel or bed composed of substrates primarily associated with flowing water, which during periods of the year is below the local water table and obtains its flow from both surface runoff and groundwater discharges.”

#### Ephemeral

An ephemeral stream is a “water conveyance which lacks substrates associated with flowing waters and flows only in direct response to precipitation in the immediate watershed or in response to melting snow pack and which is always above the local water table.”

#### Perennial

A perennial stream is a “body of water flowing in a channel or bed composed primarily of substrates associated with flowing water and is capable, in the absence of pollution or other manmade stream disturbances, of supporting a benthic macroinvertebrate community composed of two or more recognizable taxonomic groups of organisms which are large enough to be seen by the unaided eye, and live at least part of their life cycles within or upon available substrates in a body of water or water transport system.” Streams that flow year-round are perennial streams.

Point discharge limits (as described later in this chapter) are estimated at the point where the stream supports a benthic macroinvertebrate community characterizing a “perennial stream.”

In the past, mining operations in Pennsylvania could have streams reclassified as intermittent or ephemeral, classifications requiring no special protections under state mining regulations. However, DEP has recently begun shifting its policy to require detailed biological assessments before approving such operations. Under this new policy, non-permanent intermittent and ephemeral streams are receiving similar protections as permanent, perennial streams before mining can proceed.

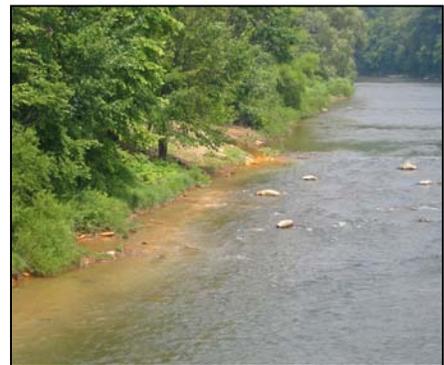
Protection of intermittent and ephemeral streams is also included for logging and other earth-moving activities, although permitted activities may differ from those involving perennial streams. In cases where there is some question over what protections are in place for an activity, DEP’s regional offices should be consulted.

## **Water Quality**

### Major Sources of Impairment

#### Abandoned Mine Drainage

AMD is the most significant cause of impairment in the Redbank Creek watershed. Over 145 stream miles are polluted by AMD. AMD is formed when mining activities fracture bedrock that is situated over coal seams, allowing rain, groundwater, and oxygen to come into contact with the seam. This contact causes chemical and biological reactions resulting in water contaminated with



*Abandoned mine drainage entering Redbank Creek*

dissolved metals including iron, manganese, and aluminum. Acid is formed when sulfur-oxidizing bacteria in the rock helps convert inorganic sulfur to sulfate and sulfuric acid. If there are insufficient neutralizing compounds, the water will become acidic. The polluted water discharges into streams and groundwater through mine openings and seeps. When the water is exposed to oxygen in the air, the metals will precipitate or drop out of the solution as solids, creating even more acid and coating stream bottoms with silt-like metals. High levels of iron and aluminum can poison fish and threaten drinking water supplies (Fripp, Ziemkiewicz, & Charkavorki, 2000). The siltation from the metals and the altered pH can also affect the survivability of aquatic macroinvertebrates, which form the base of the food chain and thus the basis of a healthy, functioning stream ecosystem.

Numerous coal seams have been mined within the Redbank Creek watershed. This includes surface and underground mining of the Lower Clarion, Lower Kittanning, Middle Kittanning, and Lower Freeport coals and strip mining of the upper Freeport coal.

Underground mining refers to practices that extract coal by tunneling into the earth. The most common underground mining method utilized is the room and pillar method. Using this method, an opening at the surface is used to reach the coal seam. Rooms are cut into the coal bed, leaving a series of pillars or columns of coal to help support the mine roof. Surface mining involves extracting deposits of mineral resources close to the surface. A common surface mining method is strip mining, which removes the layer of rock, or overburden, directly over the coal seam.

Remediation refers to activities undertaken or treatment methods used to minimize or remove pollution from a contaminated area. Regarding reducing water pollution from AMD, the goals are to reduce metal loadings and water acidity or raise water pH to acceptable levels. AMD treatment falls into two broad categories, active and passive. Active treatment involves the physical addition of a neutralizing agent, such as limestone, to the source of the AMD or directly into the stream. Passive treatment includes a variety of techniques to raise the pH and reduce metal loading that involve a constructed treatment or containment project, such as a wetland or limestone drain. While initial costs for passive treatment can be higher, passive treatment generally requires less maintenance and attention once constructed (Turner et al.).

The type of system used is highly dependent on the concentrations of metals present in the AMD and site conditions. Chemical treatment is typically implemented through passive and active methods, such as the addition of lime or the use of limestone-lined ponds. If it is necessary to reduce metal concentrations and raise the pH, then a variety of passive treatments may be used, including an anaerobic wetland, aerobic wetland, or combination of systems (Pennsylvania State University).

Previously mined areas can also be dangerous, with unstable portals and roofs associated with underground mining and dangerous high walls, and spoil banks associated with surface mining. In some cases, reclamation techniques, such as removal of refuse and/or regrading and revetting, can be used to make a site safer and reduce mine discharges in surface mined areas. Once an area is surface mined, its suitability for different land uses may change because mined material can have a lower pH and different soil composition.

Some funding for mine reclamation is available through the Office of Surface Mining and other state programs. See the Land Resources chapter for information about the impacts of mining on the landscape and for funding opportunities. Underground and surface mining continue to be utilized. As more profitable coal seams are mined in Pennsylvania, the reclaiming of old areas and targeting of once unprofitable coal seams may become more cost effective.

### Acid Precipitation

Acidity from acid rain, as well as AMD, is a significant source of water pollution. Acidity refers to the number of hydrogen ions in solution, and acid precipitation is a result of atmospheric pollution from sources such as automobile exhaust and power plants, which produce nitrates and sulfates. Average rainfall pH within the watershed is estimated at being lower than 4.3, whereas normally, rainfall has a pH of about 5.5 (Rightnour & Hoover, 2005). Every unit decrease in pH is equal to a tenfold increase in acidity, so rainfall is about 10 times more acidic than it would be naturally. This does not show up in the larger stream courses, because acidity is neutralized where runoff enters streams after passing through development, agriculture, and natural geology. It is most prevalent in headwater areas, where rainfall is the greatest source of water. A recent study conducted for the North Fork Redbank Creek watershed by North Fork Watershed Association found that stream pH was as low as 3.0 in some headwater areas and that nearly 50 percent of streams had a pH less than 4.0. Most fish and other aquatic organisms cannot survive when the pH is below 5.0 (Rightnour & Hoover, 2005).

### Agricultural Practices

Agricultural pollution is the second-leading cause of water quality degradation in Pennsylvania, after AMD. Dairy and beef operations comprise a large number of farms within the project area (U.S. Census, 2000). Improper management of nutrients, such as manure and fertilizers, as well as inadequate stormwater runoff controls, increases pollution loading. These types of problems represent some of the most serious issues related to agricultural pollution (Swope, personal communication, 2006). BMP initiatives focus on nutrient reduction and proper storage of manure. Farmers that develop nutrient management plans can participate in cost-incentive programs such as Environmental Quality Incentives Program and Conservation Reserve Enhancement Program (see Land Resources chapter), which provide reimbursement for up to 75 percent or more of incurred costs. Recent efforts have also focused on no-till or reduced-till practices, which greatly reduce erosion and fuel costs associated with plowing (Swope, personal communication, 2006). Increased funding for any of these programs is always needed. The local Natural Resources Conservation Service (NRCS), located in DuBois, can be contacted for more information.

### Forestry Practices

Jefferson County ranks as one of the top five lumber-producing counties in Pennsylvania, and the value of standing timber in the county is approximately tenth in the state (Jacobson & Seyler, 1997). Forestry contributes approximately twice the amount of money earned from agriculture to the county's economy (U.S. Census, 2000). Though a portion of the county is outside of the project area, these statistics are certainly relevant to the watershed, which is located primarily in Jefferson County. Forestry activities can have a substantial impact on water quality.

The amount of water running off a forest during a rainstorm depends in large part on the forest age and proportion affected by timber harvesting. Following a cut, there is an increase in the amount of water running off a forest patch because fewer trees exist to intercept rainfall or to transpire water. Most of the water infiltrates into soil or carries sediment and nutrients to streams. High-grade cuts (which remove the best-quality trees and leave little for regeneration) and other practices leaving few standing trees can increase the amount of runoff to streams. The filtering function of forests can be maintained through a number of practices, such as dispersing harvesting operations so that only a small percentage of any watershed is affected at any one place and time, utilizing forestry methods that leave an appropriate amount of trees to prevent sediment and erosion, leaving enough streamside forest to filter sediment from surface runoff, utilizing thinning practices to maximize filtering capacity and forest health, and implementing additional sediment and erosion control BMPs (Klapproth & Johnson, 2000). These are discussed further in the Land Resources chapter.

### Development Practices

Most municipalities do not have land ordinances, which can be tailored to protect water resources. One of the biggest impacts is development on floodplains, which are natural features of a stream that dissipate water during flood events. Even smaller-scale development along floodplains reduces their effectiveness. Removing riparian vegetation can also increase the amount of streambank erosion, causing stream widening and a buildup of sediment on the stream bottom. Effective land ordinances restrict building in these and other sensitive areas, or allow building if certain requirements are met (Klapproth & Johnson, 2000).

Stormwater runoff is also an issue that needs to be adequately addressed in ordinances. During storm events, large amounts of water runs off paved surfaces and other impervious areas, rapidly increasing the amount of pollution and water entering streams. By preventing certain types of building in sensitive areas, and encouraging building options to allow rainwater to percolate into soils instead of into roadways and drains, some of these issues can be avoided.

### Sewage Waste

Contamination from both public sewage treatment and private on-lot systems is a potential concern. Public services are available in a small geographic area but are concentrated in boroughs, which are more populated than townships. All of these systems have a DEP point discharge permit to discharge treated sewage waste, which may contain some amount of nutrients and bacteria. These discharges have the potential to impact stream health and public water supplies, particularly if they are malfunctioning. This could cause drinking water contamination and increased drinking water treatment costs, because improperly treated effluent can enter surface water and groundwater.

Rural, on-lot systems typically contribute an even greater amount of sewage waste into streams when they are not maintained properly. Conventional systems consist of a large tank designed to hold about two days of wastewater and allow solids to settle out, and a drain field that distributes wastewater so that it can be slowly absorbed into the underlying soil. These systems remove much of the bacteria but are not very effective at removing nitrogen. They often “fail” when the drain field becomes clogged, causing raw sewage to back up out of the tank or through the ground and end up in streams and groundwater. The systems must be pumped out every few years to prevent buildup and clogs (BF Environmental Consultants, 2004).

More advanced on-lot systems are designed to remove nitrogen by moving effluent through a series of chambers containing different kinds of microbes, which uptake the nitrogen. These systems have pumps, moving parts, and other components that need to be inspected every few years. These more advanced systems can remove twice as much nitrogen as conventional systems but are more expensive and can have higher environmental impacts if not pumped out (BF Environmental Consultants, 2004).

A number of efforts are being made in the area to reduce sewage going into streams. For instance, the Jefferson County Sewage Association provides enforcement and permitting services to a number of municipalities. However, additional funds in the form of grants to homeowners and public treatment providers are needed to better address this issue.

Nutrients and organic matter from sewage effluent can cause an increase in alkalinity and conductivity of water. It is believed that these inputs may actually mitigate the impacts of AMD by raising the pH in streams that would otherwise be acidic.



*Sabula Lake, located near the headwaters of Sandy Lick Creek in Sandy Township, Clearfield County*

## Sandy Lick Creek

### DEP Designation

The majority of the mainstem of Sandy Lick Creek is a TSF, except for a few small sections. Almost all of the tributaries to Sandy Lick Creek are CWF, and the following are HQ-CWF: Little Mill Creek, Schoolhouse Run, and Falls Creek.

### Impaired Waters

A total of 28.5 stream miles in the Sandy Lick Creek subwatershed are impaired as a result of AMD. These include all or portions of Soldier Run, Laborde Branch, and a number of unnamed tributaries (UNT). Other impaired sections include the following: Trout Run (water flow variability); UNT Fivemile Run (package plants, nutrients); UNT Sandy

Lick Creek (unknown metals) (Figure 3-5).

### Reports

Sandy Lick Conservation Initiative started a visual assessment study for Sandy Lick Creek in 2006, which was put on hold until more funding can be secured to resume the study

A Coldwater Heritage grant from Trout Unlimited was secured in 2006 to do an assessment of Schoolhouse Run.

## North Fork Redbank Creek

### DEP Designation

Craft Run, Shippen Run, and South Branch North Fork Creek tributaries are EV-CWF, while the remainders are HQ-CWF.

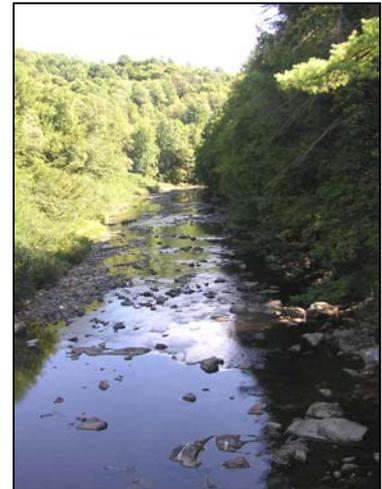
### Impaired Waters

The only stream in the North Fork Redbank Creek subwatershed, listed on the Integrated Waterbody List of impaired streams, is Sugarcamp Run. Approximately 8.8 miles of Sugarcamp Run are impaired due to metals, pH, and/or siltation from AMD. Another 2.83 miles from five UNTs are also listed for metal and siltation impacts from AMD.

### Reports

In 2005, Water's Edge Hydrology, Inc. was hired to assist the North Fork Watershed Association in completing the **North Fork Watershed Assessment and Restoration Plan**—an assessment to identify acidification problem areas and quantify potential alkaline addition. Acid precipitation is considered to be the biggest water quality problem within the North Fork Redbank Creek watershed. The majority of the region is located within one of the worst areas for low-pH rainfall in Pennsylvania.

In-stream water quality and flow monitoring was conducted 11 times at a total of 25 points in the watershed, and sampling of soils was conducted at 16 headwater sites to determine calcium/aluminum ratios as



*A scenic view of North Fork Redbank Creek*

an indication of soil acidification. The study confirmed that tributaries to North Fork Redbank Creek that are found in higher, younger geologic units, such as the Allegheny Group, contain zones of higher alkalinity and have less acid precipitation impacts. While those of lower, older topography tend to contain less inherent alkalinity. The high degree of acidification found in the northwest and northeast portions of the watershed correlated to exposed bedrock geology. The most affected streams were in the northeast and included Williams Run, Bearpen Run, Manners Dam Run, Lucas Run, Swede Run, and South Branch North Fork Creek.

The assessment and restoration plan included a review of potential alkaline addition technologies, including applicability and cost comparisons, and conceptual alternatives for primary and supplemental systems at each site were suggested. A progressive restoration plan was developed, suggesting the order that sites should be addressed to result in the most environmental benefits. In most cases, sites that could be improved with the least effort were suggested as the first sites to conduct projects. Total cost of conducting projects at all the recommended sites was estimated at \$500,000 to \$6,000,000, depending on the methods used.

The methods most commonly suggested included pebble quicklime addition units and limestone sand dosing. Pebble quicklime units consist of silos in the stream that run by waterpower and deliver an amount of pellet-sized pebble quicklime to neutralize the stream, depending on the amount of water flow. Limestone sand dosing involves periodically dumping a quantity of high-calcium carbonate limestone sand into a stream channel or on the banks of a stream where high flow will wash it into the stream and neutralize the acidity. Other methods include lake liming, high-flow buffer channels, land application liming, diversion wells, rotary drums or baskets, and vertical flow wetlands.

## Redbank Creek

### DEP Designation

The entire Redbank Creek watershed is designated a CWF, except for the mainstem, which is a TSF.

### Impaired Waters

Redbank Creek is the most severely degraded section of the Redbank Creek watershed, with approximately 120 miles on the Intergraded Waterbody List due to AMD pollution. This includes a number of unnamed tributaries that directly enter Redbank Creek, as well as portions of Fiddlers Run, Leatherwood Creek, Middle Run, Town Run, Runaway Run, Welch Run, Simpson Run, Coder Run, Clement Run, and Beaver Run. A portion of the mainstem of Redbank Creek is also considered impaired due to AMD (Figure 3-5) (DEP, 2006c).

### Studies

As part of a series of assessments submitted to DEP on water quality for the Redbank Creek watershed—prepared by the Armstrong Conservation District—the **Lower Redbank Creek—Main Stream Assessment Report** describes the non-point source pollution impacts on the mainstem of the lower portion of the mainstem of Redbank Creek. One of the main points is that the negative effects of AMD and agricultural and sewage runoff are cancelling each other out and, as a result, Redbank Creek is able to support a rather healthy aquatic community along the mainstem. Also, while the stream is designated a TSF, it is actually a WWF and it is unlikely that a CWF can be restored.

The study found impairments in Redbank Creek from Fairmont City to the New Bethlehem Dam, which was attributed to effects of the dam and the inputs of AMD from Town Run and Middle Run. Another impairment below South Bethlehem was attributed to sewage discharge. The remainder of the mainstem had good to excellent water quality. A major concern in the study area includes the invasive species Japanese knotweed, which appears to be expanding, possibly as a result of logging on steep

slopes, and disturbance from all-terrain vehicles (ATV). Many opportunities exist for stream recreation, but public access for launching and landing boats is limited.

**Miscellaneous and Unnamed Tributaries to Redbank Creek and The Allegheny River—Armstrong County**, sponsored by the Armstrong and Clarion County conservation districts, contains an assessment of water quality and impairments to small watersheds in the Armstrong portion of the Redbank Creek watershed, as well as those entering the Allegheny River in Armstrong County. For this report, a total of 15 tributaries entering Redbank Creek from the south were assessed. Both surface and underground mining have caused severe AMD impacts, especially in tributaries that enter Redbank Creek near its mouth. Mining impacts tend to decrease traveling east, with most western tributaries exhibiting at least fair water quality and some wild trout populations observed in some. Most of these tributaries, consisting primarily of small first- and second-order streams, are unnamed.

Sponsored by Clarion County Conservation District, the **Miscellaneous and Unnamed Tributaries to Redbank Creek and The Allegheny River—Clarion County** study contains an assessment of water quality and impairments to small watersheds entering Redbank Creek and the Allegheny River in Clarion County. A total of 18 tributaries entering Redbank Creek from the north were assessed. Though many were impaired by AMD, most exhibited at least fair water quality. Some of the most severely impacted included Wildcat Run, Leasure Run, Middle Run in Redbank Township, and Town Creek. It was found that tributaries impaired due to agricultural runoff included Middle Run and Leatherwood Creek in Porter Township.

Sponsored by the Clarion County and Armstrong conservation districts, the **Leatherwood Creek Watershed Assessment Report** investigated the water quality of streams within the 21.3-square-mile Leatherwood Creek watershed. Data was collected on water chemistry, aquatic biology, stream morphology, evidence of soil erosion, and condition of the riparian zone. The lower three-mile section of mainstem shows little evidence of degradation, but is being affected by activities upstream. The upper 5.2 miles is mostly pastureland, with a lack of riparian zone, low macroinvertebrate growth, bottom siltation, and exposure to sunlight at midday. Some areas of wetlands and woodlands are present, although most are of lower quality. Similar but more severe impacts have occurred on the tributaries of Jack Run and West Fork. Extensive surface mining has occurred in the upper portion of Leatherwood Creek and in Jack Run and West Fork tributaries. Some of this has been replanted to grasses and legumes, and the Bureau of Abandoned Mine Reclamation has reclaimed one area. Water quality analysis shows that past mining is having little impact on the water quality of this watershed. However, agricultural pollution may be cancelling out AMD effects by raising the pH and alkalinity.

Livestock access to streams is thought to be the main cause of streambank erosion and a source of sediment and nutrients to Leatherwood Creek and tributaries. According to this study, at least 12 miles of streambank fencing is needed. Stabilization and proper management of barnyards and other livestock areas should be encouraged. Acquisition or other protection of the many wetlands in the area, particularly those located in abandoned farmland, should be encouraged. Many of these farms may qualify for landowner incentive programs available through NRCS or the conservation district.

### Little Sandy Creek

#### DEP Designation

The entire Little Sandy Creek watershed is a DEP-designated CWF.

#### Impaired Waters

Approximately 2.5 miles of streams in the Little Sandy Creek watershed are on the Integrated Waterbody List, with AMD as the cause of impairment. These include all or portions of Reitz Run, Ferguson Run, McCracken Run, Middle Run, and several unnamed tributaries (Figure 3-5).

#### Studies

The **Lower Little Sandy Creek Watershed Assessment Report**, sponsored by the Armstrong Conservation District, primarily includes visual and macroinvertebrate assessments of the lower portion of Little Sandy Creek and Nolf Run. Approximately 60 percent of this area is forested, with areas of cropland, hayland, and residential use. Much of this area is northern hardwood forest, containing species such as eastern hemlock, eastern white pine, maple, black cherry, and birch, and a heavy understory of great rhododendron. Riparian zones contain areas of bottomland hardwoods, with species including sycamore, tulip poplar, silky dogwood, and spicebush.

Macroinvertebrate sampling shows good water quality in both Little Sandy Creek and Nolf Run. Fish samples indicate that Little Sandy Creek is somewhere in transition between a WWF and CWF, while Nolf Run is a CWF. The biggest impacts in the Armstrong County portion include sedimentation from gas well roads, ATVs, and possible logging impacts. Silt covers the bottom of much of the creek and there are several severely eroded banks, including an area about 0.5 miles downstream of the Armstrong County line that may be impacted from an upstream ford and another area about 500 feet downstream. Foam in Little Sandy Creek from dissolved and suspended materials may be coming from upstream in Jefferson County. Because of the presence of many seep areas along the mainstem, Little Sandy Creek is susceptible to erosion, particularly from road construction.

Nolf Run is heavily wooded to the north of State Route 539, but is mainly agricultural in the southern portion. This southern section is impaired by agriculture and sewage pollution from North Freedom.

Recommendations include conducting further study of the sources of sedimentation to Little Sandy Creek, implementing agricultural BMPs in the upper portion of Nolf Run, encouraging law enforcement agencies to actively prosecute illegal use of ATVs on private properties in the area, implementation of established sediment and erosion control BMPs on gas well roads, increasing efficiency of sewage systems in North Freedom, and working to conserve land in the upper portion of Nolf Run for outdoor recreation through purchase or agreements with landowners.

## **Pennsylvania's State Water Plan**

Act 220, passed in December 2002, requires that the DEP update the Pennsylvania State Water Plan within five years to determine how much water we have in Pennsylvania, how much we use, and how much will be available in the future (DEP, 2005c).

The State Water Plan has not been updated in more than 25 years and, as a result, we do not know which areas have critical water needs until water supplies are dry. Pennsylvania has experienced serious water droughts in the last 10 years and water use has increased dramatically.

Starting in March 2004, DEP required any commercial, industrial, agricultural, or individual withdrawing 10,000 or more gallons of water per day, averaged over a 30-day period, to register and report their water use to DEP. Those using less than 10,000 gallons may choose to register voluntarily to help DEP get a more complete picture of water use (DEP<sup>6</sup>).

To carry out the planning provisions of the law, a statewide water resources committee was formed to help guide the plan. Six regional water resource committees were also created to facilitate the development of regional components of the plan. Among their responsibilities is carrying out a public participation process to ensure that people with an interest in water resource issues have adequate opportunities to provide input. A series of meetings was held in 2005 at each of the six regional planning areas to better define local water resource problems and opportunities (DEP<sup>2</sup>).

During the development of the plan, areas will be identified where demand exceeds available supplies. These water-planning areas will serve as planning boundaries for the creation of detailed water budgets to be used in critical area resource plans. These will be submitted for review and comment to the official planning agency and governing body of each municipality in the identified area prior to recommendations (DEP<sup>6</sup>).

The act also establishes a formal program to promote voluntary water conservation and water use for all water users. A water resources technical center will be created to promote the use and development of water conservation and efficiency education and programs (DEP<sup>6</sup>).

The Redbank Creek watershed is located within the Ohio River basin. The Ohio Regional Water Resources Committee has developed five regional priorities. These include:

- Maintaining water supply (loss prevention), considering the impacts of mining, loss of residential water, groundwater/stormwater recharge/old infrastructure and malfunctioning sewage systems, and contingency plans.
- Implementing appropriate, applied technologies, including remediation and conservation technologies.
- Identifying and planning for economic development opportunities, including how to replace water used, developing positive incentives for economic growth, and defining intended water uses.
- Conducting public education and outreach on water resources, including obtaining feedback and providing information.
- Balancing multi-purpose uses, including protecting existing uses, water budgeting, and developing a balance between different uses under both regular and emergency conditions.

## **Water Quality Trading**

Water quality trading is when facilities with higher pollution-control costs, called buyers, purchase the right to pollute from sellers, or other companies that have reduced their pollution output below their required limits. This can enable polluters to reduce pollution at a lower cost than it would be to make reductions at their facilities. For instance, it may be cheaper for a polluter that discharges nitrates to buy credits from a polluter that can reduce its nitrate discharges more easily. Or, it may be cheaper for a polluter to pay for the installation of BMPs on a farm than to develop technologies to reduce pollution from nitrates. If the same pollution-reduction goal can be achieved through trading, then it is a benefit to both the company and the farmer (EPA, 2004d).

Generally, certain criteria must be met for a water quality-trading program to work. There must be a driver, or reason why pollution reductions are being sought. This is usually a TMDL, which requires point-source polluters to reduce their level of pollution by a certain amount in order for water quality standards to be met. The water quality trading will be most effective if the sources have different costs to control their pollution, making it more economically profitable to trade. Also, the levels of pollution must be such that not all sources within the watershed must reduce their inputs. This provides a reason to bargain. Finally, watershed stakeholders and state regulatory agencies must be willing to try an innovative

approach and to engage in trading design and implementation issues. Water quality trading should be conducted within a legal, regulatory framework, such as the NPDES program, which requires point source polluters to obtain permits to discharge pollutants into waterways of the United States (EPA, 2004d).

Proponents of trading think that it can help achieve improvements at the lowest cost to society. It provides incentives for companies to lower their amount of pollution. Ideally, a regulatory agency or appointed committee controls the transfer of pollution credits between polluters. If a company lowers its amount of pollution below its “target” limit, it will be paid for these credits by the regulatory agency. Other companies that go over this limit can purchase these credits from the regulatory agency. If non-point source pollution is present, there is the potential for a company to pay for the implementation of BMPs in exchange for polluting over its target amount. The type of program used depends on the watershed’s pollution issues (EPA, 2004d).

All water trading activities must comply with the requirements of the Clean Water Act, as well as state and local requirements, including public notification of transfers of trading credits. One potential problem with water quality trading is localized impacts. For example, all of the credits purchased may discharge into the same small stream. Because of these possible complications, it is important that the trading program be designed so that localized impacts do not occur. For instance, the amount of credits that can be purchased by certain polluters can be set by the regulatory agency.

DEP has recently developed a framework for water quality trading in Pennsylvania. The framework is intended to provide a means for single trades between two parties, a number of trades in a small watershed, multiple trades on an ongoing basis, or purchase of credits by three parties. Trading must be a part of the TMDL development and NPDES permitting process. As part of this, the Conestoga Pilot Project was launched in 2001. For this project, a company will receive nutrient credits in exchange for restoring a natural floodplain and wetland in the Conestoga watershed in Lancaster, Pennsylvania.

Groups wishing to develop future water quality-trading projects should contact DEP. There is the potential for nutrient trading within the Redbank Creek watershed because of the large number of NPDES permits. Unfortunately, the largest source of pollution in the watershed is AMD, which cannot be regulated through such a program.

## Management Recommendations

### Goal 3-1. Address acidity problems in local waterways caused by abandoned mine drainage and acid precipitation.

Develop a remediation plan by locating and prioritizing abandoned mine discharges for treatment systems based upon a selected set of criteria.	High
Address abandoned mine discharges within the lower Redbank Creek subwatershed, particularly on the Armstrong County side, to restore quality cold water fisheries	High
Implement recommendations identified in the North Fork Watershed Assessment and Restoration Plan to increase the pH and decrease acidity in the waterways.	High
Construct mine drainage treatment systems in the Soldier Run subwatershed as identified in the restoration plan that has been established.	High
Continue addressing mine drainage at the DuBois Mall site through the development of a mine drainage treatment system.	Medium
Determine the effects that land liming could have on water quality by conducting a land liming demonstration project.	Medium

**Goal 3-2. Protect and maintain wetland areas.**

Encourage the protection of wetlands, particularly those located on abandoned farmlands.	High
Protect and conserve the 6-7 acre riverine depression owned by Armstrong Conservancy in the lower Redbank Creek watershed	High
Discourage development in areas upstream of wetlands.	High

**Goal 3-3 Reduce the amount of erosion and sedimentation entering area waterways.**

Implement erosion and sedimentation control best management practices on gas well, logging, and dirt and gravel roadways.	High
Reduce erosion and sedimentation by incorporating best management practices into all earth-moving activities, including logging, construction and development, and natural resource extraction.	High
Increase funding to maintain the dirt and gravel road program.	High
Conduct watershed study to determine sources of sedimentation entering Little Sandy Creek.	Medium

**Goal 3-4. Update sewage and septic systems to eliminate sewage impacts on local waterways.**

Improve cost-effective on-lot sewage options.	Medium
Design wastewater treatment systems to adequately serve the communities by separating stormwater from wastewater systems, in order to ease the occurrence of combined sewage overflows.	Medium
Update and improve wastewater treatment in urbanized areas.	Medium
Increase funding available to assist landowners in repairing failing on-lot septic systems through a cost-share or grant program.	Medium
Increase funding to homeowners and public treatment providers in the form of grants to assist in sewage treatment.	Medium

**Goal 3-5. Improve water quality so that streams attain their designated use.**

Improve water quality of the entire Redbank Creek watershed; attempting to achieve the water quality that North Fork Redbank Creek currently has.	High
Implement recommendations that have been identified through the North Fork Watershed Assessment and Restoration Plan.	High
Conduct a watershed assessment for the Sandy Lick Creek watershed, including physical, biological, and chemical parameters.	Medium
Host annual stream cleanups to remove debris from waterways.	Medium
Establish stricter regulations and management of pollution from runoff, including industrial, commercial, residential, salt piles, and truck stops.	Medium

**Goal 3-6. Ensure a sufficient public water supply without putting additional stress on the water systems.**

Install dry hydrants throughout the Redbank Creek watershed	Medium
Conduct surface water or well-head protection plans in order to identify and protect drinking water sources.	Medium
Establish an additional well in Summerville Borough to supply sufficient water to residents.	Medium
Investigate the effects of transporting water across the continental divide, and how this might disrupt the water budget for Anderson Creek and Redbank Creek.	Low

**Goal 3-7. Minimize the amount of destruction caused by flooding.**

Strengthen and enforce floodplain ordinances allowing floodplain areas to be undeveloped, so they may remain as open space and serve their purpose as a location where flood waters can safely overflow the streambanks.	High
Establish a dedicated flood-control program to assess, create, and maintain projects that will minimize the risk and severity of flooding.	Medium

<b>Goal 3-7. Minimize the amount of destruction caused by flooding (continued).</b>	
Discourage the development of primary and secondary residences in floodplain areas.	Medium
Develop a flood-control plan that considers alternative methods of flood control using dredging only as a last resort.	Medium
Consult a hydrologist and discuss the potential use of natural stream channel design techniques and geomorphology to decrease the risk of flooding.	Low

<b>Goal 3-8. Minimize impacts from stormwater through planning and decreasing the amount of impervious surfaces.</b>	
Minimize the amount of impervious surface by utilizing porous pavement on parking lots, driveways, and sidewalks.	Medium
Develop stormwater management plans for North Fork Redbank and Redbank creeks.	Medium
Inventory individual watersheds to determine percent impervious cover and stormwater impacts.	Medium

<b>Goal 3-9. Maintain dams for recreational, historical, and water supply purposes.</b>	
Redesign the New Bethlehem Dam to include adjustable gates, fish passage, a canoe and kayak port, and public access to the stream.	Medium
Preserve the Manners Run Dam for historical and recreational purposes.	Medium

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## CHAPTER 4. BIOLOGICAL RESOURCES

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This section will describe the natural features of the watershed, including important areas of biodiversity, and make recommendations regarding conservation and restoration efforts. Although the area has been heavily impacted by activities contributing to forest and stream degradation, opportunities exist to protect remaining high-quality areas and restore degraded ones. Some unique features that will be described in this chapter include northern hardwood forests, blackwater streams, and hemlock-mixed-hardwood-palustrine wetlands.



*A unique mushroom found within the watershed*

### Ecoregion Characteristics

Ecosystems are groups of plants and animals that live in association with each other and specific environmental conditions. From 1992 to 1993, the United States Department of Agriculture (USDA) Forest Service adopted a consistent approach to terrestrial (land) ecosystem classification and mapping. Ecological types were classified and ecological units were mapped based on these relationships and environmental factors, such as energy, moisture, and nutrient gradients. The resulting areas, termed **ecoregions**, describe major ecosystems of essentially the same macroclimate, or similar climates notwithstanding vegetation and landform differences. Within ecoregions are landforms (such as a plateau or ridge formation) that form natural ecological units recognized by the term **subregions** (McNab & Avers, 1994).

Ecoregions may be confused with physiographic provinces, whose boundaries are largely dictated by similarities in geological history. However, physiographic provinces are only one component of what is used to define ecoregions. Other components include geology, water, soils, air, hydrology, and potential natural communities (McNab & Avers, 1994).

The project area is located in the Eastern Broadleaf Forest Province and Southern Glaciated Allegheny Plateau ecological subregion and is characterized by high hills, sharp ridges, and narrow valleys. Typical forest communities include: mixed oak, oak-hickory, oak-pine, hemlock, beech, floodplain and swamp forests. The climate is generally characterized by wet winters and mild, dry summers with a growing season of 120 to 180 days. Soils have an udic moisture regime, which means they typically retain moisture during dry months (McNab and Avers, 1994).

Common mammals within this ecological subregion include the whitetail deer, gray fox, woodchuck, opossum, gray squirrel, white-footed mouse, and short-tailed shrew. Less common species include the hairy-tailed mole, smoky shrew, and rare eastern woodrat. Common birds include wild turkey, ruffed grouse, barred owl, pileated woodpecker, eastern phoebe, blue-gray gnatcatcher, Acadian flycatcher, white-eyed vireo, ovenbird, and yellow-breasted chat. Amphibians commonly found in this subregion include the red-spotted newt, northern dusky salamander, American toad, and wood frog. Reptiles include the northern fence lizard, ringneck snake, black rat snake, and copperhead. The fish assemblage is typical of those found in headwater streams to large river habitats, with species such as hatchery-raised brook trout, brown trout, rainbow trout, southern redbelly dace, creek chub, fantail darter, and greenside darter in smaller streams and black bass, sunfish, sauger, catfish, and striped bass in larger tributaries (McNab and Avers, 1994).

A relatively high density of streams, ranging from high headwater streams to low-gradient rivers, characterizes this section. Though the area was not covered by ice, the glaciers affected it. Drainage re-arrangements over long periods have created a complicated drainage system. Some streams are underlain by shallow silt, sand, or gravel alluvium, while others are filled with glacial deposits. Natural stream flow and water quality have been altered by acid deposition, oil, gas, and coal activities. The sale of wood products is important in some parts of the watershed and most slopes have been repeatedly logged (McNab and Avers, 1994).

## Natural Habitats

### Forests

The landscape has been altered considerably as a result of human activities, including extensive logging and mining. In the early twentieth century, nearly the entire area was clear-cut. Although some of these logged areas have grown again, natural communities are significantly different than they once were. Species such as maple and cherry have increased in abundance, while oaks and hemlocks have decreased (McPherson, 2004). American chestnut trees, which once had a significant presence in the region, have disappeared due to the chestnut blight. Few areas of old-growth forest remain. However, hemlock-mixed-hardwood forest communities still exist in some areas and locations of second- and third-growth forest areas have the potential to develop into older-growth habitat in the future.



*Mixed hardwood forest community*

The study area is located primarily in the Pittsburgh Low Plateau section of the Appalachian Plateaus Physiographic Province, with only a small northern portion in the High Plateau section. With its location adjacent to the High Plateau, the watershed essentially borders the highest concentration of contiguous forest in Pennsylvania (McPherson, 2004). The high proportion of public land and steep terrain limit development in this High Plateau section. Development may be limited due to large boulders found throughout the soil as well.

There are a number of core forest areas, which are sections of forest more than 500 contiguous acres in size that have the potential to support interior-forest species, such as the barred owl, that require larger tracts of forest to survive and thrive. Interior forest excludes the forest edge and areas separated by clearings or roads (McPherson, 2004). However, because the majority of the study area is located within the Low Plateau, which is more impacted by roads, clearings, and other forms of development than locations farther north in Pennsylvania. This leads to fragmented habitats and declining interior-forest species.

In most cases, core forest areas are not interconnected. Roads, clearings, surface-mined areas, and rights-of-way now fragment much of the forestland. This fragmentation is detrimental to many interior-forest species, which often have large home ranges and require connectivity between available habitats. The climate, vegetation, prey and predatory species differ in forest interior habitats compared to edge habitats and small, fragmented forests. The barred owl, for example, depends on the availability of large, mature, and deteriorating trees, more commonly found in interior forests, for cavity nesting and perching from which they survey the land below for prey. Although some species with special habitat requirements or large home ranges may be able to survive within a habitat that differs from their preferred needs, there are often negative effects, such as inbreeding among animals, disease, or population decline associated with the limitation of space, resources, and mates. Forest fragmentation also has the potential to create conditions that promote the introduction of invasive species that typically exploit disturbed areas,

debilitated species, and displaced animals. This may decrease the economic value and overall health of a forest and its inhabitants.

Corridors connecting core forest areas facilitate the movement of species across boundaries and may help sustain a population by maintaining genetic variety and the ability to respond to a changing environment (McPherson, 2004). Therefore, every effort should be made to maintain and increase the number of corridors between important forest habitats. This may include encouraging redevelopment in already disturbed areas instead of clearing forested land, and taking advantage of tools, such as easements and sustainable forest-management practices, to protect forest habitat (McPherson, 2004).

#### Deer Overbrowsing

Deer overbrowsing is one of the most significant problems affecting forest habitat in Pennsylvania. It is estimated that deer densities in Pennsylvania average nearly double the number recommended for healthy forests (PA Audubon). Deer overabundance threatens forest sustainability by altering species composition and interrupting natural processes, such as forest regeneration and succession. When deer overbrowse an area, new trees are not able to grow and younger trees are conspicuously absent from the forest structure. A recent study showed that forests with deer densities of over 20 per square mile are not able to support forest species such as eastern wood pewees and cerulean warblers (Horsley, Stout, & DeCalesta, 2003). Deer densities in Jefferson County range from 29–40 deer per square mile, depending on whether estimates are made before or after the deer-hunting season (Wallingford & Grund, 2003). The removal of understory vegetation and alteration of forest composition are the main impacts attributed to overbrowsing. Many forest birds utilize a multi-layered forest habitat, which requires tree species of varying size and age. Their populations can be affected as well.

Very few forests show healthy regeneration of the understory. This is a problem that affects both wildlife and economic values. Deer exclosures have been added to several areas of state forest in order to keep deer out and promote regeneration. Within the enclosed areas, undergrowth is significantly restored when browsing is eliminated, clearly showing the effects deer have on the understory. In areas where deer overabundance is an issue, it should be factored into forestry management. Public and private landowners may now enroll in a program called the Deer Management Assistance Program (DMAP), which provides hunters with additional licenses to hunt on specific properties and help reduce deer populations.



*Whitetail deer browsing in a resident's backyard*

#### Disease and Pests

Fluctuations from drought to moist conditions often occur in Pennsylvania and place a high amount of stress on forests, making them susceptible to certain types of pests and disease. Pennsylvania Department of Conservation and Natural Resources (DCNR) conducts regular surveys of public and private land across the Commonwealth to assess some of these impacts. Historically, the chestnut blight significantly changed the composition of Pennsylvania's forests. The American chestnut originally inhabited nearly 20 percent of the project area, but now, any sighting of this species in the area is rare (DCNR, 2004a). One current threat to forests includes a number of pests affecting hemlocks, including the hemlock wooly adelgid and elongate hemlock scale. Additional threats include gypsy moth, Bruce spanworm, and anthracnose. Anthracnose is a group of fungi that can infect a variety of deciduous and evergreen trees. Many of these diseases and pests have been identified within the project area, but not at a significant scale. Cold, wet conditions can hinder the spread of pests, such as the gypsy moth and wooly

adelgid, but encourage the spread of fungal agents. Cherry leaf spot and sugar maple anthracnose could potentially affect seedling establishment within the northern hardwood forest area within the watershed (DCNR, 2004a).

It is difficult to prevent the spread of pests and disease within forests. In some cases, after in-depth study, a biological control agent—a living organism used to control another living organism—can be introduced. DCNR has successfully introduced predators to control the woolly adelgid, elongate hemlock scale, gypsy moth, and other pests in some areas. The agency employs an active monitoring program and the public can play an essential role by contacting the agency about pest and disease sightings. Forest management techniques may also be employed to prevent or hinder the spread of disease and pests. A sanitation thinning, for example, involves removing tree species that a particular pest prefers as a food source or shelter for its larvae and removing trees that are in poor health and susceptible to predation.

#### Poor Forestry Practices

Sustainable forestry can be loosely defined as that which contributes to the long-term health of forests by using management techniques that value multiple forest uses. All aspects of the forest ecosystem are considered important, including economic and non-economic values.

Poor forestry practices threaten forest health and the profitability of a forest. One such practice is high-grading, which involves harvesting all of the best-quality timber and leaving weaker, diseased trees behind.

It should not be assumed that logging companies always use sustainable forestry practices. Therefore, it is important for landowners to discuss the practices that they want to be utilized on their properties with their chosen logging company. These practices may include the appropriate time of year for logging to take place, the ability of the forest to regenerate, and important stream and other water resources to protect. For instance, in cases where deer overbrowsing or disease are affecting a forest, certain tree species may not regenerate without plantings or forest enclosures following cutting. Due to the slope of the landscape, proximity to streams, and soil type, it may be beneficial to restrict logging activities to the fall when there is less potential for erosion. Also, if an area of forest next to a stream provides important habitat for birds and other species, it may be important to leave this portion forested. In many cases, a forest tract may serve an important role in the landscape, such as providing important habitat for migratory warblers, in which case the landowner may choose to leave a portion of the forest to protect these species (Rodewald & Bittingham, 2001).

A number of organizations and agencies in Pennsylvania can assist private landowners with making sustainable forestry decisions. These include the Rural and Community Forestry Section of the Bureau of Forestry (717-787-2106), and the Sustainable Forestry Initiative (1-888-734-9466).



*Areas containing sphagnum moss and cinnamon fern can be found in the hemlock palustrine forest communities of the watershed*

#### Wetlands

By definition, wetlands are areas that are either seasonally or permanently inundated with water, have hydrophytic (water-loving) vegetation, and contain hydric soils (soils formed under water-logged, anaerobic conditions) (Mitsch & Gosselink, 2000).

Wetland areas include floodplain zones, headwater areas, temporary ponds, and seeps. These may only hold water on a seasonal basis, during wetter months, or may be wet the entire

year. Floodplain wetlands form when an area of land becomes inundated with water from the adjacent stream or when groundwater comes to the surface in this zone. These areas are able to support a variety of plants and animals. Typical tree species in these communities may include a combination of sycamore, box elder, silver maple, tulip poplar, and American elm (McPherson, 2004). However, although sycamore is present along the floodplains, it is less common here than in more southern areas of the state. Silver maple floodplain forest is often more abundant along Redbank Creek itself.

Locations of higher-quality floodplain forest communities include those along Trout Run, Sandy Lick Creek, Beavertdam Run, Mud Run, Windfall Run, Seneca Run, Mill Creek, and Soldier Run.

One of the more interesting wetland community types found within the project is the hemlock mixed-hardwood palustrine forest. This wetland forest is dominated by hemlock, but may also contain species such as eastern white pine, yellow birch, black ash, and white oak. It is usually found around a permanently saturated wetland community type, such as a mixed-forest wetland community. The mixed-hardwood palustrine forest is characterized by mound and pool microtopography and areas dominated by sphagnum moss and cinnamon fern (Tracey, personal communication, 2006).

An overlooked wetland type is the vernal, or seasonal, pool. Seasonal pools are temporary wetlands that form in topographic depressions, typically during the spring (Mitsch and Gosselink, 2000). They have no outlet or source other than rainwater and dry up in the summer due to evapotranspiration. A number of species require seasonal pools for completion of their life cycles. The absence of fish predators is the primary reason why certain species select these pools, even though there is a risk of the pools drying up before the organisms are ready to leave. Species that may be found in vernal pools include the spotted salamander, wood frog, and fairy shrimp (Colburn, 2004). Although good information about vernal pools in the area is currently not available, Western Pennsylvania Conservancy (WPC) is conducting a volunteer-based project to document vernal pools in Pennsylvania, which may generate more information. Data gathered will be available to researchers, landowners, and agencies that manage these overlooked wetlands. WPC may be contacted for more information or to participate in this program.

#### Early-successional/Edge Habitats

The “value” of early-successional habitats in Pennsylvania is highly disputed. Whereas it is widely believed that these habitats were not historically part of the natural landscape of Pennsylvania, early-successional landscapes increased in abundance after the logging boom of the early 20<sup>th</sup> century. Early-successional habitats are those in the intermediate stage between forest and grassland, which develop as a forest recovers from recent logging activity. They are often susceptible to an influx of invasive species, such as multiflora rose and autumn olive. On the shores of Redbank Creek below Brookville, logging activity has contributed to the invasion of Japanese knotweed.

In many areas, natural succession has advanced beyond the early stages to the point where trees and forests comprise the main plant communities. As a result, habitat for some early-successional species, such as the golden-winged warbler and American woodcock, has been decreasing (Robertson and Rosenberg, 2003). The presence of a large amount of early-successional habitat is generally considered undesirable. Appropriate management strategies would maintain the majority of the project area in forest tracts of different age structures, allowing corridors between older, mature forests to support forest species, while maintaining some tracts of early-successional habitat. Active management of logged areas is also needed to promote healthy forest regeneration, remove invasive species, and limit the whitetail deer population. Essentially, this means maintaining a balance of natural habitats to benefit wildlife and the economy, while keeping in mind the historically forested landscape. Areas like power line rights-of-way and utility access roads may be appropriate areas to maintain early-successional habitat (McPherson, 2004).

### Grasslands/Open Habitats

Open habitats in Pennsylvania consist of natural grassy openings, farmland and cropland habitat, surface mines, and natural barrens. Grasslands are generally not a natural part of the landscape, but a result of human alteration. However, because native grassland habitats are disappearing in much of the United States, these types of non-natural grasslands are important for many species.

Abandoned farm fields, highway medians, power line rights-of-way, and hayfields can support grassland birds, mammals, and other wildlife. Declining grassland bird species, such as the grasshopper sparrow, dickcissel, and field sparrow, have been found in these habitats (Robertson & Rosenberg, 2003). The use of specific management options in habitats where forest regeneration is not feasible may be valuable for maintaining these and other grassland species. Although revegetating strip-mined areas with forestlands is often considered more desirable, grasslands can provide a viable option for the revegetation of these areas, because a number of native grasses are suited to dry, acidic conditions. However, mine land reclaimed to grassland provides very little financial benefit to the property owner. Newly developed reforestation techniques for surface mines can now return the disturbed land to productive and valuable hardwood production, which could lead to less forestland being converted to grassland in the future.

In urban or suburban areas, open land can also include large managed lawns, parks, golf courses, and recreational fields. These intensively managed areas are generally not suitable for grassland species, which require relatively undisturbed grasslands for cover and may be harmed by mowing and tilling practices.

### Rivers and Streams

#### Water Quality

A major portion of the impacts to aquatic resources is a result of mine drainage. Mining impacts are particularly severe as a result of naturally acidic conditions caused by the underlying sandstone geology, which is unable to provide buffering capacity for increased acidity caused by mining. Aluminum, iron, and other metals contained in mine drainage precipitate in streams, clogging the gills of fish and macroinvertebrates. Though agricultural land use makes up approximately 27 percent of the watershed, only one stream (Huling Run) is listed as impaired due to agriculture by Pennsylvania Department of Environmental Protection (DEP). The number of streams affected by agriculture is probably higher, but the impacts are essentially negated in some cases due to the predominance of mine drainage. Other sources of pollution include discharges from gas wells, industrial pollution, and malfunctioning septic systems (DEP; Armstrong County Conservation District). A canoe float by WPC down Redbank Creek found no noticeable AMD pollution entering the mainstem of the creek between Brookville and the tributary of Welch Run. Below this area, though, a number of AMD-polluted tributaries began to visually alter the condition of the creek.



*Mine drainage flowing in a tributary to Redbank Creek*

Acid deposition was another impact to water quality identified in the North Fork Watershed Assessment and Restoration Plan, affecting water quality in much of the headwaters of the North Fork Redbank Creek watershed. This includes the following streams which are listed as either high quality or exceptional value: South Branch North Fork Creek, Shippen Run, Craft Run, and North Fork Redbank Creek.

Four streams are considered Exceptional Value and six are considered High Quality by DEP (Pennsylvania Code, 1997c). Exceptional Value streams include Silver Creek, South Branch North Fork Creek, Shippen Run, and Craft Run. High Quality streams include Silver Creek, Falls Creek, Schoolhouse Run, Little Mill Creek, North Fork Redbank Creek, and Beaver Run.

More information about water quality is provided in the Water Resources chapter.



*A blackwater stream ecosystem found at the headwaters of North Fork Redbank Creek*

#### Unique Feature

One of the unique features is the presence of low-medium gradient, blackwater stream systems. These are found mainly in the headwaters of the North Fork Redbank Creek subwatershed. These streams flow slowly through headwater wetland areas of low pH and high organic matter, mainly hemlock palustrine swamps. Such swamps often form over time as water flow is impeded by a buildup of organic matter and/or debris. Leaching from the conifer needles that characterizes the swamps causes a dark color, high dissolved-matter content, and low pH. Hemlock palustrine swamp communities are typically found adjacent to other types of wetlands, such as those containing native shrubs, through which the stream system also flows.

## Wildlife

### Birds

This area is home to a variety of bird species, especially those utilizing forested habitats, including owls, woodpeckers, and numerous migratory species. Data about the birds exists as a result of the Pennsylvania Breeding Bird Atlas and United States Geological Survey's Breeding Bird Survey. The Pennsylvania Breeding Bird Atlas uses volunteers throughout Pennsylvania to document birds that are breeding in designated geographic areas, or "blocks." The first Bird Atlas Project was conducted from 1983–1989 and the second Atlas Project is currently underway (2004–2008) (Brauning & Gill, 1994). Another resource, the North American Breeding Bird Survey (NABBS), documents breeding birds along predetermined driving routes throughout the United States, such as Route 72009, which passes through the region (Sauer, Hines, & Fallon, 2005).

At least 20 of the bird species found are of conservation concern according to Partners in Flight (PIF) or the National Audubon Society. PIF is a conservation organization dedicated to documenting and developing conservation strategies for the protection of at-risk bird species in North America (Robertson & Rosenberg, 2003). National Audubon Society has similar objectives, but focuses on the United States. Birds on the Audubon Watchlist are considered to be seriously declining or face major threats within the United States.

Table 4-1 shows at-risk species according to either PIF or National Audubon Society priorities. Priorities differ slightly, but many birds are on both lists. Species at risk throughout North America are considered to be of highest conservation concern. Other species may not be of high concern nationally, but are declining in the Allegheny Plateau region (regional concern). The conservation region also has high responsibility for protecting a species if it hosts a significant percentage of their population. Additional species may not be notably declining but specific threats to their survival have been recognized (high regional threats).

Included in these at-risk species are many grassland species, such as the grasshopper sparrow, and shrub/scrub species, such as the golden-winged warbler and blue-winged warbler. As the forested areas have been recovering in recent decades, early-successional habitats have been declining (Robertson & Rosenberg, 2003). Though the importance of maintaining mature forest landscapes should be recognized, the maintenance of early-successional habitats is important for some species. Scrub/shrub species require only a small plot within a forest mosaic. Grassland species, which may require more space, can often be found in reclaimed strip mines.

A number of forest bird species also are considered at-risk in this largely forested region, including species, such as the cerulean warbler that require a layered forest structure with trees of multiple ages. As forests get older, important understory vegetation decreases because less light penetrates the forest canopy. But, one of the biggest factors contributing to these species' decline is poor forest management. Commonly used even-aged management practices, such as shelterwood cuts, can be detrimental. This practice involves logging the majority of the forest, but leaving a sampling of healthy trees of a variety of species for regeneration. The practice can be an important management tool for regenerating oak forest; however, when too many of these cuts occur over a landscape, diverse habitat for forest species becomes scarce. Also, because whitetail deer populations in the Redbank Creek watershed are so high, many of these forests do not properly regenerate and the area remains devastated (McPherson, 2004). In other cases, the forests are healthy, but the streams that flow through them are impaired. This affects species, such as the Louisiana waterthrush, that require forest next to higher-quality streams.

**Table 4-1. Priority Bird Species**

Species	High Continental Concern	High Regional Concern	High Regional Responsibility	Low Regional Responsibility	High Regional Threats or State Listed
wood thrush*	X	X	X		
blue-winged warbler*	X	X	X		
Canada warbler*	X	X	X		
willow flycatcher*	X	X	X		
American woodcock*	X	X	X		
American black duck*	X			X	
cerulean warbler*	X			X	
golden-winged warbler*	X			X	
prairie warbler*	X			X	
worm-eating warbler*	X			X	
red-headed woodpecker*	X			X	
black-billed cuckoo		X			
field sparrow		X			
scarlet tanager		X			
eastern towhee		X			
Louisiana waterthrush			X		
rose-breasted grosbeak			X		
grasshopper sparrow					X
dickcissel*					X
olive-sided flycatcher*					
* these species are also on the Audubon Watchlist					

### Amphibians and Reptiles

The primary habitat for amphibians and reptiles is forested headwater streams. Turtle abundance and diversity is rather low because of the rugged, forested terrain (Myers, 2000). Riparian wetlands and temporary woodland pools may support mole salamanders, like the spotted and Jefferson salamanders, and the elusive four-toed salamander whose range extends to the watershed. However, sightings of these species in the watershed are uncommon. They are often difficult to locate because they spend most of the year in underground burrows. Species that may be found in the many forested streams in the watershed include northern and mountain dusky salamanders, longtail salamanders, and northern two-lined and northern spring salamanders (Hulse, McCoy, & Censky, 2001).

Several species within the watershed are at the farthest extent of their ranges. The northern copperhead snake is found only in the southernmost two-thirds of Pennsylvania. The queen snake, which is likely at its very eastern extent, is an inhabitant of fast-flowing streams, creeks, and small rivers bordered with shrubs and trees and containing an open canopy. This species rarely strays from the stream's edge and feeds solely on crayfish. The mountain chorus frog, which has its northeastern extent in the vicinity of the watershed, is highly suited to available habitat there. This frog, which can be confused with the spring peeper, lives in upland deciduous woodlands and is generally not associated with water (except during breeding season). However, this is one of the most understudied species in the country and none have been identified in the last few decades (Hulse et al., 2001).

### Fish

Forty-one different species of fish have been identified within the Redbank Creek watershed, according to waterway management reports from the Pennsylvania Fish and Boat Commission (PFBC). In order to complete the management plans, surveys of waterways were conducted to examine biological, chemical, physical, and social characteristics. Using the results of the surveys, the PFBC developed management plans determining what stream sections would be stocked and with which species they would be stocked.

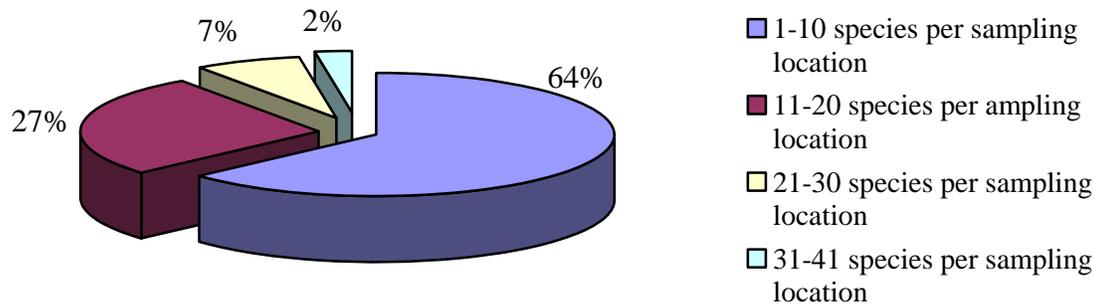


*Mottled sculpin*

The most diverse species was the creek chub, found in 32 of the 40 sampling sites. The blacknose dace and the mottled sculpin were also very diverse, being identified in 30 of the sampling sites, while the white sucker was identified in 28 sites.

The majority of the species identified—64 percent—were identified in 10 or less of the sampling sites. Appendix G identifies all of the species collected and their locations within the 40 sampling sites, while Figure 4-2 shows the percent occurrence at sampling locations.

Figure 4-2. Percent Occurrence at Sampling Locations



### Mammals

The Pennsylvania Gap Analysis Project used Geographic Information Systems to provide an understanding of the distribution of mammals, birds, amphibians, reptiles, and fish in Pennsylvania. Though mammals are associated with many different habitats, mammal diversity tends to be higher in intact areas of forest, which have been less impacted by fragmentation. Areas with a high percentage of core forest, or interconnected forest with little edge, such as the Allegheny High Plateau section in the northern portion of the state and the ridges of the Ridge and Valley Province, support the highest diversity of mammal species in Pennsylvania (Myers, 2000). The Redbank Creek watershed borders the Allegheny High Plateau section and, even though it is more heavily fragmented than areas farther north, it also supports a high population of mammals. Many of the larger mammal species have smaller populations in other areas of Pennsylvania because habitat is not available. These include the bobcat and the black bear.

The bobcat is the only wild cat found in the state. It is found in early-successional, yet more remote, woodlands. Its habitat has been declining as forest matures in Pennsylvania. The large, intact forests of the watershed are typical of those preferred by black bear.

Though mammals are largely terrestrial, many are semi-aquatic and depend on plants and animals near waterways or wetland environments for food. These species include shrews and bats, as well as raccoons, mink, and beavers.

Potential mammal species of special concern include the Allegheny woodrat and least shrew, though neither has yet been identified in the counties that make up the watershed. Historically, little has been done to document the mammals in this region of Pennsylvania; more effort is needed.

## Conservation Areas

### Natural Heritage Areas

WPC, with funds provided by DCNR and other sources, is working to complete County Natural Heritage Inventories (CNHIs) in western Pennsylvania. These inventories identify and map the most significant natural places in a county based on species accounts and natural communities (McPherson, 2004). Areas important for wildlife habitat and scientific study are also included. WPC is part of the Pennsylvania Natural Heritage Program, which includes a group of organizations dedicated to collecting, tracking, and interpreting information regarding Pennsylvania's biodiversity. The final product of these CNHI investigations is a report highlighting specific areas and giving detailed management recommendations for their protection. The report should be utilized by local municipalities, counties, utility companies, and groups involved with comprehensive planning, zoning, review of development proposals, and other objectives.

The Redbank Creek watershed is located in Jefferson, Clearfield, Clarion, and Armstrong counties. The Jefferson, Armstrong, and Clarion county NHIs are currently underway, and are scheduled to be completed in 2006. The Clearfield County NHI, completed in 2004, was administered by the Clearfield County Planning Commission (McPherson, 2004).

The natural areas identified in NHIs are termed:

#### 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 takes into account the natural community or habitat that is the focus of the site.

#### Landscape Conservation Area (LCA):

A larger area of land, compared to a BDA, that contains minimal human disturbance and allows ecosystems to function on a landscape level. These areas often contain multiple BDAs.

#### Dedicated Area (DA):

An area of land recognized because of an owner's specific intention to protect it, which could result in the site improving either to become a BDA in the future or to become a high-quality area within an already designated BDA. Numerous areas within the watershed could be DAs in the future through landowner agreements, special programs, or other methods.

The following section describes BDAs located within the Redbank Creek watershed. Specific names and exact locations of rare species are omitted from NHIs and this report to protect those species. Generally, few species of special concern have been identified within the watershed. Although, a number of unique habitats exist that are relatively rare in Pennsylvania, including hemlock palustrine forests and blackwater streams. More study of these ecosystems is needed to better understand their ecology and hydrology.

#### Clearfield County

##### 1) **Sandy Lick Creek and Laborde Branch Wetland BDA**

Significance: High

Location: Sandy and Union townships

Description: Various portions of the wetlands provide habitat for many species, including two species of special concern in Pennsylvania.

Rare Occurrences: Heron rookery and highbush cranberry

Threats and Stresses: Invasive species; State Route 255 follows the creek, influencing the natural hydrology and probably resulting in greater impoundment of water between the road and the creek; several potential sources of water quality pollution exist with State Route 255, Interstate 80, several dirt roads, and industrial activities; loud noises and intrusions in the vicinity of the heron rookery.

Recommendations: Human visitors should maintain a 300-meter distance from the heron rookery during mating season. Chloride-based salts should not be utilized as a de-icing agent along roads that border wetlands. Alternative products, such as calcium magnesium acetate, should be utilized. Discharges associated with industrial activities should be carefully monitored. Foraging areas for the herons should be protected from development and should have a surrounding disturbance-free buffer of at least 328 feet.

## 2) Wolf Run Wetland BDA

Significance: Notable

Location: Sandy Township

Description: Wetland is situated in the center of a large, forested area within State Game Lands 77, drawn around an extensive acidic headwaters wetland with diverse flora.

Rare Occurrences: Hemlock palustrine forest community

Threats and Stresses: Forest canopy removal, along with the removal or disruption of herbaceous growth and organic debris, may negatively impact the quality of the habitat for amphibians by increasing temperatures and decreasing humidity on the forest floor. The use of chemical weed and pest controls, or other discharges of toxic materials, may harm wetland flora and fauna.

Recommendations: Full forest canopy should be maintained and disturbance to the forest floor minimized to avoid detrimentally impacting amphibian populations. Further surveys documenting amphibian and insect species utilizing the wetland are recommended, as these groups provide a baseline to guide future management decisions.

### Jefferson County

## 3) O'Donnell Run BDA

Significance: High

Location: Winslow and Pine Creek townships

Description: Forested stream valley with abundant wildflower populations that support a species of special concern that is currently undergoing severe declines in its range

Rare Occurrences: One animal species of special concern

Threats and Stresses: Fragmentation of the contiguous forest canopy, invasion by garlic mustard (which causes direct mortality to the species of special concern), and impacts to the larval host plant by the effects of overabundant deer.

Recommendations: Any additional fragmentation of the forested habitat that the species of special concern occupies should be avoided. Garlic mustard and other invasive exotic species should be monitored and controlled as encountered. Reduction of the deer herd also would protect plant species.

## 4) Mill Run BDA

Significance: Exceptional

Location: Pine Creek Township and Brookville Borough

Description: Forested area that provides breeding and foraging habitat for a species of special concern

Rare Occurrences: Species unnamed due to sensitivity issues

Threats and Stresses: This species is sensitive to forest fragmentation, as well as timber management. Additionally, harassment and collection by people is also a threat.

Recommendations: Eliminate disturbance in the core area of breeding habitat.

#### 5) Muddy Run BDA

Significance: Exceptional

Location: Polk Township

Description: A large wetland complex that includes a tracked community of special concern, as well as extensive open marsh lands and wet meadows.

Rare Occurrences: A representative example of a hemlock palustrine forest community; one animal species of special concern

Threats and Stresses: Continued alteration of the wetland hydrology through construction of impoundments; fragmentation of the surrounding wetland and changes to the hydrology of the wetland are major threats to this system.

Additionally, invasion by the exotic forest pest, hemlock wooly adelgid, may have significant effects on the tracked community.

Recommendations: Maintenance of the forest contiguity and hydrology of the system



*Tawny cottongrass wetland at Muddy Run*

#### 6) South Branch North Fork BDA

Significance: Exceptional

Location: Polk, Snyder, and Warsaw townships

Description: Exceptional Value stream including an associated hemlock palustrine forest and a large wetland complex

Rare Occurrences: A natural community of special concern

Threats and Stresses: Fragmentation of the surrounding wetland and changes to the hydrology of the wetland are major threats to this system. Additionally, invasion by the exotic forest pest, hemlock wooly adelgid, may have significant effects on the tracked community. Acid deposition also poses a threat to the water quality of this BDA.

Recommendations: Maintenance of the forest contiguity and hydrology of the system.

#### 7) Munderf Rookery BDA

Significance: High

Location: Polk Township

Description: Nesting colony within a mature forest

Rare Occurrences: Colonial nesting site containing over 20 nests for a bird species

Threats and Stresses: Disturbance by human recreation, as well as potential timbering activities in the immediate area

Recommendations: Keep trails and other recreation at least 1,500 feet from the nest colony. Eliminate timber harvesting from this core area.

#### 8) McNeil Station Road BDA

Significance: High

Location: Heath and Polk townships

Description: Wetland complex that supports a natural community of conservation concern

Rare Occurrences: Two occurrences of a hemlock palustrine forest

Threats and Stresses: Fragmentation of the surrounding wetland and changes to the hydrology of the wetland are major threats to this system. Additionally, invasion by the exotic forest pest, hemlock wooly adelgid, may have significant effects on the tracked community.

Recommendations: Maintenance of the forest contiguity and hydrology of the system.

**9) Spring Creek Road BDA**

Significance: Local

Location: Heath and Polk townships

Description: A vernal pool community located along a roadside

Rare Occurrences: Vernal pool community

Threats and Stresses: Runoff from roads, including sediment and de-icing salts, can affect populations of breeding amphibians.

Recommendations: Protect surrounding upland forest from changes caused by timbering and development.

**10) Hays Lookout Tower BDA**

Significance: Local

Location: Polk Township

Description: A vernal pool community

Rare Occurrences: Vernal pool community

Threats and Stresses: Runoff from roads, including sediment and de-icing salts, can affect populations of breeding amphibians.

Recommendations: Protect surrounding upland forest from changes caused by timbering and development.

**11) North Fork at Seneca Run BDA**

Significance: High

Location: Eldred, Pine Creek, and Rose townships

Description: Aquatic habitat and its associated riparian buffer of a section of Redbank Creek

Rare Occurrences: One aquatic animal species of special concern.

Threats and Stresses: Habitat degradation from siltation and stream pollution

Recommendations: The use of BMPs can prevent or eliminate the impact of non-point source pollution generated from activities within the watershed that affect water quality.

**12) Shippen Run BDA**

Significance: High

Location: Eldred and Warsaw townships

Description: An Exceptional Value stream that is a tributary of North Fork Redbank Creek

Rare Occurrences: None noted

Threats and Stresses: Uses of the land that can degrade water quality (increased siltation and canopy removal leading to higher temperature) are the major threats to this BDA. Acid deposition also poses a threat to the water quality of this BDA.

Recommendations: Activities such as road development and timber harvesting should not be conducted in the core areas of this site. If activities cannot be eliminated, the use of best management practices (BMPs) can prevent or eliminate the impact of non-point source pollution on water quality generated from these activities.

**13) Craft Run BDA**

Significance: High

Location: Eldred and Warsaw townships

Description: An Exceptional Value stream that is a tributary of North Fork Redbank Creek

Rare Occurrences: None noted

Threats and Stresses: Uses of the land that can degrade water quality (increased siltation and canopy removal leading to higher temperature) are the major threats to this BDA. Acid deposition also poses a threat to the water quality of this BDA.

Recommendations: Activities such as road development and timber harvesting should not be conducted in the core areas of this site. If activities cannot be eliminated, the use of BMPs can prevent or eliminate the impact of non-point source pollution on water quality generated from these activities.

#### **14) North Fork BDA**

Significance: High

Location: Eldred, Pine Creek, and Rose townships

Description: Aquatic habitat and its associated riparian buffer of a section of North Fork Redbank Creek

Rare Occurrences: One aquatic animal species of special concern.

Threats and Stresses: Habitat degradation from siltation and stream pollution and acid deposition affect the water quality in this BDA.

Recommendations: The use of BMPs can prevent or eliminate the impact of non-point source pollution generated from activities within the watershed that affect water quality.

#### **15) North Fork at Sugarcamp Run BDA**

Significance: High

Location: Eldred, Pine Creek, and Rose townships

Description: Aquatic habitat and its associated riparian buffer of a section of North Fork Redbank Creek

Rare Occurrences: One aquatic animal species of special concern.

Threats and Stresses: Habitat degradation from siltation and stream pollution

Recommendations: The use of BMPs can prevent or eliminate the impact of non-point source pollution generated from activities within the watershed that affect water quality.

It is recommended that a buffer zone be established around BDAs and that certain activities be eliminated or reduced within the buffer zone. Depending on the characteristics of the BDA, these activities may include camping, intensive logging, and development. The type of activities that can occur in a buffer zone are dictated by the needs of the particular plant, animal, or community that is in need of protection, and often can be incorporated into a management plan for the BDA. Suggested buffers are already incorporated into the BDA areas in Figure 4-2. Buffers are particularly important for wetland communities whose existence depends directly on a high water table. Removal or alteration of vegetation can cause the water table to be lowered, drying up or altering these communities. These hydrologic changes can lead to an increase in invasive species and a decrease in native plants of special concern.

**Table 4-2. Significance Rankings for BDAs**

Significance Rank	Explanation
Exceptional	Sites are of exceptional importance for the biological diversity and ecological integrity of the county or region, containing one or more occurrences of state or national species of special concern or a rare natural community of adequate size, condition, and extent. These areas deserve complete and strong protection.
High	Sites are highly important for biological diversity of county or region and, just like exceptional sites, contain species of special concern or natural communities that are highly ranked. These sites are also of relatively large extent and are primarily undisturbed, but are of slightly less importance in terms of rare species or condition than exceptional sites. These sites deserve strong protection.
Notable	Sites in this category contain occurrences of species of special concern or natural communities that are either more common or of smaller size and extent than exceptional or high rank areas, or have activity and disturbance. These sites deserve special protection within the context of their characteristics, degree of disturbance, and place in the community.
County	These sites have great potential for protecting biodiversity, but have not yet been found to contain species of special concern or state significant natural communities. Because of their size, undisturbed character, or proximity to other significant areas, these sites deserve further study and investigation as possible future high or exceptional sites.

Regular monitoring by landowners or concerned citizens can help to determine the health of BDAs. Just noting the types of activity occurring within the buffer zone can provide valuable insight into steps that could be taken for a BDA’s protection. This is a potential role that local organizations could play in helping to maintain these sites. If a property is identified as being threatened or as having special significance to the community, there is the possibility of working with the landowner to obtain a conservation easement for the property (private land), to develop a management plan for the property (public or private land), or to donate or sell the property for public use (private land). At the very least, the landowner could be informed of the special characteristics of the property and actions that could be taken by him/her to preserve them. In the case of a conservation easement, the landowner gives up the right to perform certain activities on the property but still retains the use of the land, in exchange for a deduction on their property tax. DCNR offers Parks and Recreation Grants for non-profit organizations that wish to purchase a property for public use. DCNR, WPC, and other organizations can be contacted for more information about these opportunities. WPC is active in a current project to locate and document seasonal wetlands in Pennsylvania in an effort to understand their ecology and what is needed for their protection. Community members can report the sighting of these areas on the WPC website and WPC will work with volunteers in the coming years to monitor these important areas for populations of amphibians, invertebrates, and other wildlife.

Important Bird and Mammal Areas

There are no Important Bird Areas (IBAs) or Important Mammal Areas (IMAs) within the watershed. The heron rookery, mentioned in the Sandy Lick Creek and Laborde Branch Wetland BDAs, may qualify for designation as an IBA if it meets certain qualifications. Individuals, organizations, or local Audubon chapters can nominate a site by contacting the Pennsylvania Audubon Society.

## Species of Special Concern

Species of plants and animals are given rankings at the state and global levels based on the number of times the species has been documented in that geographic area. Most species have a rank assigned to them, even if they are not threatened or endangered. In Pennsylvania, a species is commonly considered to be of “special concern” if it has a ranking of “vulnerable” or lower. Global ranks are assigned based on data collected at similar state offices nationwide as a part of a network called NatureServe.

The Pennsylvania Natural Heritage Program (PNHP) is responsible for collecting and managing data related to species in the state and establishing these rankings (PNHP). The PNHP is a partnership among WPC, DCNR, and The Nature Conservancy.

The Endangered Species Act of 1973 (and its amendments) provides broad protection for aquatic and terrestrial species of wildlife and plants that are listed as threatened or endangered in the United States or elsewhere. An endangered species is a species that is considered to be in danger of becoming extinct throughout its range. A threatened species is a species at risk of becoming endangered unless special action is taken. A candidate species is one that is proposed for listing as endangered or threatened at the state or local level by a state or federal agency.

In Pennsylvania, threatened or endangered status is determined by the appropriate state agency. For instance, the Pennsylvania Game Commission is responsible for assigning state statuses to bird and mammal species, while the Pennsylvania Fish and Boat Commission is responsible for fish, amphibians, and reptiles. Because there is no state agency that oversees invertebrates, such as moths and butterflies, these species can only receive state endangered or threatened status if they are federally listed. Therefore, there may be some species that technically meet the state endangered or threatened requirements, but that have not officially been given this designation.

Provisions are made for listing species, as well as for the development of recovery plans and the designation of critical habitat for listed species. As part of both federal and state acts, an environmental assessment of properties for species of concern is required before large-scale building or development projects can be permitted. However, rather than stopping development altogether, changes in design or timing of construction can often be made to protect habitat for these species.

Within the Middle Allegheny-Redbank Creek watershed, as designated by the PNHP, 68 species of concern have been identified. For protection purposes, the location of individual species cannot be provided. Appendix G lists state and global rankings for species of concern identified within the project area.

## Invasive Species

A non-native invasive species can be defined as a plant, animal, or other organism introduced to an ecological system that causes economic or environmental harm or harm to human health. Invasive species are one of the largest threats to wildlife habitat in Pennsylvania. Not all non-native species are harmful to other species or to wildlife, but some species may have severe impacts. Invasive plant species can inhibit forest regeneration in areas disturbed by deer, erosion, or human activities and impact agricultural activities. Wildlife feeding on forest-floor invertebrates may be adversely affected by changes in natural communities. This can cause cascading effects throughout the food chain, reducing food availability for species such as turkey, bear, and forest-interior birds.



This Japanese knotweed was photographed near the mouth of North Fork Creek

Plants

DCNR maintains a list of common invasive plant species within each region of Pennsylvania. Though most of the Redbank Creek watershed is included in the northwestern region, the project area also extends to the north-central and southwestern regions. Table 4-3 gives a list of common invasive plant species for the northwestern region (DCNR, 2004a). Invasive species pose the largest future threat in areas that have been altered by disturbances, such as impoundment, development, mining, oil and gas extraction, and poor forestry and agriculture management practices. In disturbed areas, invasive species can displace native plants intolerant to the changing conditions. Surveys conducted by WPC in the Redbank Creek watershed have indicated that many of these invasive species are not yet significantly

established.

**Table 4-3. Common Invasive Plants of Northwestern Pennsylvania (Source: DCNR)**

Serious Threats	Moderate Threats
garlic mustard ( <i>Alliaria petiolata</i> )	goutweed ( <i>Aegopodium podagraria</i> )
musk thistle ( <i>Carduus nutans</i> )	cheatgrass ( <i>Bromus tectorum</i> )
Canada thistle ( <i>Cirsium arvense</i> )	dame's rocket ( <i>Hesperis matronalis</i> )
bull thistle ( <i>Cirsium vulgare</i> )	wild parsnip ( <i>Pastinaca sativa</i> )
giant hogweed ( <i>Heracleium mantegazzianum</i> )	reed canary grass ( <i>Phalaris arundinacea</i> )
purple loosestrife ( <i>Lythrum salicaria, virgatum</i> )	Japanese barberry ( <i>Berberis thunbergii</i> )
common reed ( <i>Phragmites australis</i> )	European barberry ( <i>B. vulgaris</i> )
Japanese knotweed ( <i>Polygonum cuspidatum</i> )	border privet ( <i>Ligustrum obtusifolium</i> )
Johnson grass ( <i>Sorghum halepense</i> )	Bell's honeysuckle ( <i>Lonicera morrowii x tatarica</i> )
autumn olive ( <i>Elaeagnus umbellata</i> )	glossy buckthorn ( <i>Rhamnus frangula</i> )
Amur honeysuckle ( <i>Lonicera maackii</i> )	
Morrow's honeysuckle ( <i>L. morrowii</i> )	
Tartarian honeysuckle ( <i>L. tartarica</i> )	
multiflora rose ( <i>Rosa multiflora</i> )	
Oriental bittersweet ( <i>Celastrus orbiculatus</i> )	
Japanese stiltgrass ( <i>Microstegium vimineum</i> )	

Two invasive exotic plant species that were found within the project area, and could pose serious threats to the native biodiversity of the area, are Japanese knotweed and Japanese stiltgrass. Japanese knotweed has been positively identified in disturbed areas on the banks of North Fork Redbank and Redbank creeks. It spreads mainly through its root system, and one plant can grow to encompass miles of streambank (Van Driesche, Blossey, Hoodle, Reardon, & Lyon, 2002). Very small root and stem fragments are capable of sprouting, and streambank erosion can transport these plant parts downstream to take root in new areas. Japanese stiltgrass easily invades moist, shaded areas, such as forests and floodplains. It can alter soil chemistry and, like Japanese knotweed, outcompete native species. Humans, animals, and water easily disperse seeds. Mechanical removal before seed production every year and herbicide application can be somewhat effective at preventing the spread of these species if implemented early (Swearingen, Reshetiloff, Slattery, & Zwicker, 2002). Once well established, these species are difficult and costly to control.

### Animals

Invasive animal species include forest pests, such as the gypsy moth and hemlock woolly adelgid, and aquatic species, such as the zebra mussel. The gypsy moth is prevalent throughout Pennsylvania and the hemlock woolly adelgid has been identified in many counties, including those within the Redbank Creek watershed.

#### Gypsy Moth

Forest Bureau experts identify the gypsy moth as the single-most destructive forest pest in Pennsylvania. It feeds while in the larval, or caterpillar, stage. The gypsy moth was introduced to the United States from Europe in the 1980s.

Eggs are deposited in July and overwinter on bark and stones. Gypsy moth caterpillars hatch and begin feeding from mid- to late April in southern Pennsylvania, and in early to mid-May in the northern part of the state. Oak, sugar maple, beech, and aspen trees are preferred food sources for this caterpillar's voracious appetite. Large gypsy moth populations may strip entire trees of their foliage, leaving them weakened and susceptible to disease, drought, and attack by other pests. A tree begins to suffer when 30 percent or more of its leaf surface is lost (Purdue Research Foundation, 2004).

Gypsy moth populations are typically highest following wet, more temperate winters, while cold, dry winters cause the death of egg masses. Private landowners with forested land containing 250 or more egg masses per acre may be eligible for insecticide applications administered through the DCNR Bureau of Forestry. However, the biggest factor controlling populations is a natural fungus, which grows on most hardwoods and adversely affects the gypsy moth (Purdue Research Foundation, 2004).

#### Hemlock Woolly Adelgid

This tiny, fluid-feeding insect was introduced from Japan in the early 20<sup>th</sup> century, and was first discovered in Pennsylvania in 1969. Forty-two counties in Pennsylvania have been infected, including those within the Redbank Creek watershed. However, infestation is currently heaviest in south and southcentral Pennsylvania and low in the western portion, which includes the project area. Cold weather over the last several years has contributed to high mortality and likely prevented expansion of this pest, which most commonly affects hemlocks, but can also affect spruce trees (Spichiger, 2004).

The species prefers cool conditions and is most active from October to June. Eggs hatch in February or March. Damage is inflicted when an immature nymph or adult sucks sap from twigs, which causes hosts to lose needles and possibly die. Biological control agents include a beetle, which was released by DCNR in 2004 on affected hemlock trees in central and southern Pennsylvania. DCNR is also in the process of establishing sites for chemical applications against the hemlock woolly adelgid (Spichiger, 2004).

#### Zebra Mussel

Zebra mussels were brought to the United States in the 1980s in the ballasts of European ships. Since that time, they have colonized many lakes and streams in the Great Lakes region and also the entire stretch of the Mississippi River. These thumbnail-size mussels impose damage by removing all of the microscopic food, including plankton and zooplankton, depriving other organisms and altering the food chain (Pennsylvania Sea Grant, 2003).

The Pennsylvania Zebra Mussel Monitoring Network was established in 1990–1991 to monitor the spread of zebra mussels in the state. Volunteer personnel from a variety of agencies report sightings of the species to DEP. Due to its ecological requirements, the species is restricted to slow-flowing rivers, impoundments, reservoirs, and lakes. For instance, it has been identified in the Monongahela, Ohio, and Allegheny rivers, and in French Creek above an impoundment (Shaw, personal communication, 2006).

The zebra mussel is most commonly transported in ship ballasts and on recreational boats that utilize multiple waterways. It is not anticipated that this species poses a significant threat to the Redbank Creek watershed because it requires slow-flowing areas and high calcium content for growth.

### Management Recommendations

<b>Goal 4-1. Implement strategies to conserve rare and unique communities, flora, and fauna.</b>	
Increase habitat by planting or allowing the natural regeneration of riparian buffers through streambank fencing programs.	High
Promote the preservation of riparian areas through education about their benefits for wildlife, flood prevention, and groundwater supplies.	High
Improve aquatic life for fish, mussels, and other organisms by implementing best management practices and other restoration activities.	High
Protect or improve habitats that support threatened and endangered species and species of concern through acquisition, easements, and/or landowner education.	High
Encourage streamside property owners to maintain a stream-edge buffer when mowing their lawn.	Medium
<b>Goal 4-2. Minimize the spread of exotic and invasive species.</b>	
Develop an eradication or control strategy for removing invasive species, especially from high-quality areas or areas where an invasive species is expanding its territory.	High
Conduct an invasive species plant survey to develop a list of areas where invasive species pose the greatest threats to biodiversity.	Medium
Develop monitoring plans for invasive species on private properties by working with landowners, especially those whose properties contain high-quality natural communities.	Medium
Encourage the use of native plants in landscape and wildlife habitat plantings.	Medium
Compile an Internet database of exotic and invasive species sightings that can be accessed and added to by the public.	Low
<b>Goal 4-3. Protect and improve wildlife habitats.</b>	
Conduct a wetland inventory.	High
Educate residents about the importance of biodiversity and the need to protect it.	High
Develop forest and wildlife management plans.	Medium
Develop detailed management plans for landowners of biologically diverse areas, including inventories of natural features and invasive or exotic species monitoring plans.	Medium
Secure funding for purchasing easements to protect wetlands.	Medium
Establish a reasonable balance between human interests and wildlife protection.	Medium
Establish biodiversity indices for selected stream segments to document the current status of biodiversity and to track changes over time as management recommendations are implemented.	Medium
<b>Goal 4-4. Educate the public about the use and purpose of Natural Heritage Inventories in planning, with a focus on the importance of the natural resources that exist.</b>	
Study and expand biological diversity areas documented in County Natural Heritage Inventories.	Medium
Implement County Natural Heritage Inventories for Armstrong and Clarion counties once they are completed.	Medium
Incorporate Natural Heritage Inventories into county and municipal comprehensive plans.	Medium

**Goal 4-5. Develop strategies to reduce or curtail the negative impacts caused by deer overbrowsing.**

Encourage hunters to participate in the deer management assistance program (DMAP) to keep deer herds at ecologically healthy levels.	Medium
Foster continued involvement in hunting activities among all age groups and educate hunters on the importance of reducing the doe herd population.	Medium
Encourage private landowners in impacted areas to open their lands to hunting.	Medium

**Goal 4-6. Promote sustainable forestry practices and responsible private land management.**

Provide forest landowners with educational materials about sustainable forestry practices, so they understand how to protect their resource and can discuss various options with potential logging companies and foresters.	Medium
Provide forest landowners with a current list of certified foresters in their area to guide them in the proper management of their land.	Medium
Consider forming voluntary landowner associations for the purposes of providing dialogue and education about the wise stewardship of private lands	Low

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## CHAPTER 5. CULTURAL RESOURCES

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The Redbank Creek watershed is located within two recognized cultural regions of Pennsylvania, the Lumber Heritage Region and the Pennsylvania Wilds. The Lumber Heritage Region, a designation given by the Pennsylvania Department of Conservation and Natural Resources (DCNR), highlights the natural, cultural, historical, and recreational resources that embodied the industrial traditions of the lumbering industry. Covering 12,500 square miles within 15 counties of north-central Pennsylvania, the region links the heritage and culture of the lumber industry to the development of this region.

The Pennsylvania Wilds, a new name given to the region, is a marketing strategy that Pennsylvania has developed in an attempt to increase tourism and tourism-based business around the natural and outdoor experiences available in north-central Pennsylvania. The majority of the project area (Clarion, Jefferson, and Clearfield counties) is located in the Pennsylvania Wilds Region.

### Recreation

Recreation is becoming a big business in Pennsylvania, especially in rural areas. Not only has recreation become the second-leading industry in Pennsylvania, for some areas it is the only industry. It can bring in revenue from tourists who seek food, lodging, and mementos of their visit. Recreation is not only beneficial to the economy, but also is a healthy endeavor. According to findings from Panorama Recreation (a commission of municipalities from the Saanich Peninsula in Canada whose objective is to provide recreation and leisure activities and facilities to all citizens regardless of age, gender, religion, or economic status) the following are benefits of having recreational opportunities in communities (2004):

- Recreation and active living are essential to personal health.
- Recreation is key to balanced human development.
- Recreation and parks are essential to quality of life.
- Recreation reduces self-destructive and anti-social behavior.
- Recreation and parks build strong families and healthy communities.
- Recreation reduces health care, social services, and police and justice costs.
- Recreation and parks are significant economic generators.
- Parks, open space, and natural areas are essential to ecological survival.

The Redbank Valley region is fortunate to provide numerous recreational opportunities to residents and visitors alike. Opportunities include hiking, biking, fishing, hunting, horseback riding, boating, camping, wildlife viewing, and off-road or all-terrain vehicle (ATV) riding.

#### Recreation Facilities

Various public and private recreational facilities exist, although no state parks are located within the watershed. Public lands include several State Game Lands, a portion of the Kittanning State Forest, public parks, ball fields, school playgrounds, and trails. Private recreational facilities, such as bowling alleys, paintball fields, golf courses, hunting preserves, speedways, and campgrounds also exist. Recreational facilities are highlighted in Figure 5-1.



### Parks

**Redbank Valley Municipal Park**, often referred to as Alcola Park, is the home of the Clarion County Fair. The park offers roller-skating, swimming, tennis courts, ball fields, horseshoes, shuffleboard courts, campgrounds, and a playground. A reception hall and picnic shelters are also available to rent.

**Jefferson County Reynlow Park** is located three miles south of Reynoldsville on Route 310. The park has a small pond and a lake for fishing. Picnic sites and pavilions are available. There is also a gazebo, campground, and play areas.

The Borough of Brookville maintains four community parks: Brookville Memorial Park, Longview Park, Northside Park, and Dr. Walter Dick Memorial Park. **Brookville Memorial Park** has a playground, tennis and basketball courts, athletic fields, and a picnic area. **Longview Park** has a playground,



*The Dr. Walter Dick Memorial Park is a popular recreational place for many watershed residents*

basketball court, picnic shelter, and outdoor amphitheater. **Northside Park** is a park with open space, lighted walkways, baseball fields, and softball fields. **Dr. Walter Dick Memorial Park** is located along North Fork Redbank Creek just outside the Borough of Brookville. It was destroyed by a flood in 1996 and has since been rebuilt. Picnic shelters, a swimming area, playground, volleyball court, and a delayed harvest flyfishing-only area are some of the amenities available at the park.

**Gumtown Park** is located next to Redbank Creek on Water Street in New Bethlehem. The park is utilized for a number of events. It is the home to two annual festivals, the Peanut Butter Festival and Art-in-the-Park. Facilities include picnic pavilions, a playground, and an amphitheatre.

**Sandy Township Recreational Park** offers a volleyball court, a basketball court, a softball field, a soccer/football field, horseshoes, and a walking trail. The park, also known as Spider Lake Community Park, is located along Oklahoma Cemetery Road south of the DuBois mall. Another park in the DuBois area is the **DuBois Memorial Park**. This park, located along Route 219 in DuBois, offers a variety of ball fields and an amphitheatre.

### Trails

Links among communities, trails provide alternative transportation, recreation, and educational opportunities. Trails can be used for a variety of activities including hiking, bicycling, horseback riding, ATV riding, cultural and historic cultivation, and environmental education. There are two well-known trails in the region.

**Armstrong Rail Trail** is a 52.5-mile rail trail that follows the east bank of the Allegheny River. The trail is open to the public for walking, jogging, biking, hiking, horseback riding, and cross-country skiing. The trail begins at Schenley, Armstrong County, and travels north to Upper Hillville, Clarion County (Armstrong Rails to Trails, 2005).



*Armstrong Trail crossing Mortimer Run*

The Armstrong Rail Trail traverses 4.5 miles along Redbank Creek, starting at an access point at the mouth of the creek (Beale, personal communication, 2006). Efforts are currently underway to enhance the trail. There is a focus on trail improvements along the Redbank North section with goals to provide a connection to East Brady, to rehabilitate and reopen the East Brady Narrows Tunnel, and to improve the Lawsonham low-grade section (Armstrong Rails to Trails, 2005).

A portion of the 141-mile **Baker Trail** crosses through the area. Originating in 1950, the trail was named for Pittsburgh attorney Horace Forbes Baker. After World War II, his influence was vital in re-establishing the American Youth hostels in Pittsburgh (Rachel Carson Trails Conservancy, 2005). The initial trail was 133 miles long, and traveled from Aspinwall to Cook Forest. The portion of trail between Aspinwall and Freeport was later abandoned because of extensive development along the Allegheny River. Then in 1971, a new section was developed on the northern portion of the trail. The new section spanned from the Fire Tower at Cook Forest into the Allegheny National Forest (Rachel Carson Trails Conservancy, Inc., 2005). The Baker Trail, a backpacking and hiking trail, follows forest paths, old jeep trails, and dirt roads through forests, farmlands, and along rivers and streams. Nine Adirondack shelters and primitive tent-camping sites for multiple-day users are located along the trail.

#### All-Terrain Vehicles (ATV)

A popular recreational activity within the watershed is riding ATVs. An off-road vehicle, off-highway vehicle, or ATV, is any motorized vehicle capable of cross-country travel on land, water, snow, ice, marsh, swampland, or other natural terrain. The use of ATVs in the watershed, and throughout Pennsylvania, is on the rise. With a lack of public facilities available to riders, improper or illegal use by some has given this activity a bad reputation.

DCNR, along with the commonwealth of Pennsylvania, is working to regulate the use of ATVs. In 1985, Chapter 77 of the Pennsylvania Vehicle Law was established, regulating the usage of ATVs (DCNR, 2002). In 2001, Act 68 modified the law, requiring owners and operators to register their vehicles (DCNR, 2002). Fees collected from ATV registration are being used to develop and maintain trails on public lands, encourage trail development on private lands, teach safety and trail riding etiquette, and enforce the law.

Efforts to educate riders about recreating in an environmentally sound manner should be considered. Public facilities for the exclusive use of ATVs are needed in the watershed. Environmentally sound public trails or an ATV park would provide riders with legal opportunities to ride, thereby reducing damage to private property, and increasing safety for riders.

#### Golf Courses

Golfing is a popular recreational sport. There are seven golf courses within the boundaries of the watershed, two are public and the remaining five are semi-private. Table 5-1 identifies local golf courses.

**Table 5-1. Golf Courses**

<b>Course</b>	<b>Description</b>	<b>Size</b>	<b>Location</b>
Beechwoods Golf Course	Public	18 holes	Falls Creek, Pa.
Bostonia Country Club	Semi-private	9 holes	New Bethlehem, Pa.
DuBois Country Club	Semi-private	18 holes	DuBois, Pa.
Laurel Run Golf Course	Public	18 holes	Brookville, Pa.
Pinecrest Country Club	Semi-private	18 holes	Brookville, Pa.
Treasure Lake Gold Course	Semi-private	18 holes	DuBois, Pa.
Treasure Lake Silver Course	Semi-private	18 holes	DuBois, Pa.

#### Camping

Three campgrounds exist in the project area. However, there are also a number of campgrounds in the surrounding area.

**Cayman Landing Campground** is located at Treasure Lake in Sandy Township, Clearfield County. There are cabins and over 1,500 camp and RV sites available for rental year-round. Recreational opportunities at the campground include an 18-hole miniature golf course, shuffleboard, swimming pool, playgrounds, and bike rentals. Visitors to the campground can also use Treasure Lake amenities including pools, beaches, marina rentals, golf courses, restaurants, and taverns. Other amenities at the campground include five comfort stations, Ice Cream Shack and Cayman Landing Store, Cayman Lodge, and Cayman pavilion.

**Big Country Campground**, located outside of Brookville in Jefferson County, is open from April 15 to December 15. There are 100 campsites available, some with electric, water, sewage, and cable. Amenities at the campground include a recreation hall, fishing, and organized activities.

**Redbank Valley Municipal Park Campground** is a community park and campground located two miles east of New Bethlehem along Redbank Creek. Motor home sites with full hook-up and tent camping, including primitive sites, are available. Recreational opportunities include swimming, tennis, skating, horseshoes, shuffleboard, ball fields, a playground, and picnic facilities.

#### Hummingbird Speedway

Hummingbird Speedway is a dirt stock car racing track that opened in 1964 and operated until 1975. After a renovation, the track reopened for limited late model, street stock, four cylinders, and novice stock car races in September 2000.

#### Paintball

Paintball has become a popular recreational activity since it originated in New Hampshire in 1981. As of 1996, the sport of paintball had expanded into 24 countries (World and Regional Paintball Information Guide). The sport continues to grow and has been deemed one of the world's most exciting outdoor participation sports.

The sport of paintball allows participants to relive their youth, since the game is designed from the childhood games of "tag" and "hide and seek." A variety of different paintball games exist, but "capture the flag" seems to be the most popular. A game of paintball can be played with two to thousands of players, depending on the specific game and playing field. Players pair off into teams and try to eliminate the other team before they are eliminated. Once a player is hit by a paintball, he or she is eliminated from the game.

Within the project area, one paintball park exists near Falls Creek. There are four different playing fields for different styles of play at the park: speedball, semi-wooded, heavily wooded, and the pines. The park is under the management of Impact Zone, Inc.

### Other Recreational Opportunities

#### Fishing

Since 1866, the Pennsylvania Fish and Boat Commission has been responsible for protecting and managing Pennsylvania's fishery resources and regulating recreational fishing and boating (PFBC<sup>1</sup>). Nearly two million people fish in Pennsylvania each year, and it is estimated that anglers generate an economic impact of \$1.35 billion (PFBC<sup>1</sup>).

Abundant fishing opportunities are available within the watershed. Redbank Creek and Sandy Lick Creek are designated as Trout Stocked Fisheries. North Fork Redbank Creek is designated as a High Quality Cold Water Fishery. Several tributaries in the Sandy Lick Creek subwatershed are designated as Cold Water Fisheries, while Falls Creek, Schoolhouse Run, and the source of Beaver Run to the PA Route 36 Bridge are designated as High Quality Cold Water Fisheries. Three tributaries to North Fork Redbank Creek—Craft Run, Shippen Run, and South Branch North Fork Creek—are designated as Exceptional Value waterways.



*Fly fishermen at the North Fork Creek special regulation, delayed harvest flyfishing only area*

There are several PFBC programs that are currently active within the Redbank Creek watershed including Pennsylvania Wilderness Trout Waters, Approved Trout Waters, and Special Regulation Areas.

The **Pennsylvania Wilderness Trout Waters** program, established in 1969, was designed to protect and promote native brook trout fisheries, the ecological requirements necessary for natural reproduction of trout, and wilderness aesthetics (PFBC<sup>3</sup>). In order for a stream section to be classified as wilderness trout waters it first must be designated as an Exceptional Value waterway by DEP. It must also have a wild trout fishing experience in a remote, natural, and unspoiled environment where disruptive activities of man are minimized (PFBC<sup>3</sup>).

Within the North Fork Redbank Creek subwatershed, there are three stream sections that were classified as Pennsylvania Wilderness Trout Waters in 2005. They include Craft Run from the headwaters to the mouth traveling 2.7 miles, South Branch North Fork Creek from the headwaters to the mouth traveling seven miles, and Shippen Run from the headwaters to the mouth traveling 2.5 miles.

**Approved Trout Waters** are waterways—including streams, lakes, ponds, and reservoirs—that meet criteria qualifying them to be stocked with trout by the PFBC. There are 13 streams within the Redbank Creek watershed that qualified as Approved Trout Waters. They include Little Sandy Creek, Leatherwood Creek, East Sandy Creek, Wolf Run, Laborde Branch, Big Run (tributary to Little Sandy Creek), Clear Run, Fivemile Run (tributary to Sandy Lick Creek), North Fork Redbank Creek, Pekin Run, Rattlesnake Run, Redbank Creek, and Sandy Lick Creek.

Three **Special Regulation Areas** exist, North Fork Redbank Creek, Sandy Lick Creek, and Kyle Lake.

A 1.9-mile segment of North Fork Redbank Creek is regulated as a delayed harvest flyfishing only area. It begins at State Route 322 in Brookville and continues upstream. The only exception is a 50-yard section from the Brookville Water Authority Dam downstream to where a cable wire crosses above North Fork Redbank Creek to mark the delayed harvest boundary.

Beginning at the mouth of Laborde Branch and traveling 1.5 miles down Sandy Lick Creek, a second delayed harvest area has been designated. This designation took place on January 1, 2007. The delayed harvest area requires the use of artificial lures. The area is open to fishing year round. However, between June 15 and Labor Day, anglers can keep a daily limit of only three fish that exceed nine inches in length. Fishing is also restricted to one hour before sunrise to an hour after sunset.

Kyle Lake is also designated as a special regulation area, because of its inclusion in the PFBC Big Bass Program. The lake is closed to all fishing from March 1 to the opening day of trout season. As a participant in the Big Bass Program, anglers fishing at Kyle Lake can keep only largemouth bass, smallmouth bass, or spotted bass over 15 inches long, and are limited to a total of four fish per day. Between April 16 and June 17, waterways regulated in the Big Bass Program are catch and immediate release only.

### Boating

Five boat access points exist: two are located along North Fork Redbank Creek, two are located along Redbank Creek, and the fifth is located at Kyle Lake.

**Big Dam Access** is privately owned. It is located two miles north of Moore Bridge on Big Dam Road. The access has a small parking lot and shore fishing is allowed. Unpowered boats, such as canoes, kayaks, and other hand-carried boats, are permitted at the site.

**Moore Bridge Access** is similar to the Big Dam Access. It is privately owned, has a small parking facility, allows shoreline fishing, and only the use of unpowered boats is permitted. The access is located along Richardsville Road.

**Brookville Borough Access** is located at the junction of Sandy Lick Creek and North Fork Redbank Creek, where Redbank Creek forms. The Borough of Brookville manages the access. Only unpowered crafts are permitted to use the access. There is a small parking lot, and shore fishing is permitted at the site.

**Summerville Access** is located along Redbank Creek in the Borough of Summerville. The PFBC manages the access. Shore fishing is permitted, and only unpowered boats are permitted to use the site. A small parking lot is available at the site.

**Kyle Lake Boat Launch** is located along Kyle Run Road. It is managed by the PFBC and has a surface ramp and loading dock. Fishing is permitted from the shore and the fishing pier. Unpowered boats and those with electric motors are permitted on the lake.



*A young hunter harvests his first deer*

### Hunting

Hunting is a popular recreational activity throughout western Pennsylvania. According to surveys distributed throughout the planning process, hunting ranked as the most popular recreational activity in the watershed by municipal officials and the public (Chapter 6).

The Pennsylvania Game Commission (PGC) manages and regulates hunting in Pennsylvania. An individual can begin hunting once they reach 12 years of age and after they pass a hunter safety course. The number of hunters in many states has been rapidly declining, but Pennsylvania has seen a leveling of participation (PGC, 2004). It is essential for future wildlife management and the preservation of the

hunting and trapping heritage of Pennsylvania that the recruitment of new hunters and trappers is successful (PGC, 2004).

Within the project area, there are four State Game Lands. State Game Lands 93, in Sabula, Clearfield County is the largest containing 4,876 acres available for public hunting. State Game Lands 244, in

O'Donnell, Jefferson County is the second largest containing 4,868 acres. In Clearfield County, State Game Lands 77 has 3,038 acres available in Clear Run. The smallest is State Game Lands 137 located in South Bethlehem, Armstrong County; it contains 929 acres for public hunting.

In 1936, the Cooperative Farmland Program was established to protect farm property against acts of vandalism and to increase hunting opportunities. It provides landowners with advice and incentives to conserve soil, increase wildlife habitat, and implement other beneficial practices. There are two programs under the Cooperative Farmland Program: the safety zone program and the farm game program. The safety zone program involves opening a minimum of 50 acres of land for public hunting, while the farm game program includes several safety zone locations blocked together. Safety zone participants can receive seedlings each spring and pheasant stocking, while farm game participants (in addition to incentives for safety zone programs) can have some habitat improvement projects.

In addition to the Cooperative Farmland Program, the Forestland Game Program opens up additional hunting opportunities. Similar to the Cooperative Farmland Program, the Forestland Game Program works with landowners owning forested parcels greater than 1,000 acres who are willing to allow public hunting on the property.

Efforts between PGC and local landowners have allowed 253,583 acres of hunting land to remain open. Approximately 118,230 acres of farmland remain open on 1,058 farms through the farm game program, and 54,445 acres on 310 farms through the safety zone program. An additional 80,908 acres are enrolled in the forest game program in Jefferson and Clarion counties.

In addition to hunting on public lands, permission may be obtained from private landowners to hunt on their land, providing additional opportunities. Two hunting preserves also exist, both are privately owned and require a fee to hunt. Rathmel Run has over 2,000 acres available to hunt whitetail deer, elk, wild turkey, or upland game birds. White Oak Whitetail Deer Farm and Hunting Preserve, established in 1993, offers hunting packages in addition to selling deer to other preserves. Both preserves are located near Reynoldsville.

## **Environmental Education**

Environmental education is a learning process that increases knowledge and awareness of the environment and associated challenges (National Environmental Education Advisory Council, 1996). It develops skills and expertise to address challenges, and fosters attitudes, motivation, and commitment to make informed decisions and take responsible action.

The agricultural community was the first to utilize environmental education through the teaching of conservation practices. The early practices expanded to include land-use problems, preservation of natural resources, water quality improvements, and protection of native plant and animal species. Educating the public about important environmental challenges and developing knowledgeable citizens who actively participate in addressing these challenges is critical to sustaining the balance between environmental and human activities. This ensures the health and welfare of the watershed, protection of human health, advancement of quality education, expansion of employment opportunities, promotion of sustainable development, and protection of our natural heritage (Pennsylvania Department of Education, 2002).

With the rapid changes in our environment, the education of watershed stakeholders is an essential and ongoing process. There are several organizations and agencies that provide environmental education to landowners, students, and other stakeholders.

**Pennsylvania Game Commission (PGC)** provides a variety of educational programs. Wildlife conservation officers provide educational programs in the schools. The programs are designed to be appropriate for each grade level. They also provide two teacher workshops—Project WILD and PA Songbirds. Project WILD is training about the environment, the outdoors, and their interactions for educators of grades K–12. It evaluates the activities and cross-references them with the Pennsylvania Department of Education’s (PDE) environment and ecology standards, developed in 2002. PA Songbirds is a program similar to Project WILD that provides teacher workshops and lesson plans. It is co-sponsored by PGC, DCNR, and Audubon Pennsylvania. In addition to the workshops and programs, PGC has reference materials available to all educators.

**Pennsylvania Fish and Boat Commission (PFBC)** provides several workshops for educators including the Keystone Aquatic Resource Education teacher workshop and the Pennsylvania Amphibian and Reptile educator workshop. These workshops provide educators with curricula to meet the environmental standards required by PDE. PFBC has numerous educational videos, brochures, and fact sheets on a variety of topics available for students and educators.



*Individualized, hands-on environmental education activity at Clearfield-Jefferson County Watershed Festival*

**Pennsylvania Department of Conservation and Natural Resources (DCNR)** provides a variety of educational programs through its different divisions. The Bureau of Forestry is a leader in educating people about forestry and native wild plant conservation and management. Audiences include students, educators, organizations, local governments, private landowners, consulting foresters, industries, and the general public. The office of Wild Resource Conservation produces a variety of educational materials including posters, activity books, and videos for the state’s conservation agencies, PDE, and conservation groups.

Watershed education programs are offered through Pennsylvania State Parks, a part of DCNR. Programs provide school-aged children with learning experiences through hands-on activities (Table 5-2).

**Table 5-2. Watershed Education Programs Offered by DCNR**

<b>Program</b>	<b>Program Description</b>
Watershed Tour	Students explore their own watershed by traveling on a bus, taking a hike, or through an audiovisual program. They identify clues relating to the culture and history of the area, uses of local streams and rivers, and impacts on the watershed.
Adopt-A-Stream	Students discover the fascinating world of stream ecology and monitor the impacts of natural and human activities taking place within their watershed. Students learn to measure physical, chemical, and biological parameters in their local stream.
Network with Other Schools	Students use the internet to share data, discoveries, experiences, and ideas with other participating schools.
Interacting with the Community	Through research, networking, and stewardship projects, students become active community members.

**Pennsylvania Department of Environmental Protection (DEP)** provides a range of environmental education opportunities. They host several workshops and conferences, attend community festivals, and provide resource information and educational programs. They are just one of many groups that assist with

local and state Envirothons. An Envirothon is an environmental competition that is designed to cultivate a desire to learn more about the natural environment. Not only do Envirothon competitions teach environmental facts and realities, but they also instill an understanding of the ecological and community factors that are involved in environmental decisions and actions.

**County conservation districts** are active in educating citizens about the environment. They work with local landowners, the agricultural community, industries, local governments, and other agencies to implement best management practices. Conservation districts provide educational programs to students through school programs, community events, and Envirothon competitions.

**Penn State Cooperative Extension** works with individuals, families, businesses, communities, and schools through informal educational opportunities. Local offices provide residents with easy access to the resources and expertise of Pennsylvania State University through educational programs, publications, and events.

**PA CleanWays** is a non-profit organization empowering people to eliminate illegal dumping and littering in Pennsylvania. The goal of the chapter of PA CleanWays of Jefferson, Clarion, and Clearfield counties is to protect, restore, and maintain the environmental and scenic qualities of roadways, waterways, pathways, and other areas. This is accomplished through organized cleanups, addressing problem disposal items, encouraging roadway adoption, beautification projects, and educational outreach. This local chapter offers a variety of educational programs including activity books, a storybook, Litter I.Q. Board, environmental fairs, environmental crafts and experiments, displays, and presentations available to various audiences.

**North Fork Watershed Association** was formed to protect and preserve the North Fork Redbank Creek watershed. This is done through community-based education, outreach, and implementation of a comprehensive plan to monitor the water quality of the North Fork Redbank Creek watershed. The North Fork Watershed Association provides environmental education to a variety of stakeholders through programs and events. It also sponsors a one-week day camp in the summer for students and their parents. Students come from Clarion, Jefferson, and Clearfield counties. They develop an action plan to create a solution to a local environmental challenge and learn how they can make a difference in their communities.

**Sandy Lick Conservation Initiative** was formed to restore and maintain a high level of water quality throughout the Sandy Lick Creek watershed. They work to achieve this goal through education, monitoring, protection and remediation with local groups and community involvement. The Sandy Lick Conservation Initiative has held various public meetings and trainings to inform and educate watershed residents. They also attend a number of community festivals including DuBois Days and the Jefferson and Clearfield counties Annual Watershed Festival.

**Boy Scouts and Girl Scouts** have been participating in conservation projects since their beginning in 1910 and 1912, respectively. The Boy Scouts of America offer 23 different ecology and conservation merit badges. The Cub Scout program has environmental components required for rank advancement. The Girl Scouts of America works to educate girls about the environment with numerous conservation projects and badges that can be earned.

## Archaeological Resources

Anywhere people worked, lived, or recreated, artifacts could be found documenting their history as long as these materials survived over time. Artifacts are archaeological evidence, such as bits and pieces

of objects made, used, discarded, or lost through daily activities. This evidence often represents the only surviving record of an era and can provide new information about where, when, and how people lived.

Collecting and preserving artifacts requires certain procedures for identification and documentation. Knowing the exact location where each artifact was found is essential. All collectors, amateur and professional, are encouraged to register their findings. The Pennsylvania Historical and Museum Commission (PHMC) maintains a statewide registration program for archaeological discoveries known as the Pennsylvania Archaeological Site Survey, or PASS.

Located within the tri-county region of Armstrong, Clarion, and Jefferson counties, 857 archaeological sites have been recorded (Burkett). Although not all of the sites are located within the project area, they represent regional trends and occupation.

## Historical Resources

### Historical Overview

Armstrong County was formed on March 12, 1800 from portions of Allegheny, Westmoreland, and Lycoming counties. It was named for Major General John Armstrong who fought against Native Americans and who served in the Continental Congress and Revolutionary Army. The old Native American village of Kittanning is the county seat.

Jefferson County was formed on March 26, 1804 from Lycoming County and was incorporated in 1834. It was named for President Thomas Jefferson. The county seat is Brookville, which is located at the confluence of Sandy Lick and North Fork Redbank creeks, where Redbank Creek is formed. The name “Brook” came from the numerous springs and brooks that flow from the hills. The name “ville” came from the French word “yule” meaning county seat or town in English.

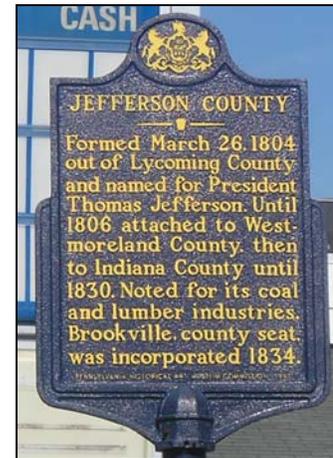
Clearfield County was formed from parts of Huntingdon and Lycoming counties on March 26, 1804. Named for Clearfield Creek, the county functioned under Centre County until 1812. The old Native American village Chinklacamoose, now the town of Clearfield, is the county seat.

Clarion County, the 54<sup>th</sup> county to organize in Pennsylvania, was formed on March 11, 1839. It was named for the Clarion River, which was the dividing line between Armstrong and Venango counties—the counties from which Clarion County was formed. The town of Clarion is the county seat.

### Origin of names

Redbank Creek had several names prior to 1798. Native Americans originally called Redbank Creek “Lycamihoning” meaning a sandy stream flowing from a lick (Beers & Co., 2001). The English translation became Sandy Lick and the French called it Red River (Shirley, 2003). The name was changed to Redbank Creek due to the red color of the soil along its banks (Davis, 1887). In 1798, by the act of Assembly of March 21, it was declared to be a public stream from the mouth to the second fork (Beers & Co., 2001).

The Delaware, a tribe of Native Americans, were responsible for naming many of the streams. When naming places they used natural features of the surrounding area to give the location its name. For example, North Fork Redbank Creek was called “Tangawunsch-hanne” meaning little briar stream after the presence of green briars overgrowing the streambanks (Scott, 1888).



*Historical marker sign at Jefferson County Courthouse*

### Early Settlement

Native Americans had inhabited the region for several years prior to the arrival of the Barnett brothers and Samuel Scott, credited as the founding settlers of Port Barnett and the Redbank Creek valley. The majority of information in the section has been obtained from The Early Native Americans by Ken Burkett, a local Archaeologist.

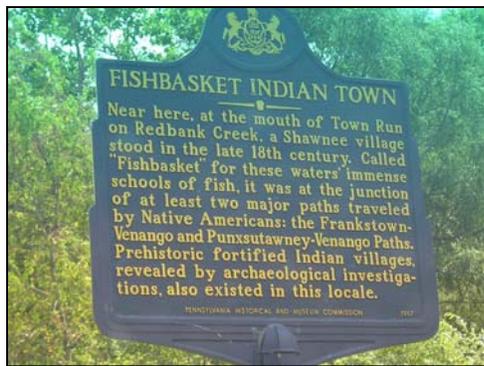
The earliest inhabitants in Pennsylvania were known as the Paleo-Indians, marking the **Paleo-Indian period**. Artifacts such as tools and points from the Paleo-Indians are rare, but could be found throughout Pennsylvania. Being that the artifacts are rare, it suggests that they lived in small groups and were frequently moving. They are thought to have resided in Pennsylvania from 12000 B.C to 8000 B.C.

During the **Archaic period**, the climate warmed and coniferous forests completely covered the region, similar to the remaining large stands of white pines and hemlocks in Cook Forest and Clear Creek state parks. Humans were rarely present until 6500 B.C. when edible plants, nuts, and modern game species became evident. It is speculated that these people continued living in small groups, but became territorial returning to the same site year after year. The invention of the atlatl, a long handled device that could extend the arms reach and help send moderately sized spears a long distance with great force, was probably the greatest invention of the time.

Three lifestyle transitions occurred during the **Woodland period**, which occurred 1000 B.C. to 1550 A.D. The changes were centered on pottery making, hunting, and agriculture. Clay pots were modified and made with straight sides and flat bottoms. This change was advantageous for cooking and storing food.

During the early Woodland period, the homes were small, semi-permanent, bottomland structures. With the growth of tobacco, the first known tubular smoking pipes appeared. Prior to the early Woodland period, personal items of adornment such as beads and pendants were not prevalent.

During the middle Woodland period, agricultural crops of corn, beans, pumpkins, and squash provided security from famine and provided an improved lifestyle.



*Historical marker along Route 28 identifies the site of Fishbasket, a Native American village that existed during the Woodland period*

In the late Woodland period, people lived in fortified villages with agriculture replacing the need to gather wild plants for food. The bow and arrow was also introduced during this period.

All the changes during the Woodland period lead to “permanent” villages, although they probably only existed for 10-15 years or as long as the local resources lasted. One such village that existed in the watershed was known as Fishbasket, or “Old Town”. It was located along both banks of Redbank Creek near the confluence with Town Run in Armstrong and Clarion counties.

The **Contact period** occurred from 1550 A.D to 1800 A.D. During this period, many Native American traditions and technologies were abandoned for more efficient and stronger European goods, such as iron tools and axes. The area was highly utilized for hunting deer and bear. A dependency on animal hides increased hunting and trapping activities, which caused prey population depletion and generated hostilities between tribes.

Along with technologies and goods, came European diseases, such as smallpox, measles, influenza, tuberculosis, typhoid, and diphtheria, which decimated Native American populations by the mid 1600s. In the early 1700s, the Delaware, Munsee, Shawnee and other eastern tribes moved into the area having been displaced by the growing European takeover of their native homelands.

The majority of Native Americans sided with the French during the French and Indian War from 1756 to 1763, because they were perceived as able to keep the settlers at bay. Then, during the Revolution, they aligned with the British to raid and harass settlers in order to divert manpower away from the American troops. In 1784, Americans and Native Americans made peace, ceding the last tribal lands in western Pennsylvania.

With the exception of the Cornplanter Iroquois, most of the Native Americans had moved further west into Ohio when the European settlers arrived, misleading historians to believe that the area had been largely uninhabited (Burkett).

Members of Cornplanter's tribe were opportunistic and enjoyed making money (Milford, 1997). They hunted and transported their goods to Pittsburgh where they sold the meat and skins. As late as 1815 and 1816, they settled along the banks of Redbank Creek near the Village of Troy, now known as Summerville (Milford, 1997). However, the rapid spread of civilization eventually drove them out of the region and into Canada.

#### Settlement

The settlement of the Redbank Creek watershed plays an important role in the settlement of northwestern Pennsylvania and Jefferson County. The first white settlers did not enter the area until 1794 when Joseph Barnett sent his brother Andrew Barnett and brother-in-law Samuel Scott to find a place to build a sawmill (Scott, 1888).

Joseph had intended for Andrew and Samuel to look along French Creek in Crawford County, but when they came to the confluence of Sandy Lick and Mill creeks they were delighted. They returned and reported back to Joseph about the uninterrupted forestland. In 1795, they returned with Joseph, and began building the mill. Once the mill was erected, Joseph went back to Lycoming County for his family. While he was gone, his brother struck ill and died. It was not until 1797 that Joseph Barnett and his family returned to Port Barnett, the name he called the settlement. Several others came to the new area with the Barnett family including Samuel Scott, John Scott, and Moses Knapp (Scott, 1888).

Samuel Scott, who first arrived in this region in 1794, stayed and worked in Port Barnett until 1810 when he saved enough money to go further west (Scott, 1888). He eventually settled in the Miami valley of Ohio (Scott, 1888). In 1802, John Scott left Port Barnett and settled in the western portion of Jefferson County, in the area now known as Corsica, Pennsylvania.

Moses Knapp stayed at Port Barnett for approximately two years before he set off and built a mill of his own along North Fork Redbank Creek. He attended one term of school in Indiana, Pennsylvania where he met and married Susan Matson. They returned to his mill on North Fork Redbank Creek where they made their home. After a few years, he sold the mill and relocated to the confluence of North Fork Redbank Creek and built another sawmill on Knapp's Run (today known as Five Mile Run), which he also sold. In 1807, he built a gristmill at the mouth of North Fork Redbank Creek, in Brookville. He was one of the earliest settlers of Brookville, if not the first (Scott, 1888).

In 1807, Yost Smith (who was one of the first settlers along Redbank Creek) settled at an old Indian village known as “Old Town” (Beers & Co., 2001). It was a popular spot for lumbermen during the early days of rafting.

Christian Himes was the first person to settle in the area of New Bethlehem in 1808. He resided there until his death in 1815. The name Gumtown was given to the area after Henry “Gum” Nolf was the second person to settle here, arriving in 1815. Having a good business sense, he established the first store, a gristmill in 1835, and a sawmill in 1855. Later the name was changed to Bethlehem, after the town in Northampton County where Henry Nolf’s parents resided. In 1858, the town was forced to change the name to New Bethlehem to end confusion with the original town of Bethlehem.

George Shaffer and his family were the first permanent settlers of DuBois when they arrived in 1812 (History Briefs). They settled on 320 acres, building their home along what is now West Long Avenue and Main Street. Mr. Shaffer died long before John DuBois, the town’s namesake, ever came through the area. The original acreage of the Shaffer family was left to their grandson Henry, who sold it in one-acre parcels, laying out the town of DuBois.

In 1871, John DuBois returned to Clearfield County where he set up residence and business. At that time, John Rumbarger, an early settler who had lived in the old Shaffer residence, realized that Mr. DuBois would be establishing business in the region and began selling parcels of his land.

For many years, the town of DuBois was divided into two sections. One section was known as the east, or DuBois, side. The lumbermen and woodsmen and their families lived there. The other section was known as the Rumbarger side, named after John Rumbarger. The coal miners and their families lived there. The rivalry existed until the rapid building development on the DuBois side of town overtook the village of Rumbarger, giving the entire community the DuBois name.

Early settlers had little or no problems with the Native Americans. Native Americans had helped Joseph Barnett in the raising of his sawmill and Samuel Scott with the burial of Andrew Barnett. They were also frequent visitors and patrons of Joseph Barnett. However, settlers did suffer frequent attacks from wolves and bears. Hunting parties were organized to drive the bears and wolves away from the settlement (Davis, 1887). Later, these hunting parties were developed for sport (Davis, 1887).

### Industrial

Industry played an important role in the settlement. As mentioned earlier, Joseph Barnett came to the area looking to build a sawmill. In 1797, shortly after he arrived and had built the mill, the first load of boards (approximately 4,000) was transported by raft down Redbank Creek to the Allegheny River and on to Pittsburgh (Scott, 1888).

The trips to Pittsburgh were long and dangerous. The lumber was sold or exchanged for flour, groceries, clothing, or other needs. When the transactions were completed, the workers placed the supplies in a canoe and pushed the canoe upstream using long poles as they walked along the shoreline. What they could not fit in the canoe, they would carry. One time, Joseph Barnett carried 60 pounds of flour on his back all the way from Pittsburgh.

The local demand for flour and sawed lumber created an early need for mills. With the closest gristmill located in Kittanning, locally grown grains were ground using hand mills. This was a slow and difficult process. In 1801, Joseph Barnett built a gristmill to ease the effort. Though small in size, the mill was used for many years, and was even utilized by the Native Americans.

Shortly after settling in Redbank Township in 1815, Archibald McKillip built another primitive gristmill. One drawback of his mill occurred when the water level would get too low to grind, and again the settlers would have to travel or resort to hand mills. In 1830, Henry Nolf, Jr. built a mill on Little Sandy Creek; it was an improvement on early mills, because it could be turned by hand when the water level was too low to grind.

By 1837, the lumber business had become vast, with many industrialists entering the region (Scott, 1888). A variety of mills were being built and rebuilt, and improvements of machinery and process increased their productivity. In 1854, lumber trade was estimated at over 20 million board feet with 22 saws working in the North Fork Redbank Creek subwatershed, 20 in the Sandy Lick Creek subwatershed, and 15 saws in the Little Sandy Creek and Redbank Creek subwatersheds.

During the spring flood of 1869, 74 board and 350 timber rafts were run out of the Redbank Creek (Scott, 1888). By 1872, 917 timber and 570 board rafts were making the trip (Scott, 1888). At the time, a pilot's wage was 20 dollars for a trip from Brookville to the mouth of Redbank. It took a day to float down and a day to walk back. Some pilots earned as much as a 150 dollars in one season (Davis, 1887).

During the early settlements, timber was removed to make way for homes and farming fields. All this changed with the introduction of the railroad and the declining supply of timber resources in the region. Since the decline of the lumber trade, farming became the principal business for many of the citizens.

Wilson Jones and Captain J.M. Brinker formed the firm of "Jones and Brinker." In 1857, they purchased their first property where they built a distillery, a year later, to manufacture whisky. The quality of whisky produced was so superior that it became world famous. The distillery worked to maximum capacity until 1871, when Jones and Brinker accepted a contract to work on the Low Grade Division of the Allegheny Valley Railroad (Davis, 1887).

Underlying the region were many minerals including coal, iron ore, and limestone. Little was done toward the extraction of these minerals until the railroad was completed in 1873. Coal mining became one of the major industries in the region from 1886 to 1961 (Kalgren, 1997). Early methods of coal mining involved using dynamite to loosen the coal, then sending miners into the mine with picks and shovels to break up and remove the coal. As time went on, technology improved and the cost of coal removal decreased greatly.

After completing their work on the railroad, Jones and Brinker formed the Fairmount Coal and Iron Company. With a purchase of 1,200 acres, they laid out the city of Fairmount, building houses and developing the Fairmount mines. In 1873, the mine was opened, and on the first day 22 tons of coal had been mined (Davis, 1887). By 1881, they were producing 900 tons of coal daily, and the company was sold to a New York syndicate that continued operating the mines.

After selling the Fairmount mines, they moved to New Bethlehem where they developed the Long Run mines, building several coke ovens and three miles of rail lines that connected the mines to the railroad (Davis, 1887).

The majority of the coal mines (78.5%) were strip-mine operations (Kalgren, 1997). In 1903, over seven million tons of bituminous coal, the largest amount of coal in Jefferson County history, had been removed (Kalgren, 1997). By 1975, coal mining in the region had declined to approximately 33,000 tons of coal per year (Kalgren, 1997).

During the late-19<sup>th</sup> and early-20<sup>th</sup> centuries, a number of diverse industries developed. Such businesses included the following: an ax factory, box factory, ladder factory, tannery, breweries, hotels, furniture and glass factories, livery stables, carriage manufacturers, foundries, wood mill, iron works, and the Twyford Motor Company (Brookville Chamber of Commerce, 2003; History Briefs).

#### Postal Delivery

In early colonial times, correspondents depended on friends, merchants, and Native Americans to carry messages between the colonies. However, most correspondence ran between the colonists and England. William Penn established Pennsylvania's first post office in 1683 (U.S. Postal Service).

In May 1775, as the colonies began to separate from England, a Continental Congress was organized to establish an independent government. One of the first questions before the delegates was how to convey and deliver the mail. Benjamin Franklin was appointed chairman of the committee to establish a postal system and was later appointed as the first Postmaster General (U.S. Postal Service).

In the days prior to telephones, radios, and televisions, communication from the outside world could only be obtained through mail and newspapers. Mail would be delivered to the post office and picked up there by the recipients. Many families, particularly the agricultural families, waited days, weeks, or even months before picking up their mail. They had to coordinate trips for supplies, food, or equipment to pick up mail.

The first mail route in the area was established in 1826 from Kittanning to Olean, New York. The route carried mail biweekly, and covered a distance of 110 miles (Scott, 1888). At that time, Joseph Barnett was appointed as the first postmaster in Jefferson County, with a post office being located in Port Barnett. He held this office until 1830 when the post office was relocated to Brookville.

In 1893, Postmaster General John Wanamaker, from Pennsylvania, introduced rural delivery (U.S. Postal Service). With rural delivery, farmers and other settlers would no longer have to wait days or weeks to get their mail; it would be delivered directly to them. Farmers were delighted with the new service, although some were against it because of safety and cost.

As mail delivery evolved from foot to horseback, stagecoach, steamboat, railroad, automobile, and airplane, infrastructure was needed. A byproduct of postal delivery was the establishment of good roads. After the postal service turned down many rural delivery routes because of the road conditions, local governments began extending and improving existing highways.

The present postal service descends from the system planned by Benjamin Franklin, and history rightfully accords him major credit for establishing the basis of the postal service for the American people (U.S. Postal Service).

#### Transportation

Early transportation was limited. Native Americans used dugout canoes, hollowed out of a single large log, to transport materials and people (Burkett). Early settlers used packhorses, wagons, and sleds along paths created by Native Americans to get to their destination. Four well-known paths that early settlers used were the Chinklacamoose path, Meade's trail, Susquehanna-Venango path, and Catawba path. Chinklacamoose path traveled from Milesburg to Tionesta through Brookville. Meade's trail traveled from Clearfield through Brookville, and westward. The Susquehanna-Venango path crossed Redbank Creek at the mouth of Town Run, the site of the Native American Village Fishbasket (Davis, 1887). The Catawba path, one of the most important early pathways in North America entered Jefferson

County near Clear Creek and headed south through Sigel, Brookville, Stanton, Worthville, Sprinkle Mills, and Grange before leaving the county (Burkett).

During the early industrial days, waterways were also used in the transportation of goods and supplies. Timber and iron were floated on rafts down Redbank Creek to the Allegheny River and on to Pittsburgh. In order to improve flow and make it easier for transportation, many waterways were straightened, deepened, or dammed (Weimer, 1997).

Prior to 1812, very few roads existed. The first roadway in the region was constructed in 1810 and traveled from Indiana, Pennsylvania to Port Barnett (Weimer, 1997). Authorized in 1812, the Waterford and Susquehanna Turnpike was the first effort to build a state road in the area. One of the most significant roads, this turnpike is believed to have contributed to the early growth of Brookville (Jefferson County Historical Society).

Olean Road, the second state road in the area, traveled from Kittanning in Armstrong County through Jefferson and McKean counties, to the New York state line near Hamilton, New York (Scott, 1888). Authorized in 1821, it was completed one year later, around the same time as the Waterford and Susquehanna Turnpike (Scott, 1888).

Early roads were simple stretches of primarily well-packed dirt paths between settlements that tended to be dusty or muddy, depending on weather conditions. It was not until the early 1900s that roadways were paved. The first paved roadways were paved with bricks, and it was not until the 1920s that roadways were paved with concrete.

The first railroad in the region was the Allegheny Low Grade Division of the Pennsylvania Railroad. It traveled eastward from the mouth of Redbank Creek through New Bethlehem, Brookville, and Reynoldsville, to the Philadelphia and Erie Railroad in Driftwood, Cameron County. Completed in 1874, the railroad provided passenger and freight service to principal stations in Summerville, Brookville, and Reynoldsville, and 14 minor stations including one in Falls Creek (Scott, 1888; Weimer, 1997).

In 1883, the Buffalo, Rochester, and Pittsburgh Railroad was completed. Entering Jefferson County at the Snyder Township and Elk County border, the rail line traveled into DuBois and then to Punxsutawney and Claysville, providing passenger and freight service. The Buffalo, Rochester, and Pittsburgh Railroad was an important railroad in the transportation of coal.

Other early railroads included the Ridgway and Clearfield Railroad, and the Reynoldsville and Falls Creek Railroad. Primarily used for the transportation of coal, the Ridgway and Clearfield Railroad paralleled the Buffalo, Rochester, and Pittsburgh Railroad from Ridgway to Falls Creek. The Reynoldsville and Falls Creek Railroad traveled seven miles from Rathmel to Falls Creek where it connected to the Low Grade Division of the Allegheny Valley Railroad. Owned by Bell, Lewis, and Yates, the same men who owned the mines in the Reynoldsville Coal Basin, the rail line was used for the transportation of coal (Scott, 1888).

The Pittsburgh, Shawmut and Northern Railroad was organized in 1905 (Beers & Co., 1999). Construction was completed, and the first train left Kittanning on October 20, 1913 with 41 passengers (Beers & Co., 1999). The rail line extended from Wayland, New York to Freeport, Pennsylvania, traveling through Brockway. This rail line mostly traveled along the Allegheny River and Mahoning Creek. Originally, the railroad was called the Brookville and Mahoning, but the initials B&M got confused with the Boston & Main railroad so it was renamed the Pittsburgh and Shawmut (Shoffstall).

The Redbank Railroad was 10 miles long, and was only in operation for a few years during the 1990s. The Pittsburg and Shawmut Railroad Company purchased the line, traveling from Sligo to Lawsonham, from Conrail. It later became the Mountain Laurel Railroad when another track, traveling from Lawsonham to Driftwood, was purchased. The Mountain Laurel Railroad contained 110 miles of track, but was only in operation a short time (even shorter than the Redbank Railroad.) Today the Redbank, Mountain Laurel, and Pittsburg & Shawmut are all a part of the Genessee & Wyoming, Inc.

In 1769, the first automobile was built by Captain Nicolas-Josephy Cugnot, a French Army officer, as a method to transport artillery pieces. Over the next two centuries, many modifications were made to the automobile. Around 1905, the Twyford Motor Company, located in Brookville, built the first four-wheel drive vehicle (Brookville Chamber of Commerce, 2003). It was not until the 1920s, when automobiles became affordable for the average citizen, that sales increased.

Around the turn of the 20th century, trolleys became a popular transportation method. Between 1892 and 1901, the Punxsutawney Street Passenger Railway, the Reynoldsville Traction Company, and the Jefferson Street Railway Company were formed (Weimer, 1997). In 1902, the three companies merged to form the Jefferson Traction Company. The new company managed 39 miles of track, and included service within the watershed to Reynoldsville, Adrian, Wishaw, and Soldier (Weimer 1997). The United Traction Company managed services from DuBois and Falls Creek.

#### Education

Education received early attention from settlers. The first school in Jefferson County was organized in 1803 and taught by John Dixon. Within two years, John Johnson had begun teaching at a school between Port Barnett and Brookville. In 1827, the first school in the DuBois area was held in a bar near Luthersburg (History Briefs). In 1828, a pay school was organized in New Bethlehem, where students attended school part-time or as long as they could afford it. The first school in Brookville was taught at the old jail in 1830.

The first schoolhouse in Redbank Township, located on Redbank Creek, was built in 1828 near the town of Oak Ridge (Beers & Co., 2001). Reynoldsville's first schoolhouse, known as the Fuller Schoolhouse, was built in 1836. The first schoolhouse in New Bethlehem, built in 1848, was designed as a one-room schoolhouse. By 1848, there were five schools in Brady Township that were built as a combination church and school (History Briefs).

Prior to 1834 and the act to establish a general system of education by common schools, every community having the population and means of supporting a school had organized one. By 1854, just within Jefferson County, 105 schools had been organized under the Common Schools Act (Scott, 1888).

#### Religion

Religion was very important to the early settlers. However, no churches or ministers maintained a presence in the area until Bethel Church was organized in 1824. It is believed that Bethel Church was not only the first church to form, but that it was the first building for worship in Jefferson County.

Rev. Robert McGarragh held the first organized religious service in Pine Creek Township in 1809. Being from Clarion County, Rev. McGarragh played a vital role in the organization of the Bethel Church.

In 1825, the first building used for religious purposes in the DuBois area was a tavern in Luthersburg (History Briefs). The first church of DuBois was built in 1874 at the corner of East Long Avenue and Church Street. The building was built on posts two feet above ground.

In 1850, there were 18 churches in Jefferson County—nine Presbyterian, six Methodist, two Baptist, and one Lutheran. By 1870, the number of churches had increased to 64—21 Presbyterian, 18 Methodist, eight Lutheran, five Baptist, five Evangelical Association, three Roman Catholic, and three Reformed German.

#### Important People

**Joseph Barnett** is credited as the first settler of Jefferson County, settling at the confluence of Mill and Sandy Lick creeks.

**Annor McKnight** was an attorney-soldier from Brookville who commanded the 105<sup>th</sup> Regiment of Pennsylvania Volunteers, popularly known as the Wildcat Regiment, during the Civil War. At the time of his death, at the battle at Chancellorville, President Abraham Lincoln promoted McKnight to brigadier general.

**Dr. William James McKnight**, Annor McKnight's brother, was a well-known doctor and senator from Brookville. In 1857, McKnight began practicing medicine, 12 years before he got his degree. He was involved in the first autopsy in Pennsylvania, even before it was legal. For his actions he paid a \$25 fine.

**Cornplanter**, or Garganwahagah (the Iroquois name for John O'Ball), was a famous chief of the Seneca tribe. Born in 1750, his father was an English or Dutch trader, and his mother was a full-blooded Seneca. From 1784 until 1814, peace was maintained between the Iroquois and the American government because of Cornplanter's efforts.

**Albert Walter Lyle**, also known as "Sparky," was born in DuBois, Pennsylvania in 1944. He was a former relief pitcher for the New York Yankees during the 1970s. In 1977, he became the first relief pitcher to ever win the Cy Young award.

#### Historical Sites, Structures, and Districts

In 1966, the National Historic Preservation Act established the National Register of Historic Places. Listed properties include districts, sites, buildings, structures, and other objects significant to American history, architecture, archeology, engineering, and culture. A listing in the register honors historic properties, but it does not interfere with the property owner's rights. Private property owners have no obligation to maintain or manage their property, and can dispose of their property as they see fit. Sites located within the watershed are listed in Table 5-4 and Figure 5-1.

The PHMC manages the register for Pennsylvania. The historic preservation officer submits nominated properties to the state review board. If the property owner, or the majority of the owners (if the property is owned by more than one person), objects to the nomination, it sent to the National Park Service for a determination of eligibility, without formally listing the property in the National Register (National Park Service, 2001).

#### Historical Sites

Built in 1872, the **Lawsonham Stone Arch Railroad Bridge** is located along Redbank Creek at the southern border of Clarion County. Although not identified as a historical site of the National Registry, the site has local historical significance and should be preserved.

Another local historical site not identified on the National Register is the **Redbank Coal Tipple**. The tipple is located on the Redbank North section of the Armstrong Trail between East Brady and the mouth of Redbank Creek. The tipple is in disrepair and in need of preservation before the structure collapses.

### *Historical Structures*

The **Brookville Presbyterian Church and Manse** was significant for its Romanesque, Second Empire architecture. Historically important from 1875–1924, the privately owned structure was and is still utilized for religious services. It is located at White and Main streets in Brookville.

**Commercial Hotel/Avenue Theatre**, also known as General Pershing Hotel, is located along Long and Brady avenues in DuBois. Historically significant from 1875–1924, the privately owned structure maintains its original use as a hotel.

**Joseph E. Hall House**, also known as Hall-Nicholson House and the Rebecca M. Arthurs Memorial Library, is located on Main Street in Brookville. Significant for the Greek revival architecture, this structure is privately owned. It was an important structure during the period of 1825–1849.

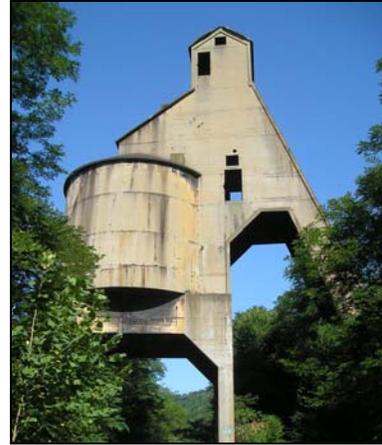
The **Gray-Taylor House**, located along Walnut Street in Brookville, is a privately owned residence. It was significant from 1875–1949 for William Henry Gray's Second Empire architectural style.

**Phillip Taylor House**, also known as Pennsylvania Memorial Home, was significant for its Italian Villa architectural style. Located in Brookville, it is privately owned and currently vacant. It was significant during the period of 1825–1874.

### *Historical Districts*

The **Brookville Historic District** was historically significant from 1825–1949. The architecture is from the late-Victorian and late-19<sup>th</sup> and 20<sup>th</sup> centuries revivals. Located within the boundaries of Franklin Avenue, Church Street, Main Street, and railroad tracks, the Brookville Historic District maintains its use for business and housing.

The **DuBois Historic District/DuBois Commercial Historic District** is located along North and South Brady streets and East and West Long avenues in DuBois. Significant from 1875–1949 for the Romanesque, Italianate, and Gothic Revival architectural styles, these private and federally owned buildings still maintain some of their original uses, while other uses have changed.



*Redbank coal tipple,  
located along the Redbank  
North section of the  
Armstrong Trail*

**Table 5-3. Historical Sites**

<b>Municipality</b>	<b>Property</b>	<b>Status</b>	<b>Date</b>
<i>Armstrong County</i>			
No sites in the watershed			
<i>Clarion County</i>			
New Bethlehem Borough	Craig House	Eligible	1/31/1996
New Bethlehem Borough	New Bethlehem Historic District	Eligible	1/31/1996
Multiple Municipalities	Clarion Secondary Railroad	Eligible	3/17/1997
<i>Clearfield County</i>			
City of DuBois	B.R.& P. DuBois Passenger Station	Eligible	5/23/1990
City of DuBois	Commercial Hotel/Avenue Theatre	Listed	11/13/1985
City of DuBois	DuBois Brewing Company	Eligible	5/6/1982
City of DuBois	DuBois Historic District/DuBois Commercial Historic District	Listed	10/24/1987
City of DuBois	DuBois U.S. Post Office/DuBois Post Office	Eligible	12/23/1996
City of DuBois	First Presbyterian Church of DuBois	Eligible	10/22/1986
Falls Creek Borough	Falls Creek Public School	Eligible	1/17/1984
Sandy Township	Wilson School	Eligible	6/24/1998
<i>Jefferson County</i>			
Brookville Borough	Brookville Historic District	Listed	6/7/1984
Brookville Borough	Brookville Historic District (Boundary Increase)	Eligible	3/29/2005
Brookville Borough	Brookville Presbyterian Church & Manse	Listed	11/26/1982
Brookville Borough	Elizabeth Gernsback Property	Eligible	8/4/1995
Brookville Borough	Taylor Gray House	Listed	8/3/1979
Brookville Borough	Joseph E. Hall House	Listed	12/13/1978
Brookville Borough	Phillip Taylor House	Listed	7/22/1982
Falls Creek Borough	Falls Creek Public School	Eligible	10/2/1984
Pine Creek Township	Jefferson Manor	Eligible	2/6/1996
Reynoldsville Borough	Herpel Brothers Foundry & Machine Shop	Listed	8/4/2004
Reynoldsville Borough	Reynoldsville	Eligible	5/17/1989
Rose Township	Pittsburg & Shawmut Railroad Coder Viaduct Railroad	Eligible	10/2/1997
Snyder Township	Pennsylvania Game Commission Training School	Eligible	11/20/86
Washington Township	Wray Schoolhouse	Eligible	5/28/2002
Multiple Municipalities	Buffalo, Rochester, Pittsburgh Railway Company	Eligible	4/28/1993

## Management Recommendations

### Goal 5-1. Increase support for watershed issues.

Increase funding for environmental education programs targeting landowners and school students.	High
Encourage school districts to work with conservation groups and agencies to educate students about watersheds.	High
Establish a Redbank Creek Watershed Association.	Medium

### Goal 5-2. Address environmental issues.

Educate residents and developers about environmentally friendly development practices, such as smart growth or conservation by design.	High
Educate citizens about the impacts of illegal dumping on water quality, aesthetics, and property values.	High
Encourage water conservation year round, not just in times of drought.	Medium

### Goal 5-3. Increase awareness of local environmental issues affecting the area.

Educate citizens (youth and adult) and municipal officials about the benefits and importance of watershed protection and resource conservation.	High
Implement programs to help landowners and elected officials understand the importance of watersheds, wetlands, floodplains, etc.	High
Provide more environmental education opportunities for both youth and adults.	High
Increase awareness of watershed-related issues through the distribution of materials and educational programs.	High

### Goal 5-4. Highlight, preserve, and promote appreciation of the local history of the region.

Increase the preservation of existing historical sites and landmarks.	Medium
Incorporate local history into classes taught at local school districts.	Medium
Conduct historical site surveys to identify additional historical landmarks, and learn more about existing historical sites.	Medium
Work with elected officials to offer incentives or tax breaks for the restoration of historic buildings.	Medium
Install interpretive signage at historical locations.	Low
Establish self-guided walking, biking, or automobile tours similar to the walking tour of historic Brookville.	Low

### Goal 5-5. Encourage environmentally sound recreation activities and increase accessibility to facilities and activities for kids.

Conserve land in the lower Little Sandy Creek for outdoor recreation through acquisition or agreements with landowners.	Medium
Establish specific recreational-use areas and access including boat launches and trailheads.	Medium
Improve canoe access points and designate camping areas along streams.	Medium
Establish winter recreation activities, such as snowmobile or cross-country skiing trails.	Medium

**Goal 5-6. Minimize the intrusion of ATV usage on private lands and impacts to the environment.**

Increase enforcement of illegal ATV use on private and public lands.	High
Prohibit the use of recreational vehicles in areas at risk of being affected by their use. Steep slopes, streambanks, stream crossings, and habitat for rare, threatened, or endangered species are examples of at-risk areas.	High
Educate riders about ATV impacts on at-risk areas, and why they should avoid those areas.	Medium
Establish ATV parks or trails, offering a legal place to ride ATVs without trespassing on private properties.	Medium
Designate areas for ATVs, containing proper design to minimize erosion and sedimentation impacts.	Medium

**Goal 5-7. Enhance existing recreational facilities.**

Enhance amenities such as bathrooms and parking lots at recreational facilities.	Medium
Upgrade equipment and develop playgrounds at community facilities.	Low
Improve and maintain Reynlow Park.	Low
Upgrade equipment at Alcola Park and increase utilization of available facilities.	Low

**Goal 5-8. Increase the number of accessible recreational facilities.**

Create a water trail for Redbank, Sandy Lick, and North Fork Redbank creeks.	Medium
Develop trails for specific uses, such as ATVs, hiking, biking, and horseback riding.	Medium
Develop a walkway around Kyle Lake, providing additional access to the lake.	Low

**Goal 5-9. Connect recreational facilities by linking or extending existing trails with new trails and community parks.**

Connect Venango County Sandy Creek Trail with Pennsylvania RR Low Grade Secondary from Brookville to the town of Van.	Medium
Establish a rails-to-trails link from Brockway to DuBois.	Low
Improve the Lawsonham low-grade section of the Armstrong Trail.	Low
Provide a connection along the Armstrong Trail to East Brady.	Low
Rehabilitate and re-open the East Brady Narrows Tunnel.	Low

**Goal 5-10. Preserve railroad corridors.**

Explore the possibility of connecting railroad corridors and trails to existing trails from surrounding areas.	Medium
Protect the Low Grade Secondary railroad corridor, which will be abandoned from Sligo to Lawsonham and from Lawsonham to Brookville	Medium
Establish a rail tour, highlighting scenery and history of the railroad, similar to Kiski Junction Railroad in Schenley, Armstrong County.	Medium
Highlight historical sites along railroad corridors through the use of interpretive signage.	Medium
Investigate the preservation of railroad corridors and encourage uses, such as rails-to-trails, that preserve these corridors and offer recreational opportunities.	Medium

**Goal 5-11. Enhance area trails.**

Provide better access by establishing well-defined trailheads.	Medium
Enhance amenities such as bathrooms, benches, and parking at trailheads.	Medium
Increase maintenance of trail corridors to provide a safer recreational opportunity.	Medium
Increase funding for trail development and maintenance.	Low

**Goal 5-12. Increase the marketing of recreational activities in the region.**

Utilize local recreational facilities to host community festivals and events.	Medium
Develop and distribute maps identifying recreational facilities and lands open to the public.	Medium
Utilize local tourism-promotion agencies to highlight or spotlight individual recreational opportunities.	Medium

**Goal 5-13. Increase local tourism**

Establish a campaign to market local resources to community residents who may not be aware of the opportunities available in the area.	Medium
Offer affordable, local, cultural activities, such as plays, concerts, etc.	Low
Establish a place where teens can safely and legally gather during evenings, weekends, and summers.	Low

**Goal 5-14. Enhance recreational opportunities for sportsmen.**

Improve water quality in order to aid the recovery of the local fishery as a local resource for recreation and tourism.	High
Preserve the right to hunt, fish, and canoe, and educate sportsmen about areas open to public usage.	High
Establish a river access point at the mouth of Redbank Creek	Medium
Establish additional, or enhance existing, public access points to streams and trails, including amenities such as parking and restroom facilities.	Medium

**Goal 5-15. Increase camping as a recreational use.**

Acquire and develop areas along the stream for primitive camping.	Medium
Enhance camping experience through facility and program updates, encouraging more visitors to experience the natural environment.	Medium

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## CHAPTER 6. ISSUES AND CONCERNS

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A fundamental element of watershed conservation planning is providing ample opportunities for open and direct communication between plan developers and local citizens. Stakeholders were given the chance to provide their unique perspective on topics affecting the region and everyday life. Western Pennsylvania Conservancy (WPC) and the Redbank Creek Watershed Conservation Plan steering committee hosted a series of public meetings, and met with groups and individuals to ascertain these views. Public meeting workshops, public and municipal surveys, and stakeholder interviews were used to identify the issues and concerns of area residents, which are presented in this chapter. The expressed views and opinions represent those of the stakeholders, and do not necessarily reflect the views and opinions of WPC or the steering committee.



*Members of the project steering and advisory committees discuss the progress of the plan*

The surveys were anonymous, and the results identified how stakeholders use and perceive the area. Key stakeholders, identified by the steering committee, were interviewed for their opinions about watershed matters. This information was used to determine the management recommendations (Chapter 7).

### Meeting Summaries

#### Initial Meetings

In July 2005, WPC and the steering committee hosted a round of three public meetings. During these meetings, the process used to develop the Redbank Creek Watershed Conservation Plan was introduced to the community. Background information about the Pennsylvania Department of Conservation and Natural Resources (DCNR) planning process was presented. Attendees were given their first opportunity to identify important local issues and concerns. These and other issues identified by participants will be discussed later in this section.

#### Draft Presentations

In January 2007, another series of public meetings was held to announce the draft of the plan. Stakeholders were given the opportunity to review the plan and provide comments (Appendix I). Public comments were collected for 30 days and incorporated into the final plan.

### Issues and Concerns

Many issues and concerns identified by the watershed community are interrelated and cannot be addressed separately. For example, stormwater management, flooding, erosion and sedimentation, agricultural runoff, and dirt and gravel roads are all interrelated. To best utilize limited resources, projects should be designed to address the issues collectively, whenever possible. Issues identified by stakeholders are summarized in the sections that follow.

#### Water Quality

A primary goal of stakeholders is to maintain clean and healthy waterways. It is important to community residents to address particular concerns, such as stormwater management, abandoned mine drainage, acid rain, septic and sewage, flooding, and dredging.

### Stormwater Management

Stormwater management involves planning for surface runoff into stream and river systems during rain or snowmelt events. Problems with stormwater occur when there is a large amount of impervious surface, such as buildings, driveways, roads, and parking lots, and water drains too quickly to the stream. Surface runoff during storm events can cause flash flooding, which flushes excess sediment and pollutants into the streams. Developing a comprehensive stormwater management plan for Redbank and North Fork Redbank creeks would be beneficial. These plans would identify best management practices that minimize the generation of stormwater, provide groundwater recharge, and minimize effects of stormwater discharge on water resources (DEP, 2006a). Practices could include permeable paving, stormwater wetlands, riparian corridor management, rooftop runoff management, and filter strips.



*AMD from the Hanley discharge is visible while metals are being deposited on the streambed*

### Abandoned Mine Drainage

Western Pennsylvania's legacy of mining has left lasting impacts on the environment, particularly in the form of abandoned mine drainage (AMD). Mine drainage entering a stream adversely affects aquatic life and water use. Formed through a series of complex chemical reactions, AMD usually pollutes the water with high levels of dissolved metals. Waters may visually appear clean and clear, while being chemically toxic to aquatic organisms and plant life. Often, impaired streams are stained orange from the high levels of iron. Upon entering a stream, metals deposit on the stream bottom and severely degrade the habitat of aquatic plants and animals. Developing a comprehensive assessment, restoration, and implementation plan would identify AMD pollution sources and prioritize areas for cleanup. Implementing treatment systems for major discharges based on a prioritization plan allows for the best use of funding and maximizes the benefits to the stream.

### Acid Rain

Acid rain is a challenging issue to address, as conditions can result from pollutant sources hundreds of miles away in other states, and even other countries. Acid rain is primarily a product of coal-burning power plants, formed when the primary pollutants sulfur dioxide and nitrogen oxides are emitted into the atmosphere, where they form the secondary pollutants of nitric acid vapor, sulfuric acid, and acid-forming sulfate and nitrate salts. These substances can descend into the earth's surface as wet deposition (rain, snow, fog, etc.) or as dry deposition particles. Due to an abundance of coal-burning power and industrial plants, the northeast and Ohio valley regions release the largest amount of sulfur dioxide and acidic pollutants in the country, resulting in the entire region having acidic (low pH) precipitation. Acid precipitation is a national issue that requires cooperation between the states and national government.

### Septic and Sewage

The development of adequate and comprehensive wastewater treatment is needed throughout the project area. Malfunctioning and nonexistent septic systems allow nutrients and bacteria to enter water sources, which can cause contamination of streams and groundwater. This contamination can create potential health hazards.

In urbanized areas, homes are connected to wastewater treatment plants that treat sewage waste. Sewage is pumped into these plants where it goes through a three-step process to remove sewage waste and treat the water. Once treatment is complete, the water is released back into a nearby waterway. Older wastewater treatment plants were designed to collect both wastewater and stormwater. When large

stormwater events occur and cause the systems to exceed capacity, combined sewage overflows allow nutrients and bacteria to flow untreated to the streams and contaminate waterways. Designing wastewater treatment systems to adequately serve the communities is necessary. Separating stormwater from wastewater systems can ease the amount of combined sewage overflows occurring.



*Gravel bars, resulting from flooding and increased sediment in area waterways, restrict and redirect the flow of the stream*

### Flooding

The flood of 1996 had a dramatic impact on the watershed and the consciousness of its residents. The flood caused a tremendous amount of property damage and resulted in the dispersal of debris throughout the watershed. Nearly a decade later, the remnant debris is still an issue on people's minds. A dedicated flood-control program is needed to assess, create, and maintain projects that will minimize the chances and severity of flooding in the area.

### Dredging

Dredging is the removal, displacement, and disposal of unconsolidated earth materials such as sand, silt, gravel, or other submerged materials from the bottom of waterbodies, ditches, or natural wetlands (Mason County, 2006). It utilizes machinery to remove and collect the material from the waterbody floor.

Many believe dredging to be an answer to lessen flooding; however, often it is not a practical solution, due to its cost and ineffectiveness. Dredging is very expensive for a temporary solution. The United States Army Corps of Engineers only covers 50 percent of the cost, requiring the local municipalities to provide the other 50 percent. Once the dredging is completed, the municipalities are then responsible for the maintenance and upkeep of the dredged area, which can and will fill in again due to natural events, rendering the process useless.

An alternative to dredging is natural stream channel design. Natural stream channel design utilizes techniques to reshape and support streambanks through the installation of in-stream structures and vegetated streamside or riparian corridors, which better controls floodwater and sediment transported by the stream. Reshaping the streambanks sometimes creates a wider floodplain that is capable of handling higher storm flows. In-stream structures, such as rock vanes, redirect the stream flow away from the banks, minimizing erosion and stabilizing the streambank and allowing sediment to move downstream. Vegetation holds soils in place during flood events and filters pollution from entering the stream.

### Erosion and Sedimentation

Erosion and sedimentation are important issues. Erosion can result from a number of land-use practices, including construction activities, poor agricultural practices, and poor logging techniques. Soils lacking vegetation are susceptible to extensive erosion, allowing large amounts of silt to enter the stream, especially during storm events. The sediment is then deposited in the streambed, often filling or blocking the channel. Erosion occurs on streambanks where little or no vegetation is present because there are no roots to hold the soil in place. On streambanks lacking vegetation, native species could be planted to limit the amount of erosion and sedimentation in the streams and protect streambanks.

### Agricultural Runoff

Agriculture is one of the primary land uses in the project area. Working with the agricultural community to control runoff and stabilize streambanks would be beneficial. Educating the agricultural community to understand that the implementation of best management practices is not only beneficial to the environment, but also to farmers, is critical. Streambank fencing, for example, limits the access of

livestock to the stream, resulting in re-established vegetation, stabilized streambanks, a reduction in soil erosion and sedimentation, and improved water quality. This also increases the health of the herd, resulting in a financial gain for farmers.

### All-terrain Vehicles

One of the most controversial issues within the watershed is the use of off-highway vehicles or all-terrain vehicles (ATV). ATVs are one of the major causes of soil erosion. Drivers typically ride on areas of steep slopes, or streambeds, ripping up vegetation and allowing additional sediment to enter streams. Enforcement and strengthening of current regulations is needed within the project area. Keeping ATVs off private lands and unauthorized trails is difficult with the increased interest in ATVs. Establishing designated areas for ATVs, like the Off Road Vehicle area at Shenango River Lake and the Allegheny National Forest, could potentially eliminate some of the problems. Proper design of trails can help control erosion and sedimentation.

### Dirt and Gravel Roads

Non-point runoff sediment from dirt and gravel roads is a major source of pollution to Pennsylvania's waters. The Pennsylvania State Conservation Commission's Dirt and Gravel Road Maintenance Program was created to address these issues on a primarily local level. Annually, the program allots \$4 million to county conservation districts to operate the program. Townships and conservation districts work together to become trained in the maintenance of dirt and gravel roads and to develop a plan to alleviate sediment runoff issues.

### Public Awareness and Education

Education is the key to actively involved citizens and an improved quality of life for residents. Within the area there seems to be a lack of concern for the environment. This lack of concern leads to poor environmental planning, minimal environmental awareness, and missed funding opportunities. Educating residents and officials to understand the economic benefits and importance of watershed protection is essential to improvements.

Environmental education is generally targeted to school-aged children. Adult environmental educational programs are limited. Implementing programs to help landowners understand the importance of watersheds could be a first step to getting them more involved. Stakeholders have identified a need to make the public more aware of environmental issues affecting the community, such as illegal dumping, water conservation, and environmentally friendly development.

The Pennsylvania Department of Education (PDE) established environment and ecology standards requiring educators and students to become more involved in watersheds. Educators often look to local organizations, such as watershed groups, to assist them in educating the youth. Reaching out to help the local school districts teach students about watershed issues may inspire kids to become more involved in their local communities.

### Illegal Dumping

In addition to being unsightly, illegal dumps pose direct health threats and have a high potential to contaminate waterways. Waste containing hazardous materials soaked by rainfall may cause contaminants to leach through the soil or run off the land surface, contaminating ground or surface water. Trash and



*Using pigment from AMD to tie-dye t-shirts is a fun, hands-on way to educate people about mine drainage*

debris can directly enter the stream through heavy rainstorms, affecting water quality and stream aesthetics. Debris can collect in the stream, clogging it, which raises water levels and causes flooding.

Locating and cleaning up illegal dumpsites is an important issue for the community residents. Reducing the number of illegal dumpsites can occur through cleanups, education, and alternate disposal methods. Active participation by residents and local government officials is needed to address illegal dumping issues. In addition, educating the public about the threats of illegal dumping is an important step in battling the epidemic. PA CleanWays chapters and volunteers work to clean up illegal dumps across the state by adopting roadways and trails where dumping occurs. For more information about illegal dumping and what you can do to help, contact the Jefferson, Clarion, and Clearfield County Chapter of PA CleanWays.

### Landowner Rights

Buying property comes with many rights, privileges, and responsibilities for the landowner. Liability is a major concern for landowners and the reason that many landowners post their property. Respecting landowners' rights, individuals should refrain from trespassing on private lands during hiking, fishing, hunting, or other recreational activities. Having maps available that identify recreational facilities and public lands could minimize the intrusion on landowners' rights.

### Agriculture

Agriculture is the second-leading land use in the region and a way of life for many residents. Preserving the rural character also involves preserving the agricultural lands operations.

#### Sustainable Farming versus Industrial Farming

Current agricultural operations in the area are small, sustainable, family-owned operations. In addition to developmental pressure, there is also the pressure for the establishment of industrial farming or concentrated animal feeding operations (CAFO). The vast open space in combination with Interstate 80 makes the region attractive to industrial agriculture. Although many residents see industrial agriculture as a means of economic development in the region, other residents are concerned about the practices used, such as the use of hormones and antibiotics and concentrating a large number of animals in a condensed space. Other potential impacts that area residents are concerned with include the storage and disposal of manure, increased nutrients and sediments entering waterways, and odor. The management of these operations is controlled by regulations of DEP and the State Conservation Commission.



*Young cows at a small, local, family-operated farm outside of Brookville*

#### Farmland Preservation

Preserving farmland and open space for future generations is essential. Several programs are available to help landowners protect their farms and the rural way of life. Purchasing conservation easements protects the land for agricultural uses indefinitely. Other alternatives include designation of agricultural security areas. Agricultural landowners in the watershed should consider enrolling in the program that is best for them. Enrolling in these programs can protect their farmland from development pressures.

### Recreation

Residents expressed an interest in capitalizing on the recreation opportunities that exist or could be developed. Marketing of current recreational facilities is limited. Hunting, fishing, and hiking have been identified as popular recreation activities and can be enhanced through additional planning and protection.

The region has a variety of recreational facilities. Working to connect these facilities to one another and enhance the amenities of these facilities would be beneficial.

Extending and linking existing trails, along with the development of new trails, is something that residents would like to see. Stakeholders also identified the desire for more access to trails, better maintenance, and the creation of water trails. Parking facilities and access points for boating were also suggested.



*A gristmill located in Port Barnett along Mill Creek, a tributary to Sandy Lick Creek*

### Historic Preservation

Residents expressed the importance of preserving remaining historic sites. Preserving historic sites for future generations is key to protecting the culture of the region. To help preserve these historic areas, municipal officials must get involved with local citizens and preservation groups. Establishing self-guided tours that highlight the history of the area, like the Brookville historic walking tour, could increase tourism and make local citizens and visitors more aware of the local culture.

### Smart Growth and Planning

Development is going to occur. It can be done attentively and wisely through the implementation of cooperative land-use strategies. Smart growth principles promote the use of sound land-use planning, including mixing land uses; making development decisions predictable, fair, and cost effective; strengthening and directing development toward existing communities; fostering distinct, attractive communities with a strong sense of place; and preserving open space, farmland, natural beauty, and critical environmental areas. By employing smart growth principles, businesses and industries could be attracted to the area, generating jobs while maintaining the natural settings prized by residents and tourists. Smart growth also involves educating landowners about the process and its benefits.

The establishment of zoning ordinances would help the community protect itself from unwanted land uses. Each municipality should consider zoning ordinances and a comprehensive municipal plan and/or joint plan with neighboring municipalities. Many residents are interested in working with municipal officials to establish ordinances to protect their community from sprawl and other unwanted land uses.

### Protecting Biodiversity

Biodiversity means having a variety of living things in an area. This region is fortunate to have a great diversity of plants, wildlife, and natural communities within its boundaries. Features like the cottongrass wetland, vernal pools, and Hemlock Palustrine Forests provide habitat for a variety of animal and plant species. Conducting an inventory of wild plants and animals would be beneficial because it would help protect biodiversity. The Pennsylvania Natural Heritage Program documents areas and species of special concern. The findings from biodiversity studies can be used to market the area for its natural areas, potentially bringing in more tourism and recreational opportunities, while protecting the resources.

One component of protecting biodiversity involves controlling invasive species. Invasive species, which spread quickly and are difficult to eradicate, become dominant taking over areas of native vegetation.

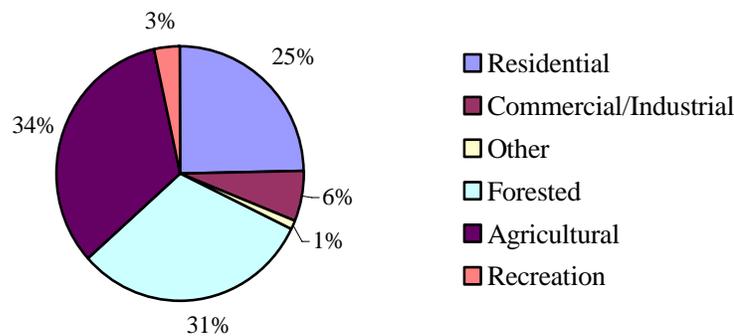
## Survey Results

Surveys were developed for both residents and municipal officials in order to determine how stakeholders perceived and utilized the watershed’s resources. Copies of the surveys are located in Appendix J. Twenty-nine public and 18 municipal surveys were completed and received. The results are summarized below.

### Land Use

Residents and municipal officials were asked to identify the two most common land uses from a list of six choices. The two land uses most frequently selected were agricultural and forestry. Indeed, land-use data identified that forestry, followed by agriculture, are the two actual major land uses within the watershed. Additional information about land use is available in the Land Resources chapter.

**Figure 6-1. Common Land Uses as Viewed by Watershed Stakeholders and Municipal Officials**



### Watershed Attributes

Survey participants were asked to rank a list of attributes according to their priority, with one being the most important and nine being the least important. The results are listed in Table 6-1. Municipal officials and stakeholders both agreed that the second most important attribute is water quality improvement, but had divergent views on the first and third most important attributes. Stakeholders identified preserving historical sites as first, and attractive natural settings as third, while municipal officials chose new businesses and jobs as first, and recreation opportunities as third.

**Table 6-1. Values of Importance**

Attribute	Public Surveys			Municipal Surveys		
	Total	Rank	Surveys Responding	Total	Rank	Surveys Responding
Preserving Historical Sites	194	1	28	39	7	12
Water Quality Improvement	180	2	28	89	2	15
Attractive Natural Settings	141	3	28	60	5	13
New Businesses/Jobs	140	4	28	105	1	15
Recreation Opportunities	139	5	28	83	3	15
Educational Opportunities	117	6	28	36	8	14
Community Activities	99	7	27	45	6	14
Residential Development	81	8	27	80	4	15

Recreational Opportunities

Participants were asked to rank a list of outdoor recreational opportunities according to their priority, with one being the most important and 15 being the least important. Results are identified in Table 6-2. Municipal officials and stakeholders both concluded that hunting is the first priority and that hiking is the third. However, the second priority varied between the two groups, with stakeholders choosing scenic vistas, and municipal officials choosing fishing. Golfing was not originally listed, but was written in by several participants.

**Table 6-2. Recreational Opportunities of Importance**

Recreational Opportunity	Public Surveys			Municipal Surveys		
	Total	Rank	Surveys Responding	Total	Rank	Surveys Responding
Hunting	249	1	22	269	1	18
Scenic Vistas	217	2	21	35	15	6
Hiking	214	3	20	166	3	15
Picnicking	213	4	23	110	6	11
Public Parks	197	5*	20	55	13	8
Fishing	197	5*	20	222	2	17
Kayaking/Canoeing	181	7	18	75	9	9
Swimming	163	8	18	82	8	9
Boating	155	9	13	68	11*	9
Photography	150	10	19	46	14	7
Bird Watching	139	11	19	68	11*	10
Organized Sports	138	12	17	83	7	9
Horseback Riding	101	13	16	70	10	9
Biking	92	14	15	138	5	14
ATV Riding	90	15	14	160	4	14

\* Ranking tied

Watershed Aspects

Public survey participants were asked to identify positive and negative aspects of the Redbank Creek valley. In the sections below, the participants’ opinions about the positive and negative aspects are listed along with potential methods for improvement identified by survey participants.

Positive Aspects

Participants largely connect the positive aspects of the Redbank Creek valley with the rural environment in which it is located and the associated benefits that are intertwined. The rural setting itself was cited numerous times and the majority of other positive aspects appear to be directly related to these surroundings. Among these rural-associated positives, peace and quiet, natural scenic beauty, outdoor recreational activities, a low crime rate, and light traffic conditions top the list. Additionally, many residents are proud to reside in an area with historical depth, especially since some have local family history that goes back for several generations. Many also found the climate to be a positive environmental influence.

Negative Aspects

Negative aspects are primarily concentrated in four categories: economic challenges, residents’ attitudes, resource extraction, and lack of infrastructure/zoning. Economically, many feel that the region is suffering. There is a lack of jobs, specifically, well-paying jobs. Some residents report a limited number

of commercial establishments, such as gas stations, restaurants, and stores in their communities. Accompanying, and perhaps contributing to, economic problems, high taxes were cited, along with insufficient school funding.

Many negative aspects cited were related to the attitudes and beliefs of watershed residents. Many cited that there is a large amount of apathy on the part of the public towards conservation issues and participation in local government. Others feel that residents are uninformed, close-minded, or are afraid of change. One survey respondent felt that a lack of education about the issues could be to blame for these sentiments.

The legacy of resource extraction has left scars on the landscape, which are visible in the presence of AMD and abandoned strip mines. Currently, the surge in the number of gas wells being drilled also presents cause for concern amongst residents. Many residents also feel that the infrastructure and recreational opportunities are lacking, as many townships are without municipal water and sewage facilities. Some residents also report problems with dirt roads and illegal dumpsites, which could be related to a lack of trash pickup. A lack of land-use regulations and planning could be related to other negative aspects stated, such as sprawl.

#### Methods for Improvement

Residents identified several methods and suggestions to address some of the issues and concerns noted in this plan. In addition to the following list, future negative impacts could be reduced through smart growth planning, conservation efforts, and environmental education.

- Better stormwater management;
- Economic improvement and increased job opportunities;
- Address and treat mine drainage issues (lime ground);
- Enforce environmental laws and create stricter guidelines;
- Improve water quality;
- Control ATV traffic;
- Clean up illegal dumps/junk cars and educate about the issue;
- Education for youth and landowners about environmental issues;
- Increase community involvement and awareness;
- Improve access to hiking and canoeing/kayaking opportunities;
- Improve forest and wildlife management;
- Work together to find a common goal amongst residents;
- Increase recycling;
- Increase funding and political support for the environment in federal and state budgets;
- Improve infrastructure (sewage, roads, water);
- Develop flood-prevention methods;
- Develop agricultural preservation;
- Create zoning ordinances and land-use regulations;
- Control and limit sprawl;
- Encourage environmentally sound recreational activities;
- Promote tourism;
- Cease creation of new landfills; and
- Reforest strip mines.

#### Critical Needs

Municipal survey participants were asked to identify critical needs or challenges within their municipality. Many participants primarily identified water issues as a critical need. Water issues cited

include water quality, proper drainage, flooding, stormwater management, access to affordable public water and sewage, contamination of water, water runoff from mines, and sewage problems. Other critical challenges include the creation of better roads, oppressive wetland requirements, debris, garbage and industrial waste, employment opportunities, the need for zoning, and issues of erosion.

#### Future Projects

Municipal survey participants were asked to identify projects that they envision for the future of their municipality.

#### Land Resources

- Farmland preservation;
- Forestland preservation;
- Logging regulations;
- Regional water supply systems; and
- Conduct a flood-control study to determine causes of flooding and methods to minimize flooding.

#### Water Resources

- Water quality preservation;
- Additional well for increased capacity (Summerville Borough);
- Realistic wetland requirements;
- Public water access;
- Stream cleanup ;
- Dredge creek above New Bethlehem Dam, and replace the dam with adjustable gated structure;
- Flood control.

#### Biological Resources

- Maintain natural beauty in Coder area;
- Biodiversity index for various stream segments;
- Improve fishery; and
- Educational processes for preparing and caring for all biological resources.

#### Cultural Resources

- Preserve the right to hunt, fish, and canoe the watershed;
- Upgrade and develop playgrounds;
- Create public parking spaces and additional access to streams for fishing, canoeing, etc.;
- Enhance environmental education;
- Preserve existing historical sites and landmarks;
- Improve and maintain Reynlow Park;
- Improve campground recreational use; and
- Rails-to-trails.

#### Other Resources

- Continue to upgrade and improve roads within the watershed especially secondary roads.;
- Place more limestone to limit sediment and raise pH and water quality;
- Regional economic development plan;
- Careful planning of urban development to ensure economic enhancement without sprawl;
- Improve secondary roads;
- Research railroad possibilities before removing them; and
- Creation of businesses and job opportunities to improve economy.

## Meeting Results

During the initial round of public meetings, participants had the opportunity to discuss what they envisioned for their watershed, including what they would like to protect and improve. Meeting participants prioritized the results of the visioning session, identified in the following section.

### Protection

**Table 6-3. Community Vision and Prioritization for Protection**

Votes	Community Vision
34	Outdoor recreation including hiking, canoeing, fishing, camping, and hunting
20	Being able to own land and being able to do what you want, unzoned, undeveloped areas – landowner freedom
14	Resources are available to support yourself, such as gas and timber
11	Wide diversity of wildlife and wildlife at your doorstep
10	Environmental quality, such as clean water, low noise, clean air, etc.
9	Natural beauty, rural area, natural surroundings, and solitude
9	Not overcrowded, no traffic, no long waits in line, etc.
8	Forested areas
8	Local history, including historical structures and places
7	Low taxes
5	Not far away from wilderness and close proximity to state parks
3	Family and ancestors were here
2	Good education opportunities
1	Healthy and safe environment to raise a family; low crime
1	Community pride and orientation
0	Close to urban areas for culture
0	Climate
0	Ease of east–west (interstate) travel

### Improvements

**Table 6-4. Community Vision and Prioritization for Improvement**

Votes	Community Vision
27	Improvement of existing infrastructure and new infrastructure is needed for businesses to come into the area. Improve infrastructure, including local water, sewage, internet, direct link access from I-80
21	Increase community awareness about watersheds, conservation, AMD, and other issues, and increase funding available for environmental education. Educate the public about what we have and conserving it
21	Redesign dam in New Bethlehem to include adjustable gates
19	Increase accessible recreational facilities, such as specifically designated trails for ATVs, hiking, biking, and horseback riding; parks, facilities, and activities for kids, etc.
14	Increase inter-municipal cooperation and agreements

**Table 6-4. Community Vision and Prioritization for Improvement (continued)**

<b>Votes</b>	<b>Community Vision</b>
14	Canoe access improvements and designated camping areas along streams
14	Dredging of creek needed for flooding and recreation
9	Treat AMD and unreclaimed abandoned mine lands
9	Increase the number of good-quality jobs and diversify the types of jobs in the area so they are not all tourism-based
8	Encourage industry to move in
7	Need for planning – there is no countywide planning and currently, planning is reactionary. Lack of zoning and regulation. Reluctance to change and plan for growth
6	Establish more awareness of impacts that new businesses have on local communities, streams, groundwater, and their effects downstream
6	“Townners” – Illegal dumping, town mentality, out of sight, out of mind
6	Educate government officials
5	Improve sewage systems in urban areas
5	Keep ATVs off riparian and public areas and increase awareness about why they are being prohibited from these areas
4	Increase assistance to agricultural community for technical assistance and money for best management practices
3	Improve forest management
3	Establish a water trail to get landowners involved and generate interest, and to delineate access points and danger points
3	Repair riparian corridor
3	Increase involvement at schools
3	Increase community involvement and volunteerism
3	Better communication between municipalities and counties, such as flooding notification. Eliminate the mentality that each community is separate
2	Motivate people not to be apathetic
2	Reclaim unreclaimed mines
2	Improve cost-effective on-lot sewage options
2	Locally controlled zoning in urban areas
1	Better utilization of Alcoa Park and upgrade equipment
1	Need for winter recreation activities (Dec.-Apr.), such as an area for snowmobile use
1	Downtown revitalization is needed to restore storefronts
1	Need for historical preservation
0	Rural road improvements; dirt from gravel roads ends up in streams
0	Travel north-west – there is no easy route
0	Repair failing on-lot septic systems
0	Increase fire protection

Future Visions

**Table 6-5. Community Vision and Prioritization for Future Visions**

<b>Votes</b>	<b>Community Vision</b>
15	Preservation of railroad corridors, including Rails-to-Trails
12	Clean up water and get rid of sewage problem
10	Lessen power of environmental agencies, including Department of Environmental Protection, and be less restrictive to agriculture

**Table 6-5. Community Vision and Prioritization for Future Visions (continued)**

Votes	Community Vision
9	Eliminate township supervisors' ability to legislate
7	Establish a go-between for the community and Department of Environmental Protection
6	More participation in recycling, servicing by provider (emptying the bins), and education about what can be recycled is needed
5	Decrease the amount of low-income housing
5	Encourage local communities and governments to work better together
4	Tree cover on reclaimed strip mines, flooding, other benefits
4	Better enforcement of sediment and erosion controls and point source discharges
3	Conserve existing natural resources
3	Better regulations and management of pollution from runoff, including industrial, commercial, residential, salt piles, and truck stops, is needed
3	Establish more agricultural best management practices, such as manure storage and conservation easements
2	Specific recreational-use areas and access, including boat launches and trail heads, etc.
2	Improve water quality of entire Redbank Creek watershed to reach the water quality that North Fork Redbank Creek currently has
2	Better connection between taxes and availability of services
2	Increase tipping fees to get more money
1	More environmentally sound infrastructure and businesses are needed
1	Consider soil type and quality in planning and development
1	Establish better government oversight of gas well exploration including the impacts and amount of interest in establishing addition gas well sites
1	Establish an evening place for teens to gather
1	Establish more affordable local cultural activities, such as plays, concerts, etc., for everyone (variety)
1	More accessible library hours
1	Having a watershed no longer being impacted by abandoned mine drainage
0	Responsible zoning is needed to protect agricultural and other lands
0	Future transportation improvements
0	Establish plans to control hazardous spills
0	Reasonable balance between human interests and wildlife protection

Other Things to Include in the Plan

**Table 6-6. Community Vision and Prioritization for Other Things to Include in the Plan**

Votes	Community Vision
8	Cultural, historic, and prehistoric resources
5	How to get funding for different projects, reclamation, etc. and make it fair
2	Don't want unreasonable development restrictions, such as dredging, sidewalks, access, etc.
1	AMD issues
1	More power to clean up, get support, and address land ownership issues
0	Flood control

## Interview Results

Interviews were held with key individuals identified by the steering committee. The interviews were conducted via telephone. The results of the interviews are summarized below. A copy of the interview questions is located in Appendix J.

### How has the watershed changed in the past 10 years?

Although a few participants claimed that there has been no change in the past 10 years, the majority of participants believed that significant change has occurred. However, views often differ about whether the changes have been positive or negative.

Most people believe that certain aspects of water quality are improving, due to the public's awareness of relevant issues and what they put into the water, stricter and more developed regulations for sewage, and, in one opinion, because farmers are reverting to older, less chemically dependent farming practices. It is also said that in many areas AMD is less prevalent than it was 10 years ago. Sewage issues have improved, but still exist. However, other water quality issues are troubling to many respondents. Among these issues, is the decrease in the water's pH level, which indicates an increased amount of acidity, and has resulted in a noticeable decrease in the fish population. Additionally, the stream seems to be warmer in temperature. More runoff from developed areas is entering waterways, and a larger population has increased the stress put on sewage and water systems. One participant believes that the water table is decreasing faster, an issue that is perhaps related to the area's population growth.

The population has increased and brought along with it a greater demand for development, which can be seen in the building of new houses. The growth of the timbering industry causes great concern to many participants. There is a concern that development and timbering have increased flood events because of more impervious surface and less absorption because trees have been removed. Finally, another important concern is the additional number of gas wells in the last few years and their impact on water quality, the visual aspect of the watershed, and landowners' rights.

### Do the following meet the needs of the watershed community?

#### Transportation

The general consensus concerning roadways is that there are enough roads and that they are well-maintained. Several people mentioned that some of the more remote roads could be improved, especially since runoff from dirt and gravel roads could have negative impacts on water quality. The proximity to the transportation corridors of Interstate 80, and State Routes 322, and 219 is considered a beneficial attribute of the region. Many residents also considered the accessibility to the airport a plus, although one found the access to be overkill. The lack of public transportation is also an issue, although several people mentioned the opportunities available through the Area Transportation Authority (ATA) of north-central Pennsylvania. While this is a good service, many feel this could be expanded, and a taxi service be made available. In addition, a number of people mentioned the possibility of utilizing old railways for public transportation in the future, and the importance of maintaining these rights-of-way.

#### Infrastructure

Most people believe that the sewage and water infrastructure is not that good, but is improving. The major issue is inadequate septic and sewage systems, which people believe to be in poor condition, resulting in raw sewage being dumped into the creek in some areas. Financial limitations are an issue, because malfunctioning areas are in poor communities. Some areas are being outfitted with public systems, but this does not work everywhere and is dependent on community block grants. It was suggested that small, innovative sewage systems be used, as opposed to large community systems. Water

supply issues are not as big of a concern, and many areas have public water. Water quantity issues are a slight concern because some people believe that the water table is lowering. Also, DuBois gets its water from Anderson Creek, a tributary to the West Branch of the Susquehanna River, and there is concern about how this affects the water cycle. Stormwater management in growing urban areas is also a concern.

#### Employment Opportunities

The general consensus is that there are not enough jobs, specifically, well-paying jobs. Only a few people interviewed felt that enough local jobs were available in certain sectors of natural resource extraction. Many people commute to Clarion or Pittsburgh for employment, but reside within the Redbank Creek watershed due to the relatively low cost of living. Some well-paying jobs exist in the growing coal and gas industries, but most people believe that a lack of a manufacturing base has caused an economic decline. A revitalization of the manufacturing base, as well as small-town community businesses and local history promotion, would help the local economy. A few people mentioned that increased regulations were limiting jobs in agriculture and other industries.

#### Educational Opportunities

Overall, residents have a high degree of satisfaction with the quality and availability of educational opportunities both in the public school system and post-secondary education system. Only a small percentage of those interviewed mentioned that some of the public schools could be improved. One concern was that most of the school districts are not in one county, and this causes a split of loyalties throughout the area.

However, the types of post-secondary opportunities, including four-year colleges and trade schools, are varied and held in high regard. Among the schools mentioned were Penn State-DuBois campus, Triangle Tech, DuBois College, and nearby Clarion University.

Several people mentioned the lack of environmental education and continuing education in the area of natural resources and local history. Few outdoor classroom opportunities exist and these are poorly attended. However, in the past, fly-fishing workshops were well attended, but it is not clear whether an outfitter is still active. Participants believe that supplementary environmental education should focus on water conservation and quality and farm tours.

#### Land Use/Zoning Ordinances

There is a lack of agreement about whether there are too many or not enough land-use controls. Most people do not want to see any restrictions on personal property rights that are perceived to be unfair, excessive, or confining. However, many people are concerned about unplanned development and activities that affect water resources. A number of people feel that there is not enough enforcement of existing regulations, that decisions are reactionary and not proactive, and that they can easily be outweighed by financial circumstances. Other concerns include outdated stormwater ordinances, a lack of comprehensive planning, and no countywide zoning.



*Culverts allow water to continue flowing underneath roadways and are often used for stormwater management*

## Do the recreational opportunities currently meet the needs of the watershed community?

### Parks/Picnic Sites

There are contradictory opinions about the quality and amount of parks and picnic sites that are



*Gumtown Park, located along Redbank Creek in New Bethlehem*

available. However, all of the respondents from the Borough of Brookville agreed that the number of parks is adequate, although an issue with the need for parking arises. There is a lack of knowledge concerning the parks, and infrastructure within existing parks needs to be improved and made more accessible.

Some people believe enough picnic sites and parks exist, while others feel the number is inadequate. In general, knowledge is lacking about where the sites are located, and more picnic tables and other amenities are needed in the sites that do exist. Known locations outside the region, such as Cook Forest, Parker Dam State Park, and Elliot Park, are often used more than sites within.

### Hiking/Biking Trails

Although some people think that the number of trails is adequate, in general, the opinion exists that they should be expanded. The majority of trail opportunities are rail/trails that tend to be concentrated in the north. Trail opportunities also exist near the project area; however, few people are aware of the locations of the existing opportunities. Several plans are underway for expansion to the rail/trails, but some landowners are opposed. Few, or no, walkways or bikeways are available adjacent to roads, which often are too narrow for such activities. Modification of existing roads to consider pedestrian rights-of-way could help local communities.

### All-terrain Vehicle Riding

ATVs provide a popular form of recreation. However, much of the off-road vehicle use is on private lands and trespassing is common, creating tension with landowners. A perception exists that many ATV riders do not respect private property rights. Although some public trails can be found in the vicinity, such as Allegheny National Forest, few convenient opportunities exist. The designation of parks for ATVs riding could alleviate some of the pressures on private property owners and decrease some of the negative impacts by concentrating it away from sensitive areas. Another issue is the use of unlicensed ATVs and reckless, unlicensed young drivers.

### Scenic Vistas/Photography

Most participants claim that impressive scenic vistas are available, but most residents and visitors are unfamiliar with, and unaware of, the locations. Indeed, many participants feel that increased advertising and marketing regarding the scenic vistas would improve the ability of potential users to locate and access these locations. One respondent, though, questioned whether the scenic vistas should be made public knowledge. Some participants felt that the scenic vistas and photography areas were lacking or merely adequate.

### Wildlife/Bird Watching

The overall consensus is that there are many quality opportunities available for wildlife and bird watching, but they are informal, undesignated, and unorganized. Only one respondent mentioned that there are active Audubon chapters within the region. Additionally, it was mentioned that there are other active bird-watching groups, such as the Golden Eagles. Increased advertising and marketing is suggested as a way to increase knowledge and participation in wildlife- and bird-watching activities.

### Hunting/Fishing

Hunting and fishing are very popular recreational activities within the project area, and many opportunities exist for residents and visitors to partake in them. Fishing opportunities have been negatively impacted by the low pH levels in some streams, and in areas impacted by AMD. There is not an adequate supply of fish to meet the demands of anglers, although as water quality improves, some are reporting an increase in fish, and there are reports that trout are more plentiful in the northern region. Hunting, as a recreational activity, is considered to be above average and prevalent throughout the area, especially in gamelands. Bear and deer are the most common species for which hunting occurs. There is a co-op program in place between private landowners and sportsmen's clubs that allows a greater range of land on which hunting can take place without concerns of trespassing onto private lands.

### Boating/Swimming

Boating, generally in the form of canoes and kayaks, is a seasonal activity along Redbank Creek and its tributaries that occurs when water levels are high enough to permit their passing. In the seasonal periods where it is possible to engage in a boating activity, participants say activity is light, even during trout season.

Most swimmers utilize public pools, and there is a reported swimming hole in the Sandy Lick area, but the location is not advertised or formally known and the presence of copperhead snakes could present a dangerous situation. It is suggested that natural bodies of water are underutilized for swimming due to debris, trash, and sewage that may be present.

### Historical Sites/Structures

There are several opportunities to view historical sites and structures in the region, but people are largely unaware and it is believed that additional attention to, and advertising about, the subject could be beneficial. There are historical societies, but there is a lack of involvement and they do not restore old structures. Generally, the older population is more aware and interested in the historical sites and structures, and as this generation passes, their historical perspective will be lost. Additionally, those who have an interest are generally aware, and those who are not interested (particularly the younger population) are not informed. Sites and structures of interest that were mentioned include a Native American archaeological site, the DuBois mansion, and sites linked to the Underground Railroad. Participants think the unique history should be documented and more efforts need to be made to make the historical sites and structures more visible to the community and visitors. Also, including more local history in elementary and high school curriculum may increase interest in local history and historical preservation.

### Other

Other issues important to participants included preservation of natural vegetation and wildlife, the lack of designated campsites along trails and waterways, the lack of multiple-day hiking trails, and the absence of cross-country skiing opportunities. Participants added that there are many opportunities for golfing, tennis, organized sports, horseback riding, and for viewing stockcar racing. There is some concern over the fact that biking occurs in some areas on streets that are not wide enough for both bikes and vehicle traffic.

## What are some of the impacts currently affecting the resources of the watershed?

### Land Resources

There are many impacts currently affecting land resources. Land-resource impacts are particularly important, as they also have an affect on water and biological resources. The number of gas wells in the area has dramatically increased in recent years, spurred by changes in regulation, the rise in price, and,

therefore, demand. Participants wonder what kind of effect the surge of gas wells will have on the landscape and water supply.

There are many farms located along Redbank Creek, while Sandy Lick Creek and North Fork Redbank Creek report fewer farms. Regardless of the amount, many feel it is imperative that farmers utilize best management practices to reduce the amount of runoff, sedimentation, erosion, and other negative impacts to local waterways and natural resources.

The logging industry remains active, and although the majority of companies are following regulations, some are not fully compliant. There has been some improvement in utilizing sustainable and best management practices but there are claims that too much clear cutting is still occurring. It is suggested that certain lands should be reclaimed and restored to forested lands. Deer overbrowsing may also play a role in less than optimal forest growth. Educating forestland owners about sustainable forestry practices could improve forest resources in the long-term.

Additional impacts to land resources include strip mining, AMD, debris from the 1996 flood, illegal dumping, and increased human development.

#### Water Resources

Water quality and resources are vital issues, particularly due to the impacts and attention that the flood of 1996 brought with it. The 1996 flood, as mentioned by participants, and floods in general remain a concern. Acid rain, which decreases pH levels, was cited as a problem in several areas. Participants worry about the effects that mining and drilling could have, as residual mining runoff, AMD, and possible drilling-related issues are all relevant. Specifically, there is a large mine discharge which flows under the



*Allegheny River from the mouth of Redbank Creek*

DuBois Mall that is being addressed. Dirt and gravel roads are contributing to sedimentation issues, while nutrients from farms and septic tanks could be entering waterways. A lack of properly vegetated riparian (streamside) areas, which help to filter this runoff and lessen the amounts that enter the streams, could accelerate these problems. Without a proper riparian area, thermal issues also arise, because riparian vegetation helps to regulate water temperatures. Many respondents identified sewage and wastewater issues that are currently impacting the water resources. One respondent believed Manners Dam needs to be repaired and fixed to improve water quality. Lastly, it was suggested that a water quality plan and hydrological studies, with adequate testing, need to be implemented to study and address water issues.

#### Biological Resources

There are several impacts to the biological resources, but participants indicate that not everyone is aware of them, and there are both positive and negative results being reported. Invasive species are particularly worrisome because they compete with native species and disrupt natural interactions between indigenous plants and animals. Many participants stated that there were no invasive species present, which is indicative of the lack of education and awareness that is available about the subject.

One participant indicated that there is an overall increase in the amount of wildlife, and another participant declared that there are many newts and salamanders present in wetland areas, but others claimed macroinvertebrate populations are lacking due to sedimentation. The coyote population, which can be a nuisance to many, is said to be increasing. White-tailed deer, a native species of Pennsylvania,

can cause problems in excessive numbers due to their inclination to consume forest shrubs and ground vegetation without allowing enough time for sufficient regeneration.

In general, the participants suggested that threatened native species be reintroduced, and methods to control exotic species need to be enacted. One participant expressed concern over the amount of attention and regulations associated with wetlands. Additionally, County Natural Heritage Inventories should be performed in Armstrong and Clarion counties, and streambank fencing should be constructed to keep cattle out of streams.

#### *Other*

Participants were encouraged to mention any other issues or suggestions that did not fit into any of the previous categories. Participants brought up transportation-related spills, the possibility for locating alternative clean energy sources within the watershed, and economic issues, such as the many houses for sale and the lack of any large businesses.

#### Do you have any specific projects that you would like to see identified in the plan?

Participants suggested the following list of projects, and types of projects, that they would like to see identified in the plan:

- Flood control;
- Public access sites for streams;
- Historical sites survey;
- Clean up debris from the 1996 flood;
- Conserve and protect native flora and fauna;
- New Bethlehem Dam improvement;
- Establish a Redbank Creek watershed group;
- Increase public awareness of local history;
- Stormwater drainage;
- Address AMD issues;
- Conduct a wetland inventory and secure funding for purchasing easements to protect wetlands;
- Dirt and gravel roads program needs to be utilized by more municipalities to reduce stream siltation;
- Revitalize industrial base with historical businesses;
- Install a walkway around Kyle Lake;
- Connect rails to trails (Brockway and DuBois);
- Address illegal dumping;
- Create a streambank fencing program;
- Inventory abandoned wells and mines and plan for remediation;
- Utilize best management practices for agriculture;
- Educate the community about relevant issues;
- Repair and maintain existing erosion controls;
- Repair Manners Dam; and
- Lime agricultural or forest lands.

#### What must the watershed plan say to be successful?

Participants felt that in order for the watershed conservation plan to be successful, residents must be involved in the process and understand and benefit from its suggestions. Particularly, the plan should address the economy, dirt and gravel roads program, stormwater management, and water quality issues, while demonstrating how these efforts would be beneficial to the environment and the economy. The plan

should also show how other plans are used, explain the subject, and demonstrate how past plans have been successful. In no way should the plan hurt property rights, or act overly authoritative.

What must the watershed conservation plan not say to be successful?

In order for the watershed conservation plan to be successful it needs to use past examples and act in a non-regulatory manner that engages local grassroots efforts, rather than large government-mandated projects. The plan cannot tread on property rights or place restrictions that would not be agreeable with the public. The plan must communicate its goals and values without a “thou shall not” attitude, a list of demands, or placing blame. The plan must also not put a dollar amount on its recommendations.

## CHAPTER 7. MANAGEMENT RECOMMENDATIONS

This section highlights recommendations to improve the quality of life. These management recommendations are non-regulatory and may be used by any citizen, group, or agency. Potential partners are groups with the resources best suited to assist in meeting these objectives. Potential avenues through which the objectives may be financed are also listed. Groups listed as possible partners or funding sources are suggestions and should not be limited to those provided due to ever-changing circumstances.

The recommendations were derived from correspondence, comments, issues, and concerns identified by local citizens throughout the planning process. The issues and concerns are discussed in further detail in the Issues and Concerns chapter. The watershed community developed the management recommendations through comments, interviews, public meeting workshops, and the completion of surveys. The prioritization of the recommendations was determined by the local steering and advisory committees, and by the public during the draft review phase. These rankings are based upon impacts to the watershed, feasibility, and probability of funding.

This matrix of recommendations includes goals, methods to achieve the goals, potential partners, and potential funding sources. They are listed by priority, with the higher priorities for each goal and method listed first. An additional listing of potential funding sources and the types of projects that might be funded is included in Appendix K. Acronyms used in the management recommendation matrixes are listed in Table 7-1.

**Table 7-1. Acronyms used in Management Recommendation Matrix**

ATV	All-terrain Vehicle	PGS	Pennsylvania Geological Survey
AVLT	Allegheny Valley Land Trust	PHMC	Pennsylvania Historic Museum Commission
COG	Council of Governments	PROP	Professional Recyclers of Pennsylvania
DCED	Department of Community and Economic Development	PRWA	Pennsylvania Rural Water Authority
DCNR	Department of Conservation and Natural Resources	RC&D	Resource Conservation and Development
DEP	Department of Environmental Protection	RVMA	Redbank Valley Municipal Authority
FEMA	Federal Emergency Management Agency	SEO	Sewage Enforcement Officer
NFWA	North Fork Watershed Association	SLCI	Sandy Lick Conservation Initiative
NRCS	Natural Resources Conservation Service	USDA	United States Department of Agriculture
OSM	Office of Surface Mining	U.S. EPA	United States Environmental Protection Agency
PABS	Pennsylvania Biological Survey	USFS	United States Forest Service
PDA	Pennsylvania Department of Agriculture	USFWS	United States Fish and Wildlife Service
PennDOT	Pennsylvania Department of Transportation	USGS	United States Geological Survey
PENNVEST	Pennsylvania Infrastructure Investment Authority	WPC	Western Pennsylvania Conservancy
PEMA	Pennsylvania Emergency Management Agency	WPCAMR	Western Pennsylvania Coalition of Abandoned Mine Reclamation
PFBC	Pennsylvania Fish and Boat Commission	WREN	Water Resource Education Network
PGC	Pennsylvania Game Commission		

## Project Area Characteristics

### Goal 1-1. Increase communication and cooperation among municipalities and counties within the region and eliminate the mentality that each community is separate.

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Educate elected officials about impacts to the local environment.	Conservation Groups, Municipalities, Citizens	DEP, DCNR, Private Sources, Foundations	High
2. Increase lobbying and funding support for the environment in federal and state budgets.	Conservation Groups, Legislators, Municipalities, Counties	DEP, DCNR, Legislature	High
3. Create and enforce stricter guidelines for environmental laws.	Municipalities, Police Departments, PGC, PFBC	Private Sources	Medium
4. Municipalities within the watershed should establish an environmental advisory council to encourage local communities and government to work together.	Conservation Groups, Counties, Municipalities, Conservation Districts, Planning Commissions	Private Sources, DCED	Medium

### Goal 1-2. Become proactive as opposed to reactive when planning for the future.

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Establish or update municipal comprehensive plan for municipalities that currently do not have plans or plans that are 10 years or older. Plans can be established individually or jointly with neighboring municipalities.	Municipalities, Landowners, Conservation Groups, Planning Commissions	DCED, Private Sources, Foundations, Local Government	High
2. Utilize responsible zoning to protect agricultural and other lands, without significantly impeding landowner rights.	Municipalities, Counties, Landowners, Conservation Groups, Planning Commissions	DCED, Private Sources, Foundations, Local Government	High
3. Encourage municipalities and counties to be proactive, rather than reactionary through the development of land-use ordinances or subdivision regulations protecting the character of the communities and valuable resources.	Municipalities, Counties, Landowners, Conservation Groups, Planning Commissions	DCED, Private Sources, Foundations	High
4. Establish zoning regulations in urban areas, controlled by local municipalities.	Municipalities, Counties, Landowners, Planning Commissions	DCED, Private Sources, Foundations, Local Government	Medium

**Goal 1-2. Become proactive as opposed to reactive when planning for the future (continued).**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
5. Strengthen the regulation of land-use ordinances so they are not changed easily.	Municipalities, Counties, Planning Commissions	DCED, Private Sources, Foundations, Local Government	Low

**Goal 1-3. Plan for future infrastructural needs including transportation, water, and sewage services.**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Repair failing water and sewage lines and add new infrastructure in growth areas as identified in County and Municipal Comprehensive Plans.	Municipalities, Planning Commissions, Water Companies	PENNVEST, Private Sources, DCED	High
2. Continue improving and upgrading roadways including secondary or rural roadways.	Municipalities, Conservation Districts, PennDOT	PennDOT, DEP, Conservation Districts	Medium
3. Upgrade and maintain technology, such as high-speed internet, to enable the region to be competitive and attract new businesses.	Municipalities, Planning Commissions, Counties	Private Sources, Foundations, DCED	Medium
4. Establish an emergency management plans to control hazardous spills along Interstate 80 and prevent water contamination.	Municipalities, PennDOT, DEP	PennDOT, DEP, Homeland Security	Medium
5. Encourage municipalities with older Act 537 Sewage Facility plans to update their plans to prepare for future development.	Municipalities, SEOs, DEP, Planning Commissions	DEP, Private Sources, Foundations	Medium
6. Investigate the possibility of widening one of the north-south travel corridors to attract new businesses to the region.	Planning Commissions, Municipalities, PennDOT, Landowners	PennDOT, Private Sources	Low

**Goal 1-4. Utilize natural and historical resources to improve the economy, while increasing awareness of potential impacts that businesses may have on the region.**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Conduct a study of impacts new businesses have on local communities, streams, groundwater, and their effects downstream.	Conservation Groups, DEP, Community Groups	DEP, DCNR, DCED, Foundations, Private Sources	Medium
2. Utilize available nature-based tourism opportunities to increase revenue.	Communities, Conservation Groups, Businesses	Private Sources, DCED, Business Associations	Medium

**Goal 1-4. Utilize natural and historical resources to improve the economy, while increasing awareness of potential impacts that businesses may have on the region (continued).**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
3. Revitalize industrial base with historical businesses.	Historical Societies, Municipalities, Tourist Bureau	DCED, Private Sources, Foundations	Low

**Goal 1-5. Utilize methods to control sprawl when planning new developments.**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Encourage the use of smart-growth principles or conservation by design practices when development opportunities arise to maintain the natural setting prized by residents and tourists.	Municipalities, Counties, State Officials, U.S. EPA, DEP, Planning Commissions, Developers	DEP, U.S. EPA, Local Government, Private Sources, Foundations	Medium
2. Carefully plan urban development to ensure economic enhancement without sprawl.	Municipalities, Planning Commissions, Chambers of Commerce	DCED, Private Sources, Foundations, Local Government	Medium
3. Consult and implement county and municipal land-use plans.	Municipalities, Counties	Local Government, Private Sources	Medium
4. Limit the amount of development based upon limitations of the region, including water quantity and soil type.	Municipalities, Counties, Planning Commissions, Conservation Groups	DEP, NRCS, USGS, PGS, Foundations, Private Sources	Medium

**Goal 1-6. Increase the number of well-paying jobs and diversify the types of jobs in the area.**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Establish a regional economic development plan.	Chambers of Commerce, Counties, Municipalities, Planning Commissions	DCED, Private Sources	Medium
2. Diversify the local job market by offering incentives and tax breaks to new businesses.	Counties, Municipalities, Planning Commissions, Legislators, Developers	DCED, Private Sources, Businesses, Legislature	Medium
3. Revitalize downtown areas, following the example of Brookville, encouraging the establishment of new businesses.	Municipalities, Planning Departments	DCED, Private Sources	Medium

**Goal 1-6. Increase the number of well-paying jobs and diversify the types of jobs in the area (continued).**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
4. Encourage the redevelopment of brownfields and old industrial sites, as opposed to the development of green sites, such as agricultural lands.	Municipalities, Counties, Conservation Groups, Planning Commissions, Developers	DEP, DCED, U.S. EPA, Private Sources, Foundations	Medium

**Goal 1-7. Increase local services available to the community residents.**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Increase fire protection services in the area through additional funding, upgraded equipment, and well-trained responders, whether volunteer or professional.	Fire Departments, Police Departments, Hospitals, Paramedics, Municipalities	Homeland Security, DCED, Foundations, Private Sources	Medium
2. Educate taxpayers about the connection between taxes and available services, and how their tax dollars are being spent.	Elected Officials, Municipalities, Newspapers	Private Sources	Medium
3. Increase funding for libraries so that services can be expanded, providing more opportunities to utilize the local resource.	Municipalities, Libraries, Elected Officials	Private Sources, Foundations, Legislature	Medium

## Land Resources

### Goal 2-1. Preserve agricultural lands and lifestyles while encouraging sustainable practices.

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Encourage additional townships to participate in the Agricultural Security Area program, to protect the dwindling acreage of agriculture remaining within the watershed.	Municipalities, Farmland Preservation Programs, Conservation Districts, Conservation Groups	USDA, NRCS, DEP, Farm Bureaus, PDA	High
2. Encourage agricultural landowners to enroll in land preservation programs to protect lands and maintain agricultural uses on the land.	Municipalities, Farmland Preservation Programs, Conservation Districts, Conservation Groups	USDA, NRCS, DEP, Farm Bureaus, PDA	Medium
3. Encourage landowners to enroll in cost-incentive programs such as the Environmental Quality Incentives and Conservation Reserve Enhancement Programs.	Conservation Groups, Conservation Districts, NRCS, USDA, DEP, Farm Bureaus, PDA, Landowners	DEP, NRCS, USDA, PDA, Farm Bureaus, Legislature, Private Sources, Foundations	Medium
4. Increase technical and financial assistance to agricultural community for implementation of best management practices.	Municipalities, Farmland Preservation Programs, Conservation Districts, Conservation Groups	USDA, NRCS, DEP, Farm Bureaus, PDA	Medium
5. Lobby for additional funding for the Environmental Quality Incentives and Conservation Reserve Enhancement Programs.	Conservation Groups, NRCS, USDA, DEP, Farm Bureaus, PDA, Landowners, Legislators	DEP, NRCS, USDA, Legislature	Medium

### Goal 2-2. Protect forest resources.

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Enforce existing erosion and sedimentation regulations placed on the logging industry.	Logging Companies, DEP, Conservation Groups	DEP, Private Sources	High
2. Encourage the development and use of forest stewardship or forest management plans and participation in the Pennsylvania Forest Stewardship Program and/or the Tree Farm Program.	DCNR, Landowners, USFS, PGC, Foresters	PGC, Private Sources, Foundations, DCNR	High

**Goal 2-2. Protect forest resources (continued).**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
3. Maintain natural beauty of the region by encouraging forestland owners to protect their land from development through the purchase of a conservation easement.	Conservation Groups, Landowners, DCNR	DCNR, Private Sources, Foundations	High
4. Educate forestland owners by providing them with accurate information regarding sound silviculture practices, forest management plan development, and insect and disease problems that can affect forest health.	Foresters, Landowners, Conservation Groups, Conservation Districts, Cooperative Extensions	DCNR, Private Sources, Foundations	Medium
5. Decrease forest fragmentation by maintaining contiguous forest tracts and/or by maintaining travel corridors between existing non-contiguous forest tracts.	Conservation Groups, Landowners, PGC	DCNR, Private Sources, Foundations	Medium

**Goal 2-3. Minimize impacts from commercial and industrial sources.**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Encourage tree plantings as one method to reclaim abandoned and unreclaimed mine lands.	Conservation Groups, Mining Companies, DEP	DEP, Foundations, Private Sources	High
2. Conduct a demonstration project to determine the effect land liming of agricultural, forest, and strip-mined lands has on water quality through neutralization of acidic waters.	Conservation Groups, Conservation Districts, DEP, Landowners	DEP, Foundations, Private Sources	Medium
3. Inventory abandoned wells and mines and plan for remediation.	Conservation Groups, Conservation Districts, DEP, Landowners	DEP, Private Sources, Foundations	Medium
4. Establish better government oversight on gas-well exploration including the impacts and interests.	Conservation Districts, DEP	DEP, Foundations, Private Sources	Medium
5. Complete remediation of the Jackson Ceramix Superfund site by addressing lead pollution in the 20-acre contaminated wetland located on the site.	DEP, Landowner, Conservation Groups, U.S. EPA	DEP, U.S. EPA, Foundations, Private Sources	Medium

**Goal 2-4. Decrease the amount of illegal dumping.**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Increase enforcement and penalties for individuals caught dumping illegally.	PA CleanWays, Municipalities, DEP	DEP, Municipalities	High

**Goal 2-4. Decrease the amount of illegal dumping (continued).**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
2. Encourage increased participation in recycling programs through education and incentives for citizens, regular receptacle maintenance and collection by service providers.	PA CleanWays, Waste Haulers, Municipalities, Landfills, Conservation Groups, Conservation Districts, DEP, PROP	DEP, Foundations, Private Sources	High
3. Host annual cleanups to eliminate illegal dump sites and establish surveillance, monitoring to decrease the re-occurrence of dumping.	PA CleanWays, Municipalities, Conservation Groups, Conservation Districts	DEP, Foundations, Private Sources	High
4. Local private and public interests should work together to ensure that PA CleanWays efforts to identify and remove illegal dumpsites are adequately funded.	PA CleanWays, Municipalities, Conservation Groups, Conservation Districts	DEP, Foundations, Private Sources	High
5. Educate residents about the impacts illegal dumping has on water quality, aesthetics, and the economy.	PA CleanWays, Municipalities, Conservation Groups, Conservation Districts	DEP, Foundations, Private Sources	Medium

**Goal 2-5. Decrease erosion and sedimentation issues through the utilization of land-use ordinances and best management practices.**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Strictly enforce current regulations designed to prevent erosion and sedimentation problems.	Municipalities, Conservation Groups, Conservation Districts	Private Sources, DEP	High
2. Establish and/or strengthen land-use planning tools limiting development in floodplains and other critical areas subject to erosion and sedimentation problems.	Municipalities, DEP, Conservation Groups,	Private Sources, DCED	Medium
3. Implement agricultural best management practices to control erosion and improve herd health.	Conservation Groups, Conservation Districts, NRCS, USDA, DEP, Farm Bureaus, PDA, Landowners	DEP, NRCS, USDA, PDA, Private Sources, Foundations	Medium

**Goal 2-6. Improve herd health and decrease sedimentation through the implementation of best management practices.**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Encourage agricultural landowners to develop and implement nutrient management plans.	Conservation Groups, NRCS, USDA, DEP, Farm Bureaus, PDA, Landowners	Private Sources, NRCS, Conservation Districts	High
2. Implement a streambank fencing program to fence cattle out of streams, provide crossings, alternative watering sources, and riparian corridors.	Conservation Groups, Conservation Districts, NRCS, USDA, DEP, Farm Bureaus, PDA, Landowners	DEP, NRCS, USDA, PDA, Private Sources, Foundations	Medium
3. Stabilize and properly manage barnyards and other livestock areas.	Conservation Groups, NRCS, USDA, DEP, Farm Bureaus, PDA, Landowners	DEP, NRCS, USDA, PDA, Private Sources, Foundations	Medium

**Goal 2-7. Reduce the number of unlicensed vehicles in residential areas.**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Encourage residents to dispose of unlicensed vehicles by educating them about the impacts on safety and the environment.	PA CleanWays, Municipalities, Conservation Groups, Conservation Districts	Private Sources, DEP, Foundations	Low
2. Remove unlicensed vehicles from abandoned properties.	Municipalities, Conservation Groups	Private Sources, Foundations	Low
3. Encourage municipalities to establish and enforce land-use ordinances regarding the maintenance of unlicensed vehicles at residential properties.	Municipalities, Conservation Groups	Private Sources	Low

## Water Resources

### Goal 3-1. Address acidity problems in local waterways caused by abandoned mine drainage and acid precipitation.

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Develop a remediation plan by locating and prioritizing abandoned mine discharges for treatment systems based upon a selected set of criteria.	Conservation Districts, Conservation Groups, Mining Companies, WPCAMR	DEP, DCNR, OSM, U.S. EPA, Private Sources, Foundations	High
2. Address abandoned mine discharges within the lower Redbank Creek subwatershed, particularly on the Armstrong County side, to restore quality cold water fisheries.	Conservation Districts, Conservation Groups, Mining Companies, WPCAMR	DEP, DCNR, OSM, U.S. EPA, Private Sources, Foundations	High
3. Implement recommendations identified in the North Fork Watershed Assessment and Restoration Plan to increase the pH and decrease acidity in the waterways.	Conservation Districts, Conservation Groups, DEP	DEP, DCNR, U.S. EPA, Private Sources, Foundations	High
4. Construct mine drainage treatment systems in the Soldier Run subwatershed as identified in the restoration plan that has been established.	Conservation Districts, Conservation Groups, Mining Companies, WPCAMR	DEP, DCNR, OSM, U.S. EPA, Private Sources, Foundations	High
5. Continue addressing mine drainage at the DuBois Mall site through the development of a mine drainage treatment system.	Clearfield Conservation District, Conservation Groups, DEP, WPCAMR, Mining Company, DuBois Mall, Municipalities	DEP, DCNR, OSM, U.S. EPA, Private Sources, Foundations	Medium
6. Determine the effects that land liming could have on water quality by conducting a land liming demonstration project.	Conservation Districts, Conservation Groups, DEP	DEP, DCNR, U.S. EPA, Private Sources, Foundations	Medium

### Goal 3-2. Protect and maintain wetland areas.

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Encourage the protection of wetlands, particularly those located on abandoned farmlands.	Conservation Groups, DEP, Conservation Districts	DEP, Private Sources, Foundations	High
2. Protect and conserve the 6-7 acre riverine depression owned by Armstrong Conservancy in the lower Redbank Creek watershed.	Armstrong Conservancy, Conservation Groups, DEP, Conservation Districts	DEP, Private Sources, Foundations	High

**Goal 3-2. Protect and maintain wetland areas (continued).**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
3. Discourage development in areas upstream of wetlands.	Conservation Groups, DEP, Conservation Districts	DEP, Private Sources, Foundations	High

**Goal 3-3 Reduce the amount of erosion and sedimentation entering area waterways.**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Implement erosion and sedimentation control best management practices on gas well, logging, and dirt and gravel roadways.	Conservation Groups, Conservation Districts, DEP	DEP, Private Sources, Foundations	High
2. Reduce erosion and sedimentation by incorporating best management practices into all earth-moving activities, including logging, construction and development, and natural resource extraction.	DEP, DCNR, Businesses	DEP, DCNR, Private Sources, Foundations	High
3. Increase funding to maintain the dirt and gravel road program.	Municipalities, COG, Legislators, Conservation Districts	DEP, Private Sources, Legislature	High
4. Conduct watershed study to determine sources of sedimentation entering Little Sandy Creek.	Conservation Groups, Conservation Districts, DEP	DEP, Private Sources, Foundations	Medium

**Goal 3-4. Update sewage and septic systems to eliminate sewage impacts on local waterways.**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Improve cost-effective on-lot sewage options.	Municipalities, SEO, Planning Commissions, DEP, Conservation Groups	PENNVEST, DEP, Foundations, Private Sources, DCED	Medium
2. Design wastewater treatment systems to adequately serve the communities by separating stormwater from wastewater systems, in order to ease the occurrence of combined sewage overflows.	Municipalities, SEO, DEP, Planning Commissions	PENNVEST, DEP, Private Sources, DCED	Medium
3. Update and improve wastewater treatment in urbanized areas.	Municipalities, SEO, Planning Commissions, DEP, Conservation Groups	PENNVEST, DEP, Foundations, Private Sources, DCED	Medium

**Goal 3-4. Update sewage and septic systems to eliminate sewage impacts on local waterways (continued).**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
4. Increase funding available to assist landowners in repairing failing on-lot septic systems through a cost-share or grant program.	Municipalities, SEO, Planning Commissions, DEP, Conservation Groups, COG	PENNVEST, DEP, Foundations, Private Sources, DCED	Medium
5. Increase funding to homeowners and public treatment providers in the form of grants to assist in sewage treatment.	Municipalities, COG, Landowners, SEO, DEP	PENNVEST, DEP, Private Sources, DCED	Medium

**Goal 3-5. Improve water quality so that streams attain their designated use.**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Improve water quality of the entire Redbank Creek watershed; attempting to achieve the water quality that North Fork Redbank Creek currently has.	Conservation Groups, DEP, PFBC, U.S. EPA, Conservation Districts	DEP, Private Sources, Foundations, U.S. EPA	High
2. Implement recommendations that have been identified through the North Fork Watershed Assessment and Restoration Plan.	Conservation Groups, Conservation Districts, Landowners, DEP	DEP, DCNR, Private Sources, Foundations	High
3. Conduct a watershed assessment for the Sandy Lick Creek watershed, including physical, biological, and chemical parameters.	SLCI, Conservation Districts, Conservation Groups, DEP	DEP, Private Sources, Foundations	Medium
4. Host annual stream cleanups to remove debris from waterways.	PA CleanWays, Conservation Groups, Community Groups	DEP, Private Sources, Foundations	Medium
5. Establish stricter regulations and management of pollution from runoff, including industrial, commercial, residential, salt piles, and truck stops.	DEP, Conservation Districts, Conservation Groups	DEP, U.S. EPA, Private Sources, Foundations	Medium

**Goal 3-6. Ensure a sufficient public water supply without putting additional stress on the water systems.**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Install dry hydrants throughout the Redbank Creek watershed.	Penn Soil, Headwaters, and Penn's Corner RC&D Councils; Municipalities, Conservation Groups, Local Fire Departments, Landowners	USDA Forest Service, DCNR Bureau of Forestry, US Department of the Interior	Medium

**Goal 3-6. Ensure a sufficient public water supply without putting additional stress on the water systems (continued).**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
2. Conduct surface water or well-head protection plans in order to identify and protect drinking water sources.	Municipalities, DEP, Conservation Groups, PRWA	DEP, WREN, U.S. EPA, PRWA	Medium
3. Establish an additional well in Summerville Borough to supply sufficient water to residents.	Summerville Borough, DEP, Water Company	PENNVEST, DCED, Private Sources	Medium
4. Investigate the effects of transporting water across the continental divide, and how this might disrupt the water budget for Anderson Creek and Redbank Creek.	Municipalities, Conservation Groups, DEP, Water Companies	DEP, U.S. EPA, DCED, PENNVEST, Private Sources, Foundations	Low

**Goal 3-7. Minimize the amount of destruction caused by flooding.**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Strengthen and enforce floodplain ordinances allowing floodplain areas to be undeveloped, so they may remain as open space and serve their purpose as a location where floodwaters can safely overflow the streambanks.	Municipalities, COG, Landowners, Conservation Groups, Conservation Districts, Planning Commissions	DEP, DCED, Private Sources	High
2. Establish a dedicated flood-control program to assess, create, and maintain projects that will minimize the risk and severity of flooding.	Municipalities, DEP, Conservation Districts, COG	PEMA, FEMA, DEP, Private Sources, Foundations	Medium
3. Discourage the development of primary and secondary residences in floodplain areas.	Municipalities, Planning Commissions, DEP, Conservation Groups, Conservation Districts	PEMA, FEMA, DEP, DCED, Private Sources, Foundations	Medium
4. Develop a flood-control plan that considers alternative methods of flood control using dredging only as a last resort.	Municipalities, Planning Commissions, DCED, PEMA, Conservation Groups, Conservation Districts, DEP, COG	PEMA, FEMA, DEP, Private Sources, Foundations	Medium
5. Consult a hydrologist and discuss the potential use of natural stream channel design techniques and geomorphology to decrease the risk of flooding.	Municipalities, Planning Commissions, DCED, PEMA, Conservation Groups, Conservation Districts, DEP, COG	PEMA, FEMA, DEP, Private Sources, Foundations	Low

**Goal 3-8. Minimize impacts from stormwater through planning and decreasing the amount of impervious surfaces.**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1 Minimize the amount of impervious surface by utilizing porous pavement on parking lots, driveways, and sidewalks.	Conservation Groups, Conservation Districts, Businesses, Landowners, Municipalities, COG	DEP, Private Sources, Foundations	Medium
2 Develop stormwater management plans for North Fork Redbank and Redbank creeks.	Conservation Groups, Municipalities, Planning Commissions, COG, Conservation Districts	DEP, DCED, Private Sources, Foundations	Medium
3 Inventory individual watersheds to determine percent impervious cover and stormwater impacts.	DEP, Municipalities, Planning Commissions, Conservation Districts, Conservation Groups	DEP, Private Sources, Foundations	Medium

**Goal 3-9. Maintain dams for recreational, historical, and water supply purposes.**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Redesign the New Bethlehem Dam to include adjustable gates, fish passage, a canoe and kayak port, and public access to the stream.	New Bethlehem Borough, South Bethlehem Borough, RVMA, Citizens, Conservation Groups, DEP, PFBC	Private Sources, PFBC, DCNR	Medium
2. Preserve the Manners Dam for historical and recreational purposes.	NFWA, Municipalities, Landowners	Private Sources, Foundations	Medium

## Biological Resources

### Goal 4-1. Implement strategies to conserve rare and unique communities, flora, and fauna.

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Increase habitat by planting or allowing the natural regeneration of riparian buffers through streambank fencing programs.	NRCS, PGC, DEP, Citizens, Conservation Districts, Conservation Groups	Conservation Groups, DEP, Private Sources, Foundations	High
2. Promote the preservation of riparian areas through education about their benefits for wildlife, flood prevention, and groundwater supplies.	NRCS, PGC, DEP, DCNR, Landowners, Conservation Groups, Conservation Districts	Conservation Groups, Private Sources, Foundations, DEP, DCNR	High
3. Improve aquatic life for fish, mussels, and other organisms by implementing best management practices and other restoration activities.	DEP, PFBC, Conservation Groups, Conservation Districts	DEP, PFBC, DCNR, Foundations, Private Sources	High
4. Protect or improve habitats that support threatened and endangered species and species of concern through acquisition, easements, and/or landowner education.	Conservation Groups, DCNR, PGC, PFBC	DCNR, PGC, PFBC, Private Sources, Foundations	High
5. Encourage streamside property owners to maintain a stream-edge buffer when mowing their lawn.	NRCS, PGC, DEP, DCNR, Landowners, Conservation Groups, Conservation Districts	DEP, DCNR, Conservation Groups, Private Sources, Foundations	Medium

### Goal 4-2. Minimize the spread of exotic and invasive species.

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Develop an eradication or control strategy for removing invasive species, especially from high-quality areas or areas where an invasive species is expanding its territory.	Conservation Groups, Conservation Districts, DEP, DCNR, PABS	DEP, DCNR, U.S. EPA, Foundations, Private Sources	High
2. Conduct an invasive species plant survey to develop a list of areas where invasive species pose the greatest threats to biodiversity.	Conservation Groups, Conservation Districts, DEP, DCNR, PABS	DEP, DCNR, U.S. EPA, Private Sources, Foundations	Medium
3. Develop monitoring plans for invasive species on private properties by working with landowners, especially those whose properties contain high-quality natural communities.	Conservation Groups, Conservation Districts, DEP, DCNR, PABS	DEP, DCNR, U.S. EPA, Private Sources, Foundations	Medium

**Goal 4-2. Minimize the spread of exotic and invasive species (continued).**

<i>Methods to achieve goal:</i>	<i>Potential Partners:</i>	<i>Potential Funding:</i>	<i>Priority:</i>
4. Encourage the use of native plants in landscape and wildlife habitat plantings.	DCNR, Landowners, Landscapers, Conservation Groups, Sportsmen's Groups	DCNR, Foundations, Private Sources	Medium
5. Compile an Internet database of exotic and invasive species sightings that can be accessed and added to by the public.	Conservation Groups, Conservation Districts, DEP, DCNR, PABS	DEP, DCNR, U.S. EPA, Private Sources, Foundations	Low

**Goal 4-3. Protect and improve wildlife habitats.**

<i>Methods to achieve goal:</i>	<i>Potential Partners:</i>	<i>Potential Funding:</i>	<i>Priority:</i>
1. Conduct a wetland inventory.	NFWA, SLCI, Conservation Districts, Conservation Groups	DEP, Foundations, Private Sources	High
2. Educate residents about the importance of biodiversity and the need to protect it.	Conservation Groups, Citizens	DCNR, PGC, Private Sources, Foundations	High
3. Develop forest and wildlife management plans.	PGC, DCNR, Conservation Groups	PGC, DCNR, USFWS, NWF, Private Sources, Foundations	Medium
4. Develop detailed management plans for landowners of biologically diverse areas, including inventories of natural features and invasive or exotic species monitoring plans.	Conservation Groups, Landowners, DCNR	DCNR, Foundations, Private Sources	Medium
5. Secure funding for purchasing easements to protect wetlands.	NFWA, SLCI, Conservation Districts, Conservation Groups	DEP, Foundations, Private Sources	Medium
6. Establish a reasonable balance between human interests and wildlife protection.	Conservation Groups, Landowners, Municipalities	Private Sources	Medium
7. Establish biodiversity indices for selected stream segments to document the current status of biodiversity and to track changes over time as management recommendations are implemented.	NFWA, SLCI, Conservation District, Conservation Groups	DCNR, PGC, DEP, PFBC, Private Sources, Foundations, USFWS	Medium

**Goal 4-4. Educate the public about the use and purpose of Natural Heritage Inventories in planning, with a focus on the importance of the natural resources that exist.**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Study and expand biological diversity areas documented in County Natural Heritage Inventories.	Municipalities, Counties, Conservation Groups, DCNR, PGC, PFBC	DCNR, Foundations, Private Sources	Medium
2. Implement County Natural Heritage Inventories for Armstrong and Clarion counties once they are completed.	Local Universities, WPC, Conservation Groups, Municipalities, Planning Commissions	DCNR, Foundations, Private Sources, DCED	Medium
3. Incorporate Natural Heritage Inventories into county and municipal comprehensive plans.	Municipalities, Counties, Conservation Groups	DCNR, Foundations, Private Sources	Medium

**Goal 4-5. Develop strategies to reduce or curtail the negative impacts caused by deer overbrowsing.**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Encourage hunters to participate in the deer management assistance program (DMAP) to keep deer herds at ecologically healthy levels.	Sportsmen’s Clubs, Conservation Groups, DCNR Bureau of Forestry, PGC	DCNR, PGC, Foundations, Private Sources	Medium
2. Foster continued involvement in hunting activities among all age groups and educate hunters on the importance of reducing the doe herd population.	Sportsmen’s Clubs, Conservation Groups, DCNR Bureau of Forestry, PGC	DCNR, PGC, Foundations, Private Sources	Medium
3. Encourage private landowners in impacted areas to open their lands to hunting.	Conservation Groups, DCNR Bureau of Forestry, PGC	DCNR, PGC, Foundations, Private Sources	Medium

**Goal 4-6. Promote sustainable forestry practices and responsible private land management.**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Provide forest landowners with educational materials about sustainable forestry practices, so they understand how to protect their resource and can discuss various options with potential logging companies and foresters.	Municipalities, Counties, Conservation Groups, DCNR	DCNR, Foundations, Private Sources	Medium
2. Provide forest landowners with a current list of certified foresters in their area to guide them in the proper management of their land.	Municipalities, Counties, Conservation Groups, DCNR	DCNR, Foundations, Private Sources	Medium

**Goal 4-6. Promote sustainable forestry practices and responsible private land management (continued).**

<i>Methods to achieve goal:</i>	<i>Potential Partners:</i>	<i>Potential Funding:</i>	<i>Priority:</i>
3. Consider forming voluntary landowner associations for the purposes of providing dialogue and education about the wise stewardship of private lands	Municipalities, Counties, Conservation Groups, DCNR	DCNR, Foundations, Private Sources	Medium

## Cultural Resources

### Goal 5-1. Increase support for watershed issues.

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Increase funding for environmental education programs targeting landowners and school students.	Municipalities, School Districts, Conservation Districts, Conservation Groups, Landowners	DEP, U.S. EPA, Private Sources, Foundations	High
2. Encourage school districts to work with conservation groups and agencies to educate students about watersheds.	School Districts, Conservation Groups, Conservation Districts	DEP, U.S. EPA, Private Sources, Foundations	High
3. Establish a Redbank Creek Watershed Association.	Landowners, NFWA, SLCI, Citizens, Municipalities	DEP, U.S. EPA, Private Sources, Foundations	Medium

### Goal 5-2. Address environmental issues.

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Educate residents and developers about environmentally friendly development practices, such as Smart Growth or Conservation by Design.	Planning Commissions, Municipalities, Developers, Conservation Groups	DEP, Private Sources, Foundations	High
2. Educate citizens about the impacts of illegal dumping on water quality, aesthetics, and property values.	Conservation Districts, PA CleanWays, Conservation Groups, Municipalities	DEP, Private Sources, Foundations	High
3. Encourage water conservation year round, not just in times of drought.	Conservation Districts, Conservation Groups, Water Companies	DEP, U.S. EPA, Private Sources, Foundations	Medium

### Goal 5-3. Increase awareness of local environmental issues affecting the area.

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Educate citizens (youth and adult) and municipal officials about the benefits and importance of watershed protection and resource conservation.	DEP, Conservation Organizations, Conservation Districts	DEP, Private Sources, Foundations	High
2. Implement programs to help landowners and elected officials understand the importance of watersheds, wetlands, floodplains, etc.	DEP, Conservation Groups, Conservation Districts, Citizens, Elected Officials	DEP, DCNR, Private Sources, Foundations	High

**Goal 5-3. Increase awareness of local environmental issues affecting the area (continued).**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
3. Provide more environmental education opportunities for both youth and adults.	DEP, Conservation Organizations, Conservation Districts	DEP, Private Sources, Foundations	High
4. Increase awareness of watershed-related issues through the distribution of materials and educational programs.	DEP, Conservation Organizations, Conservation Districts	DEP, Private Sources, Foundations	High

**Goal 5-4. Highlight, preserve, and promote appreciation of the local history of the region.**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Increase the preservation of existing historical sites and landmarks.	Historical Societies, Landowners, Municipalities	PHMC, Private Sources, Foundations	Medium
2. Incorporate local history into classes taught at local school districts.	Historical Societies, School Districts	School Districts, Private Sources, Foundations	Medium
3. Conduct historical site surveys, to identify additional historical landmarks and learn more about existing historical sites.	Historical Societies, Landowners, Municipalities	PHMC, Private Sources, Foundations	Medium
4. Work with elected officials to offer incentives or tax breaks for the restoration of historic buildings.	Municipalities, PHMC, Historical Societies, Elected Officials	PHMC, Private Sources, Foundations	Medium
5. Install interpretive signage at historical locations.	Historical Societies, PennDOT, Landowners, Municipalities, Tourist Bureaus	PHMC, Private Sources, Foundations, Tourist Bureaus	Low
6. Establish self-guided walking, biking, or automobile tours similar to the walking tour of historic Brookville.	Municipalities, Community Groups, Historical Societies, Tourist Bureaus	Private Sources, Foundations, Tourist Bureaus	Low

**Goal 5-5. Encourage environmentally sound recreation activities and increase accessibility to facilities and activities for kids.**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Conserve land in the lower Little Sandy Creek for outdoor recreation, through acquisition or agreements with landowners.	Municipalities, PGC, PFBC, Community Groups, Landowners	DCNR, PGC, PFBC, Private Sources, Foundations	Medium

**Goal 5-5. Encourage environmentally sound recreation activities and increase accessibility to facilities and activities for kids (continued).**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
2. Establish specific recreational-use areas and access, including boat launches and trailheads.	Municipalities, Community Groups, PFBC	DCNR, Private Sources, Foundations, PFBC	Medium
3. Improve canoe access points and designate camping areas along streams.	Municipalities, Community Groups, Landowners, PFBC	DCNR, Private Sources, Foundations, PFBC	Medium
4. Establish winter recreation activities, such as snowmobile or cross-country skiing trails.	Municipalities, Community Groups, Landowners, Tourist Bureaus	DCNR, Private Sources, Foundations	Medium

**Goal 5-6. Minimize the intrusion of ATV usage on private lands and impacts to the environment.**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Increase enforcement of illegal ATV use on private and public lands.	Municipalities, Local Law Enforcement, Landowners	Municipalities, Local Law Enforcement	High
2. Prohibit the use of recreational vehicles in areas at risk of being affected by their use. Steep slopes, streambanks, stream crossings, and habitat for rare, threatened, or endangered species are examples of at-risk areas.	Municipalities, Local Law Enforcement, Landowners	DCNR, Private Sources, Foundations	High
3. Educate riders about how areas such as steep slopes and streambanks are impacted by ATV use and why they should avoid those areas.	Municipalities, Conservation Groups	DCNR, DEP, U.S. EPA	Medium
4. Establish ATV parks or trails offering a legal place to ride ATVs, without trespassing on private properties.	Municipalities, ATV Organizations	DCNR, Private Sources, Foundations	Medium
5. Designate areas for ATVs containing proper design to minimize erosion and sedimentation impacts.	Municipalities, ATV Organizations	DCNR, Private Sources, Foundations	Medium

**Goal 5-7. Enhance existing recreational facilities.**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Enhance amenities such as bathrooms, and parking lots at recreational facilities.	Municipalities, Community Groups	DCNR, Private Sources, Foundations	Medium

**Goal 5-7. Enhance existing recreational facilities (continued).**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
2. Upgrade equipment and develop playgrounds at community facilities.	Municipalities, Community Groups	DCNR, Private Sources, Foundations	Low
3. Improve and maintain Reynlow Park.	Municipalities, Community Groups	DCNR, Private Sources, Foundations	Low
4. Upgrade equipment at Alcola Park and increase utilization of available facilities.	Municipalities, Community Groups, Tourist Bureaus	DCNR, Private Sources, Foundations	Low

**Goal 5-8. Increase the number of accessible recreational facilities.**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Create a water trail for Redbank Creek, Sandy Lick Creek, and North Fork Redbank Creek.	DCNR, Conservation Groups, PFBC, Citizens, Municipalities, Tourist Bureaus	DCNR, Private Sources, Foundations, PFBC, Tourist Bureaus	Medium
2. Develop trails for specific uses such as ATVs, hiking, biking, and horseback riding.	Municipalities, Community Groups	DCNR, Private Sources, Foundations	Medium
3. Develop a walkway around Kyle Lake, providing additional access to the lake.	Municipalities, PFBC, Community Groups	DCNR, Private Sources, Foundations, PFBC	Low

**Goal 5-9. Connect recreational facilities by linking or extending existing trails with new trails and community parks.**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Connect Venango County Sandy Creek Trail with Pennsylvania RR Low Grade Secondary from Brookville to the town of Van.	Municipalities, Landowners, Conservation Groups	DCNR, PHMC, Private Sources, Foundations	Medium
2. Establish a rails-to-trails link from Brockway to DuBois.	Armstrong Trail, AVLTL, Armstrong Conservancy, Municipalities	DCNR, Private Sources, Foundations	Low
3. Improve the Lawsonham low-grade section of the Armstrong Trail.	Armstrong Trail, AVLTL, Armstrong Conservancy, Municipalities	DCNR, Private Sources, Foundations	Low
4. Provide a connection along the Armstrong Trail to East Brady.	Armstrong Trail, AVLTL, Armstrong Conservancy, Municipalities	DCNR, Private Sources, Foundations	Low

**Goal 5-9. Connect recreational facilities by linking or extending existing trails with new trails and community parks (continued).**

<i>Methods to achieve goal:</i>	<i>Potential Partners:</i>	<i>Potential Funding:</i>	<i>Priority:</i>
5. Rehabilitate and re-open the East Brady Narrows Tunnel.	Armstrong Trail, AVLT, Armstrong Conservancy, Municipalities	DCNR, Private Sources, Foundations, PHMC	Low

**Goal 5-10. Preserve railroad corridors.**

<i>Methods to achieve goal:</i>	<i>Potential Partners:</i>	<i>Potential Funding:</i>	<i>Priority:</i>
1. Explore possibility of connecting railroad corridors and trails to existing trails from surrounding areas.	Municipalities, Landowners, Conservation Groups	DCNR, PHMC, Private Sources, Foundations	Medium
2. Protect Low Grade Secondary railroad corridor, which will be abandoned from Sligo to Lawsonham and from Lawsonham to Brookville.	Municipalities, Landowners, Conservation Groups	DCNR, PHMC, Private Sources, Foundations	Medium
3. Establish a rail tour highlighting scenery and history of the railroad, similar to Kiski Junction Railroad in Schenley, Armstrong County.	Historical Societies, Conservation Groups, Landowners	DCNR, PHMC, Private Sources, Foundations	Medium
4. Highlight historical sites along railroad corridors through the use of interpretive signage.	Historical Societies, Tourist Bureaus	DCNR, PHMC, Private Sources, Foundations	Medium
5. Investigate the preservation of railroad corridors and encourage uses, such as rails-to-trails, that preserves these corridors and offer recreational opportunities.	Municipalities, PHMC, Landowners, Historical Societies, Armstrong Rail Trail, Conservation Groups	DCNR, PHMC, Private Sources, Foundations	Medium

**Goal 5-11. Enhance area trails.**

<i>Methods to achieve goal:</i>	<i>Potential Partners:</i>	<i>Potential Funding:</i>	<i>Priority:</i>
1. Provide better access by establishing well-defined trailheads.	Armstrong Trail, AVLT, Armstrong Conservancy, Municipalities	DCNR, Private Sources, Foundations	Medium
2. Enhance amenities such as bathrooms, benches, and parking at trailheads.	Armstrong Trail, AVLT, Armstrong Conservancy, Municipalities	DCNR, Private Sources, Foundations	Medium
3. Increase maintenance of trail corridors to provide a safer recreational opportunity.	Armstrong Trail, AVLT, Armstrong Conservancy, Municipalities	DCNR, Private Sources, Foundations	Medium

**Goal 5-11. Enhance area trails (continued).**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
4. Increase funding for trail development and maintenance.	Armstrong Trail, AVL, Armstrong Conservancy, Municipalities	DCNR, Private Sources, Foundations, PennDOT	Low

**Goal 5-12. Increase the marketing of recreational activities in the region.**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Utilize local recreational facilities to host community festivals and events.	Municipalities, Tourist Bureaus, Community Groups	Private Sources, Foundations	Medium
2. Develop and distribute maps identifying recreational facilities and lands open to the public.	Municipalities, Tourist Bureaus, Community Groups	DCNR, Private Sources, Foundations, Tourist Bureaus	Medium
3. Utilize local tourism-promotion agencies to highlight or spotlight individual recreational opportunities.	Tourist Bureaus, Community Groups, Municipalities	Tourist Bureaus, Private Sources, Foundations	Medium

**Goal 5-13. Increase local tourism.**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Establish a campaign to market the local resources to community residents who may not be aware of the opportunities available in the area.	Tourist Bureaus, Conservation Groups, Historical Societies, Museums	Private Sources, Tourist Bureaus, Foundations	Medium
2. Offer affordable local cultural activities, such as plays, concerts, etc.	Community Groups, Tourist Bureaus	Private Sources, Foundations	Low
3. Establish a place where teens can safely and legally gather during evenings, weekends, and summers.	Community Groups, Churches	Private Sources, Foundations	Low

**Goal 5-14. Enhance recreational opportunities for sportsmen.**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Improve water quality in order to aid the recovery of the local fishery, as a local resource for recreation and tourism.	Conservation Groups, Conservation Districts, Sportsmen's Groups, PFBC, DEP, Tourist Bureaus	DCNR, DEP, PFBC, Private Sources, Foundations	High
2. Preserve the right to hunt, fish, and canoe and educate sportsmen about areas open to public usage.	Municipalities, PFBC, Community Groups, Tourist Bureaus	DCNR, PFBC, Private Sources, Foundations	High

**Goal 5-14. Enhance recreational opportunities for sportsmen (continued).**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
3. Establish an access point at the mouth of Redbank Creek.	Municipalities, Conservation Groups, PFBC	DCNR, PFBC, Private Sources, Foundations	Medium
4. Establish additional or enhance existing public access points to streams and trails, including amenities such as parking and restroom facilities.	Municipalities, PFBC, Community Groups, Tourist Bureaus	DCNR, PFBC, Private Sources, Foundations	Medium

**Goal 5-15. Increase camping as a recreational use.**

<u>Methods to achieve goal:</u>	<u>Potential Partners:</u>	<u>Potential Funding:</u>	<u>Priority:</u>
1. Acquire and develop areas along the stream for primitive camping.	Municipalities, Landowners, Conservation Groups	DCNR, Private Sources, Foundations	Medium
2. Enhance camping experience through facility and program updates encouraging more visitors to experience the natural environment.	Tourist Bureaus, Campground Owners	DCNR, Private Sources, Foundations, Tourist Bureaus	Medium

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**APPENDIX A. GLOSSARY**

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Abandoned Mine Drainage	A groundwater discharge that emanates from former underground or surface mines.
Acidity	The capacity of water for neutralizing a basic solution.
Aerobic	Presence of oxygen.
Agricultural Security Areas	Lands enrolled in a statewide program that has been established to promote the conservation and preservation of agricultural lands and the agricultural community.
Airsheds	Geographic areas responsible for emitting 75 percent of the air pollution reaching a body of water.
Alkalinity	Buffering capacity; the ability to resist pH change.
All Terrain Vehicle	Any motorized vehicle capable of cross-country travel on land, water, snow, ice, marsh, swampland, or other natural terrain.
Anaerobic	Non-oxygenated.
Anthracnose	A group of fungi that can infect a variety of deciduous and evergreen trees.
Atmospheric Deposition	The process of airborne pollutants falling to the ground.
Base Flow	Flow considered to come from groundwater.
Best Management Practices	Refer to the most environmentally appropriate techniques for agriculture, forestry, mining, development, urban stormwater management, and other practices that are potential threats to natural resources.
Biodiversity	The number and variety of organisms found within a specific geographic region, or a particular habitat; the variability among living organisms on the earth, including the variability within and between species and within and between ecosystems.
Biological Diversity Areas	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.
Brownfield	A piece of industrial or commercial property that is abandoned or under used and often environmentally contaminated, especially one considered as a potential site for redevelopment.

Carbon Monoxide	A poisonous compound that results from the incomplete burning of fuels, such as motor vehicle exhaust, industrial processes, and wood stoves.
Comprehensive Plans	A general policy guide for the physical development of a municipality, taking into account many factors including locations, character, and timing of future development.
Concentrated Animal Feeding Operation	A farm where large quantities of livestock or poultry are housed inside buildings or a confined area and all units of production, including feed, wastes, and dead animals are concentrated in one area.
Conservation	The maintenance of environmental quality and resources; resources include physical, biological, or cultural. Ecosystem management with given social and economic constraints; producing goods and services for humans without depleting natural ecosystem diversity, and acknowledging the natural dynamic character of biological systems.
Continental Divide	A divide separating river systems that flow to opposite sides of a continent.
Continental Temperate Climate	Experiences cold winters and warm summers.
Dedicated Area	An area of land recognized because of an owner's specific intention to protect it, which could result in the site improving to either become a biological diversity area in the future or to become an even better high quality area with an already designated biological diversity area.
Dendritic	A pattern of drainage that follows a branching form.
Direct Deposition	Occurs when pollutants enter a waterway by falling directly into it.
Dry Deposition	Gases and particles that fall to the earth.
Early-successional Habitats	Habitats in the intermediate stage between forest and grassland, which develop as a forest recovers from recent logging activity.
Easement	A deed restriction that landowners voluntarily place on their property to protect its future uses.
Ecoregion	An area of land or water that contains a geographic assemblage of natural communities that share environmental conditions, ecological dynamics, and species that interact ecologically to enhance their longevity.

Ecosystems	Groups of plants and animals that live in association with each other and specific environmental conditions.
Elevation	The altitude of a place above sea level or ground level.
Endangered	Plant species which are in danger of extinction throughout most of their natural range.
Environmental Education	A learning process that increases knowledge and awareness of the environment and associated challenges.
Envirothon	An environmental competition among high school students.
Ephemeral Stream	A water conveyance which lacks substrates associated with flowing waters and flows only in direct response to precipitation, which is always above the local water table.
Erosion	Natural process of removing soil from the land by wind or water.
Floodplains	Areas of land adjacent to streams onto which water spills when the water level in the stream rises.
Fluvial	Relating to, or inhabiting a river system.
Geology	The science that deals with the study of the earth and its history, and is the name of the natural features of our planet.
Geomorphic	Pertaining to the form of the earth or the forms of its surface.
Ground-level Ozone	A secondary pollutant located in the lower atmospheric layer.
Groundwater	Water beneath the earth's surface found in pore spaces in rock material. Supplies wells and springs as a source of drinking water for many and contributes to surface water.
Headwaters	Upper tributaries of a river or stream.
High-grading	A controversial forestry practice that involves harvesting all the best quality timber and leaving weaker, diseased trees behind to regrow a forest.
Hydric Soils	Those formed under water-logged, anaerobic conditions.
Hydrologic Code	A system for organizing watershed of the United States that divides and subdivides the watershed into successively smaller hydrologic units and is then assigned an identifying number.

Hydrology	The study of movement of water on the earth; includes surface water and groundwater.
Hydrophytes	Plants that grows in water or very moist grounds
Indirect Deposition	Falling onto land and being washed into waterbodies as runoff
Intermittent Stream	A body of water flowing in a channel or bed composed of substrate primarily associated with flowing water, which during periods of the year is below the local water table and obtains its flow from both surface and groundwater discharges.
Invasive Species	A plant, animal, or other organism introduced to an ecological system that causes economic or environmental harm or harm to human health.
Landscape Conservation Areas	A larger area of land that contains minimal human disturbance and allows ecosystems to function on a landscape level.
Maritime Temperate Climate	Influenced by maritime airflow form the oceans, and is characterized by cool summers and mild winters.
Mass Wasting	Downhill movements of soil and rock fragments induced by gravity.
Methylmercury	A highly toxic form of mercury that builds up in fish, shellfish, and animals that eat fish.
Nonpoint Source Pollution	Pollution that enters a waterbody through an undefined source, usually in the form of runoff from places such as agricultural fields. Logging operations, lawns, and city streets.
Ozone	Colorless, odorless gas that forms in the atmosphere.
Ozone Layer	Located in the upper atmospheric layer it filters the sun's harmful ultraviolet rays.
Particular Matter	Mixture of particulates
Particulates	Tiny drops of liquid or small particles of dust, metal, or other materials that float in the air.
Perennial Stream	A body of water flowing in a channel or bed composed primarily of substrates association with flowing water and is capable, in the absence of pollution or other manmade stream disturbances, of supporting a benthic macroinvertebrate community composed of two or more recognizable taxonomic groups of organisms.

pH	The symbol for the logarithm of the reciprocal of hydrogen ion concentration in gram atoms per liter, used to express the acidity or alkalinity of a solution on a scale of 0 to 14, where less than 7 represents acidity, 7 neutrality, and more than 7 alkalinity.
Physiographic Provinces	A region with a particular type of landscape and geology.
Point Source Pollution	Discharges that enter a stream or lake directly via a pipe, culvert, container, or other means.
Pollutant	Any substance that causes damage to life, ecosystems, or property.
Precipitation	Any form of water that falls from the sky, including rain, snow, sleet, fog, and hail.
Prime Agricultural Soils	Soils that meet certain physical, chemical, and slope characteristics based upon a predetermined set of criteria.
Rare	Plant species, which are uncommon.
Remediation	Treatment methods used to minimize or remove pollution from a contaminated area.
Riparian Zones or Riparian Buffers	Vegetated areas along streams, rivers, and lakes that filter runoff and provide a transition between water and land.
Seasonal Pools	Temporary wetlands that form in topographic depressions that have no outlet or source other than rainwater.
Seasonally Adjusted Unemployment Rate	A statistical technique utilized to determine whether employment changes from month to month is due to normal seasonal patterns or changing economic conditions.
Secondary Pollutant	A pollutant that is formed in the atmosphere instead of being emitted from a specific source.
Sedimentation	Process by which the bottom of the stream becomes covered with eroded material from streambanks and land.
Soil	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.
Sprawl	The movement of people from cities and towns into suburbs and rural landscapes.
Stormwater	Water that runs off the land into surface waters during and immediately following periods of precipitation.
Stream Morphology	The form or structure of streams.

Streambed	The channel base of a stream, river, or creek; it serves as an interchange between groundwater and surface water.
Subdivision Regulations	An important tool in controlling growth, protecting natural resources and maintaining community character by authorizing a planning commission or review board to review and approve the division of a parcel of land into two or more smaller parcels, based upon standards and criteria that are set for the community.
Surface Water	Water found about the land surface in rivers, streams, lakes, reservoirs, ponds, wetlands, and seeps.
Sustainable	The ability to provide for the needs of the world's current population without damaging the ability of future generations to provide for themselves. When a process is sustainable it can be carried out over and over without negative environmental effects or impossibly high costs to anyone involved.
Swamp	A forested wetland that is not directly part of a floodplain that may be directly affected by changes in groundwater levels.
Temperate Climates	climates without extremes of temperature or precipitation.
Threatened	Plant species which may become endangered throughout most or all of their natural range.
Topography	Describes landscape features of an area.
Total Maximum Daily Load	An analysis of the maximum level of pollutants that can enter a waterbody while still meeting water quality standards.
Undulating	To move with a sinuous or wavelike motion; display a smooth rising-and-falling or side-to-side alternation of movement
Unemployment Rate	The percentage of people of the total labor force that are actively seeking a job but cannot find employment.
Vernal Pools	Isolated ponds that are created from rainwater in the spring.
Watershed	The area of land that drains to a particular point along a stream Each stream has its own watershed. Topography is the key element affecting this area of land. The boundary of a watershed is defined by the highest elevations surrounding the stream.
Wet Deposition	Particles that fall to the earth in precipitation including rain, fog, and snow.

Wetlands	Areas of land that have specific hydrological and natural features as a result of being covered in water during all or part of the year.
Zoning	A legal mechanism by which governmental bodies, for the sake of protecting public health, safety, morals, and the general welfare, can limit a landowner's right to use privately owned land
Zoning Ordinance	Divide the land within a governing body's area into districts and create regulations that apply generally to the governing body as a whole, as well as specifically to individual districts.

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**APPENDIX B. PLANNING COMMITTEES**

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Redbank Creek Watershed Conservation Plan Steering Committee

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Dave Beale	Armstrong Co Conservation District
Jim Berry	Jefferson Co Conservation District
Jessica Coil	Armstrong County Tourist Bureau
Kristin Friend	Jefferson County Planning Commission
John Kaskan	Jefferson County Planning Commission
Barry Mayes	North Central Regional Planning & Development Commission
Linda Makufka	Sandy Lick Conservation Initiative
Tim Murray	New Bethlehem Chamber of Commerce
Erika Riker	North Fork Watershed Association
Amber Sires	Jefferson County Conservation District
Mike Tharan	South Bethlehem Borough Council Redbank Valley Municipal Authority

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Redbank Creek Watershed Conservation Plan Advisory Committee Members

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*Project Area Characteristics*

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Deb Simko	
Robin Orris	PA CleanWays
John Kaskan	Clearfield County Planning

*Land Resources*

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Jack Theisen	Brookville Wood Products
Deb Simko	
Gary Gilmore	DCNR- Bureau of Forestry
Mike Makufka	Sandy Lick Conservation Initiative
Harry Kehr	New Bethlehem Chamber
Robin Orris	PA CleanWays

*Water Resources*

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Deb Simko	
Don Crytzer	North Fork Watershed Association
Mike Makufka	Sandy Lick Conservation Initiative

*Biological Resources*

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Deb Simko	
Don Crytzer	North Fork Watershed Association
Mike Makufka	Sandy Lick Conservation Initiative
Patrick Conners	
Cheryl Burkett	

*Cultural Resources*

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Jack Theisen	Brookville Wood Products
Deb Simko	
Gary Gilmore	DCNR- Bureau of Forestry
Robin Orris	PA CleanWays
Ken Burkett	

**APPENDIX C. POPULATION BY CENSUS BLOCK GROUPS**

<b>Geography</b>	<b>2000 Total population</b>	<b>1990 Total population</b>	<b># change</b>	<b>% change</b>
Block Group 1, Census Tract 9802, Armstrong County, Pennsylvania	927	939	-12	-1.29%
Block Group 5, Census Tract 9907, Clarion County, Pennsylvania	1,504	1,500	4	0.27%
Block Group 3, Census Tract 9908, Clarion County, Pennsylvania	1,466	1,564	-98	-6.68%
Block Group 5, Census Tract 9908, Clarion County, Pennsylvania	1,057	1,151	-94	-8.89%
Block Group 2, Census Tract 9909, Clarion County, Pennsylvania	835	837	-2	-0.24%
Block Group 3, Census Tract 9909, Clarion County, Pennsylvania	1,254	1,257	-3	-0.24%
Block Group 1, Census Tract 3301, Clearfield County, Pennsylvania	1,053	1,100	-47	-4.46%
Block Group 2, Census Tract 3301, Clearfield County, Pennsylvania	1,046	1,127	-81	-7.74%
Block Group 3, Census Tract 3301, Clearfield County, Pennsylvania	1,687	3,015	-1,328	-78.72%
Block Group 1, Census Tract 3302, Clearfield County, Pennsylvania	688	652	36	5.23%
Block Group 2, Census Tract 3302, Clearfield County, Pennsylvania	811	801	10	1.23%
Block Group 3, Census Tract 3302, Clearfield County, Pennsylvania	908	972	-64	-7.05%
Block Group 4, Census Tract 3302, Clearfield County, Pennsylvania	1,217	1,316	-99	-8.13%
Block Group 1, Census Tract 3303, Clearfield County, Pennsylvania	1,260	1,089	171	13.57%
Block Group 2, Census Tract 3303, Clearfield County, Pennsylvania	1,411	1,508	-97	-6.87%
Block Group 3, Census Tract 3303, Clearfield County, Pennsylvania	1,828	1,940	-112	-6.13%
Block Group 1, Census Tract 3304, Clearfield County, Pennsylvania	3,233	3,068	165	5.10%
Block Group 2, Census Tract 3304, Clearfield County, Pennsylvania	838	754	84	10.02%
Block Group 3, Census Tract 3304, Clearfield County, Pennsylvania	2,373	0	2,373	100.00%
Block Group 1, Census Tract 9503, Jefferson County, Pennsylvania	1,196	1,160	36	3.01%
Block Group 2, Census Tract 9503, Jefferson County, Pennsylvania	1,346	1,213	133	9.88%
Block Group 4, Census Tract 9503, Jefferson County, Pennsylvania	735	785	-50	-6.80%
Block Group 5, Census Tract 9503, Jefferson County, Pennsylvania	939	1,033	-94	-10.01%
Block Group 1, Census Tract 9504, Jefferson County, Pennsylvania	626	669	-43	-6.87%
Block Group 2, Census Tract 9504, Jefferson County, Pennsylvania	778	720	58	7.46%
Block Group 3, Census Tract 9504, Jefferson County, Pennsylvania	655	643	12	1.83%
Block Group 1, Census Tract 9505, Jefferson County, Pennsylvania	1,242	1,276	-34	-2.74%
Block Group 2, Census Tract 9505, Jefferson County, Pennsylvania	929	876	53	5.71%
Block Group 1, Census Tract 9506, Jefferson County, Pennsylvania	1,369	1,413	-44	-3.21%
Block Group 2, Census Tract 9506, Jefferson County, Pennsylvania	1,232	1,198	34	2.76%
Block Group 3, Census Tract 9506, Jefferson County, Pennsylvania	1,170	1,080	90	7.69%
Block Group 4, Census Tract 9506, Jefferson County, Pennsylvania	999	1,188	-189	-18.92%
Block Group 5, Census Tract 9506, Jefferson County, Pennsylvania	1,056	1,014	42	3.98%
Block Group 1, Census Tract 9507, Jefferson County, Pennsylvania	918	960	-42	-4.58%
Block Group 2, Census Tract 9507, Jefferson County, Pennsylvania	703	753	-50	-7.11%
Block Group 3, Census Tract 9507, Jefferson County, Pennsylvania	1,089	1,105	-16	-1.47%
Block Group 1, Census Tract 9508, Jefferson County, Pennsylvania	1,154	1,091	63	5.46%
Block Group 2, Census Tract 9508, Jefferson County, Pennsylvania	1,437	1,435	2	0.14%
Block Group 1, Census Tract 9509, Jefferson County, Pennsylvania	1,129	1,130	-1	-0.09%
Block Group 2, Census Tract 9509, Jefferson County, Pennsylvania	629	616	13	2.07%
Block Group 2, Census Tract 9510, Jefferson County, Pennsylvania	1,068	1,011	57	5.34%
<b>Total</b>	<b>47,795</b>	<b>46,959</b>	<b>836</b>	<b>1.75%</b>

**APPENDIX D. AGRICULTURAL SOILS**

**Prime Agricultural Soils**

Map Symbol	Soil Name	Slope Character (% slope)
<i>Armstrong County</i>		
AIB	Allegheny silt loam	3 to 8
Po	Pope loam	
RaA	Rainsboro silt loam	0 to 3
RnB	Rayne silt loam	3 to 8
Se	Steff loam	
WrB	Wharton silt loam	3 to 8

<i>Clarion County</i>		
Clc	Cookport silt loam	0 to 2
Cld	Cookport silt loam	2 to 8
Cs	Clymer channery loam	5 to 12
Cu	Clymer loam	0 to 5
Cv	Clymer loam	5 to 12
Cz	Cookport channery silt loam	2 to 8
Da	Dekalb channery loam	0 to 5
Ea	Ernest silt loam	0 to 8
Ga	Giplin channery loam	0 to 5
Ge	Gilpin channery silt loam	0 to 5
Gk	Gilpin shaly silt loam	0 to 5
Gp	Gilpin silt loam	0 to 5
Ha	Holston silt loam	0 to 2
Hb	Holston silt loam	2 to 8
Ma	Monongahela silt loam	0 to 2
Pb	Philo silt loam	0 to 6
Pc	Pope fine sandy loam	0 to 5
Pe	Pope silt loam	0 to 5
Ra	Rayne silt loam	0 to 5
Sb	Sciotoville silt loam	2 to 8
Sd	Shelocta silt loam	2 to 8
We	Wharton silt loam	0 to 2
Wf	Wharton silt loam	2 to 8
Wr	Wheeling silt loam	2 to 8

<i>Clearfield County</i>		
AIB	Allegheny silt loam	3 to 8
CIB	Clymer channery loam	3 to 8

Map Symbol	Soil Name	Slope Character (% slope)
<i>Clearfield County</i>		
CoB	Cookport channery loam	3 to 8
GIB	Giplin channery silt loam	3 to 8
HcB	Hazleton-Clymer channery loam	3 to 8
Ph	Philo silt loam	
Po	Pope loam	
RaB	Rayne silt loam	3 to 8
WhB	Wharton silt loam	3 to 8

<i>Jefferson County</i>		
CkA	Cookport channery loam	0 to 3
CkB	Cookport channery loam	3 to 8
CkB2	Cookport channery loam	3 to 8
CpA	Cookport channery loam	0 to 3
CpB	Cookport channery loam	3 to 8
CpB2	Cookport loam	3 to 8
EnA	Ernest silt loam	0 to 3
GcA	Gilpin channery silt loam	0 to 5
GcB	Gilpin channery silt loam	5 to 12
GcB2	Gilpin channery silt loam, moderately eroded	5 to 12
HaA	Clymer loam	0 to 5
HaB	Clymer loam	5 to 12
HaB2	Clymer loam, moderately eroded	5 to 12
HoA	Allegheny silt loam	0 to 5
MoA	Monongahela silt loam	0 to 3
Ph	Philo silt loam	
Pp	Pope fine sandy loam	
Ps	Pope silt loam	
RaB	Rayne silt loam	3 to 8
ScA	Chavies silt loam	0 to 5
ShB2	Shelocta silt loam	3 to 8
WnA	Wellston silt loam	0 to 5
WtA	Wharton silt loam	0 to 3
WtB	Wharton silt loam	3 to 8
WtB2	Wharton silt loam, moderately eroded	3 to 8
ZoA	Zoar silt loam	0 to 3

**Farmland of Statewide Importance**

Map Symbol	Soil Name	Slope Character (% slope)
<i>Allegheny County</i>		
A1C	Allegheny silt loam	8 to 15
CaB	Cavode silt loam	3 to 8
CaC	Cavode silt loam	8 to 15
EnB	Ernest silt loam	3 to 8
EnC	Ernest silt loam	8 to 15
GwB	Gilpin-Weikery complex	3 to 8
GwC	Gilpin-Weikery complex	8 to 15
HaC	Hazelton channery loam	8 to 15
Me	Melvin silty clay loam	
RaB	Rainsboro silt loam	3 to 8
RaC	Rainsboro silt loam	8 to 15
RnC	Rayne silt loam	8 to 15
WeB	Weikert shaly silt loam	3 to 8
WrC	Wharton silt loam	8 to 15
WtC	Wharton-Gilpin silt loams	8 to 15

<i>Clarion County</i>		
Ca	Cavode channery silt loam	2 to 8
Cb	Cavode channery silt loam	8 to 15
Cc	Cavode silt loam	0 to 2
Ce	Cavode silt loam	2 to 8
CgC	Cavode silt loam, concretionary variant	0 to 2
Ch	Cavode silt loam	8 to 15
Db	Dekalb channery loam	5 to 12
Eb	Ernest silt loam	0 to 8
Ec	Ernest silt loam	8 to 15
Gb	Gilpin channery loam	5 to 12
Gf	Gilpin channery silt loam	5 to 12
Gl	Gilpin shaly silt loam	5 to 12
Gm	Gilpin shaly silt loam, severely eroded	5 to 12
Gr	Gilpin Silt loam	5 to 12
Hc	Holston silt loam	8 to 15
Mb	Monongahela silt loam	2 to 8
Mc	Monongahela silt loam	8 to 15
Se	Shelocta silt loam	8 to 15

Map Symbol	Soil Name	Slope Character (% slope)
<i>Clarion County (continued)</i>		
Wg	Wharton silt loam	8 to 15
Rb	Rayne silt loam	5 to 12
Sc	Sciotoville silt loam	8 to 15
Wl	Wharton silt loam, concretionary variant	5 to 12
Ws	Wheeling silt loam	8 to 15

<i>Clearfield County</i>		
At	Atkins silt loam	
BeB	Berkes channery silt loam	3 to 8
BeC	Berkes channery silt loam	8 to 15
CaB	Cavode silt loam	3 to 8
CaC	Cavode silt loam	8 to 15
C1C	Clymer channery loam	8 to 15
CoC	Cookport channery loam	8 to 15
DeB	Dekalb channery loam	3 to 8
DeC	Dekalb channery loam	8 to 15
ErB	Ernest silt loam	3 to 8
ErC	Ernest silt loam	8 to 15
GlC	Gilpin channery silt loam	8 to 15
HcC	Hazleton-Clymer channery loam	8 to 15
MoB	Monongahela silt loam	3 to 15
RaC	Rayne silt loam	8 to 15
TyA	Tyler silt loam	0 to 3
TyB	Tyler silt loam	3 to 6
WhC	Wharton silt loam	8 to 15

<i>Jefferson County</i>		
Aw	Atkins silt loam	
CaA	Cavode silt loam	0 to 3
CaB	Cavode silt loam	3 to 8
CaB2	Cavode silt loam, moderately eroded	3 to 8
CaC	Cavode silt loam	8 to 15
CaC2	Cavode silt loam, moderately eroded	8 to 15
CkC	Cookport channery loam	8 to 15
DcA	Dekalb channery loam	0 to 5
DcB	Dekalb channery loam	5 to 12

**Farmland of Statewide Importance (continued)**

<b>Map Symbol</b>	<b>Soil Name</b>	<b>Slope Character (% slope)</b>
<i>Clearfield County (continued)</i>		
DcB2	Dekalb channery loam, moderately eroded	5 to 12
DcC	Dekalb channery loam	12 to 20
DcC2	Dekalb channery loam, moderately eroded	12 to 20
DhA	Dekalb loam	0 to 5
DhB	Dekalb loam	5 to 12
DhB2	Dekalb loam, moderately eroded	5 to 12
DhC	Dekalb loam	12 to 20
DhC2	Dekalb loam, moderately eroded	12 to 20
EnB	Ernest silt loam	3 to 8
EnB2	Ernest silt loam, moderately eroded	3 to 8
EnC	Ernest silt loam	8 to 15
EnC2	Ernest silt loam, moderately eroded	8 to 15
GcC	Gilpin channery silt loam	12 to 20
GcC2	Gilpin channery silt loam	12 to 20
GgC	Gilpin silt loam	12 to 20

<b>Map Symbol</b>	<b>Soil Name</b>	<b>Slope Character (% slope)</b>
<i>Clearfield County (continued)</i>		
GgC2	Gilpin silt loam	12 to 20
GsB2	Guernsey silty clay loam, moderately eroded	3 to 8
HaC2	Clymer loam, moderately eroded	12 to 20
HoB	Allegheny silt loam	5 to 12
HoC2	Allegheny silt loam, moderately eroded	12 to 20
MoB	Monongahela silt loam	3 to 8
MvA	Weikert-Gilpin channery silt loams	0 to 5
MvB2	Weikert-Gilpin channery silt loams, moderately eroded	5 to 12
RaC	Rayne silt loam	8 to 15
Ty	Tyler silt loam	
WnB2	Wellston silt loam, moderately eroded	5 to 12
WnC2	Wellston silt loam, moderately eroded	12 to 20
WsB2	Westmoreland silt loam, moderately eroded	5 to 12
WtC2	Wharton silt loam, moderately eroded	12 to 20

**APPENDIX E. RESOURCE CONSERVATION AND RECOVERY A**

<b>County</b>	<b>Site</b>	<b>Permit</b>	<b>Type</b>
Jefferson	AEP Brookville	PAR000034744	CESQG
	Beverage Air Brookville Plant	PAD068722941	SQG
	Body Shop	PA0000015487	CESQG
	The Body Shop	PAR000007641	CESQG
	BP Oil 07165	PAD987327707	SQG
	Brockway Ford	PAD987392750	SQG
	Brookville Chevrolet	PAD013904248	SQG
	Brookville Jr/Sr High School	PA0000343483	CESQG/Transporter
	Brookville Locomotive Division	PAD982662751	SQG
	Brookville Maintenance Reliant	PAD980713044	SQG
	Brookville Mining Equipment	PAR000036129	SQG
	Brookville PK 109 Maint Shop	PAR000506980	Used Oil Program
	Brookville Wood Product Bats Limited Liability Corporation	PAR000527499	CESQG
	Clontz Tire Service	PAD987387107	SQG
	Columbia Gas Trans Brookville	PAR000031716	CESQG
	Columbia Gas Trans Brookville	PAR000031716	Hazardous Waste Biennial Reporter
	Conrail M of W Repair Facility	PAD000799908	Not in a universe
	Davis Air Incorporated	PAR000040766	Not in a universe
	Dennison Brothers	PAD014512669	SQG
	DuBois Jeff County Airport	PAR000524322	CESQG
	Exton USA 24841	PAD987332269	Not in a universe
	Falls Creek Amic Site Company Incorporated	PAD004331096	Not in a universe
	Glen Gary Corp Hanley Plant	paD004318341	LQG
	1A Construction Corporation	PAD981044126	Not in a universe
	1A Const. Reynoldsville Plant	PAD004342580	SQG
	IMBT Herbert R Incorporated Plant 9	PAD981737927	Not in a universe
	Jack's Auto Body + Frame Incorporated	PAD982568115	SQG
	Jackson China	PAD987285419	Not in a universe
	Jefferson Cnty DuBois Votech	PAD066853243	CESQG
	Jims Custom Collision	PAD101580512	CESQG
	Liberty Express Airlines	PAD987277399	SQG
	Lindemuths Custom Collision	PAR000006619	CESQG
	Lyons Equipment	PAD987377611	SQG
	Lyon Sawmill Logging Equipment Supplies	PAD004331468	SQG
	McMurray Company Incorporated	PAD004331468	SQG
	McPherson Auto Body	PAR000020214	CESQG

County	Site	Permit	Type
Jefferson	Miller Welding/ Mach Maplevale	PAR000500926	SQG
	Molnar Hauling	PA0000693655	CESQG/Transporter
	National Fuel Gas Supply Company Reynoldsville	PAR000527424	SQG
	National Fuel Gas Supply Knox Station	PAD987324324	SQG
	Niagra Cutter Service Center	PAD095328563	CESQC
	NOWSCO	PAD987401098	Not in a Universe
	Owens Illinois Closure	PAD052188877	SQG
	Penn Separator Corporation	PAD987339876	SQG
	Peoples Auto Body	PA0000826834	CESQG
	Pittsburgh + Shawmut Railraod	PAD9873228366	CESQG
	Preston Trucking Term	PAD096334644	SQG/Transporter
	Reitz George I and Sons	PAD004332359	SQG
	Rt 36 Auto Body	PAD987319456	CESQG
	Shaffer Buick	PAD982580300	SQG
	Sheetz 50	PAR000525634	SQG
	Sheetz 66	PAR000525881	SQG
	Sheetz DuBois Storage Facility	PAR000507897	SQG
	Sheetz Travel Ctr store 194 700	PAR000511030	SQG
	Smith Hauling	PAD987322187	SQG
	St. Mary's Carbon Brookville	PAR0000036947	SQG
	Stockdale Mine Supply	PAD987360922	SQG
	Stockdale Mine Supply	PAD987360922	SQG
	Straitiff Auto Body	PAD987395233	CESQG/Transporter
	Sunoco Ran 107	PAD987340528	CESQG
	ToYo Transco USA Incorporated	PAR000505032	Not in a Universe
	Trail King Industries	PAD987397171	LQG
	TSA @ DuBois/Jefferson County Airport	PAR000511071	CESQG
	USARC Brookville Memorial	PA2220100042	CESQG
	Utilities and Industries Incorporated	PAR000027698	SQG
	Village Farms Greenhouse	PAD987353299	CESQG
	Wasko Chrysler Incorporated	PAR000032755	SQG
	Clearfield	101 Auto Repair	PAR000036590
Alco Standard Corporation		PAD045294543	Not in Universe
Apple Tractor Incorporated		PA0000452144	CESQG
Blommen Russel US Army Reserve Command		PA9210022134	CESQG
Brockway Analytical		PAR000509802	CESQG
Burke Parsans Bowlby Manufacturing		PAD059087163	SQG
CW Graphics Company		PA0001015692	CESQG

County	Site	Permit	Type
Clearfield	Delong Auto Body Shop	PAR000040568	Not in Universe
	Dock Street Plant	PAR000043372	CESQG
	The Dry Cleaner, Incorporated	PAD987394236	CESQG
	DuBois 1 Hour Cleanings	PAD981733959	Not in Universe
	DuBois Auto Supply	PAD085528305	CESQG
	DuBois Auto Supply	PAR000043406	CESQG
	DuBois Railcar Repair Plant	PAD086681392	LQG
	DuBois Railcar Repair Plant	PAD086681392	Hazardous Waste Biennial Reporter
	DuBois Regional Medical Center	PAR000527507	CESQG
	DuBois Spring Plant	PAD047201421	SQG
	DuBrook Incorporated	PAD981734015	CESQG
	Fairman	PAD007910565	CESQG
	Gasbarre Product	PAD987323250	SQG
	GKN Sinter Metal DuBois Plant	PAR000012773	CESQG
	Glenn O. Hawbaker	PAD987282977	CESQG
	Goodyear Auto Service Center DuBois	PAD119131209	SQG
	Gyro Lasers Incorporated	PAD000504035	Not in Universe
	Head to Toe Sportswear	PAR000022970	CESQG
	Highway Equipment	PAD014032734	Used Oil Program
	HPM Industries	PAD987344298	CESQG
	Ivensys Energy Metering Plant 2	PAD980714208	CESQG
	Ivensys Energy Metering Plant 2	PAD980714208	Hazardous Waste Biennial Reporter
	Joe Fenders Body + Frame	PAD027915362	SQG
	Joes Tux Shop	PAD987279395	SQG
	Johnson Motors Incorporated	PAD987322021	CESQG
	Johnson Nissan	PAD987361219	CESQG
	Keller Brothers Dry Cleaning Service	PAD014032858	CESQG
	Kolash's Garage	PAR000020461	CESQG
	Kwik Fill Mo 181 215	PAD987337953	CESQG
	Kwik Fill Mo 181 215	PAD987337987	CESQG
	Labue Printing Incorporated	PA0000340174	Not in universe
	Labue Printing Manufacturing	PAR000018549	CESQG
	McDowell Manufacturing	PAD987268638	CESQG
	Munson Transportation	PAD987345097	SQG
	Murray's Ford Body Shop	PAD987398054	CESQG
	Murry's Ford Incorporated	PAD987397932	CESQG
	Osburn Buick Pontiac GMC Incorporated	PAD014034169	CESQG
	Overland Express Incorporated	PAD 981735038	SQG

County	Site	Permit	Type	
Clearfield	Pace Precision Products	PAD041731498	CESQG	
	Paris Cleaner	PAD981733496	CESQG	
	Pats Printer	PAR000007468	CESQG	
	Penelec- DuBois District Office	PAD981112998	CESQG	
	Penn State University	PAD058600776	CESQG	
	Penn State University	PAD058600776	Hazardous Waste Biennial Reporter	
	Penn Traffic	PAD987369105	SQG	
	Robert Cole Trucking	PAD981731540	CESQG	
	Rockwell International	PAT440012615	Not in universe	
	Sabula Auto Center	PAR000017657	CESQG	
	Sears 7823	PAR000003764	SQG	
	Sekula Sign	PAD004316329	CESQG	
	Sensus Metering System Plant 1	PAD004335469	Hazardous Waste Biennial Reporter	
	Sensus Metering System Plant 1	PAD004335469	LQG	
	Sensus Metering System Pllant 1	PAD004335469	TSD	
	Shaw Mack Sales Suc.	PA0000479931	SQG	
	Sheetz Store 148	PAR000526301	SQG	
	Sheetz Store 149	PAR000526319	SQG	
	Sherwin-Williams Company	PAD000739201	Not in Universe	
	Smith Double A/040	PAD987380144	CESQG	
	Spray Guns Autobody	PA0000447136	CESQG	
	United Parcel Sus. DuBois	PAD987358645	CESQG	
	Walmart 1769	PAR000504746	CESQG	
	Clarion	Atlantic Service Station	PAD987340395	CESQG
		BJ Fairmount	PAR000026856	CESQG
		Bowersax Garage	PAR000001594	SQG
		Colombia Gas New Bethlehem. Operation Center	PAD987323870	Hazardous Waste Biennial Reporter
		Colombia Gas New Bethlehem. Operation Center	PAD987323870	SQG
		Conrail Diesel Refueling Facility	PAD980714844	Not in Universe
		McCauley Trucking	PA0000694315	SQG
Nolf Chrystler Dodge		PAR000003434	CESQG	
Peoples Natural Gas/Truittsburg Station		PAR000524207	CESQG	
Reddinger Coal Company Dean Shop		PAD987360898	SQG	
Rhodes Salvage		PAD987401056	LQG/Transporter	
Snyders Auto Body		PAD982580433	SQG	
Yates Garage		PAD987329489	CESQG	

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Reynoldsville
Ringgold
Brookville
DuBois





**APPENDIX F. NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM PERMITS**

Site/Facility Name	Permit #	Permit Type	Issue Date	Expire Date	City	Municipality
<b>Armstrong County</b>						
Hawthorn Area Water Authority Wastewater Treatment Plant	PA0098329	State issued	12/6/2005	12/5/2009	Hawthorn	Redbank
Mahoning Township Supervisors	PA0252581	State issued	12/4/2003	12/31/2008	New Bethlehem	Mahoning
Redbank Valley Municipal Authority	PA0024511	State issued	7/5/2005	7/4/2010	New Bethlehem	Mahoning
<b>Clarion County</b>						
Crawford, John	PAG048357	State issued	4/1/2005	2/4/2009	New Bethlehem	Porter
Hawthorn Elem. School	PA0029378	State issued	3/23/2005	3/22/2010	Hawthorn	Redbank
Kunselman, Bryan & Michelle	PAG049003	State issued	10/14/2004	2/4/2009	Fairmount City	Redbank
Living Church International Incorporation	PA0223131	State issued	2/16/2006	2/15/2011	Fairmount City	Redbank
Redbank Valley Municipal Authority	PA0024511	State issued	7/5/2005	7/4/2010	New Bethlehem	Porter
Rhodes Salvage Company	PAR608343	State issued	11/10/2004	11/9/2009	New Bethlehem	Redbank
Rimersburg Borough Municipal Authority	PA0038156	State issued	2/28/2000	2/27/2005	Rimersburg	Madison
Rowe, Dane	PAG048358	State issued	10/3/2005	2/4/2009	Fairmount City	Redbank
<b>Clearfield County</b>						
American Rock Salt Company Limited Liability Company	PAR324805	State issued	1/16/2003	1/31/2008	DuBois	Sandy
APA Transport Corporation	PAR804803	State issued	11/7/1992	11/6/1997	DuBois	Sandy
Brown, Charles III	PAG045079	State issued	9/9/2004	2/4/2009	DuBois	Sandy
Burke Parsons Bowlby Corporation	PAR224847	State issued	8/7/2002	8/31/2007	DuBois	Sandy
Chapman Auto Parts Incorporation	PAR604812	State issued	5/28/2004	5/31/2009	DuBois	Sandy
Dixon, Calvin	PAG045121	State issued	9/13/2004	2/4/2009	DuBois	Sandy
DuBois City Water Department	PA0027375	State issued	6/7/2001	6/30/2006	DuBois	Sandy
DuBois City Water Treatment Plant	PA0113051	State issued	3/22/2006	3/31/2011	DuBois	Sandy
Duttry, Carlene	PAG045048	State issued	9/9/2004	2/4/2009	DuBois	Sandy

Site/Facility Name	Permit #	Permit Type	Issue Date	Expire Date	City	Municipality
<b>Clearfield County</b>						
Emmanuel Church of Nazarene	PAG045178	State issued	7/1/2004	2/4/2009	DuBois	Sandy
Geyer, Linda	PA0209376	State issued	7/17/2002	7/31/2007	DuBois	Sandy
Glenn Hawbaker Incorporated	PAR704814	State issued	6/12/1997	6/30/2002	DuBois	Sandy
Glenn O Hawbaker Incorporated	PAR704804	State issued	7/23/2002	7/31/2007	DuBois	Sandy
Mohop Limited Partnership	PA0113727	State issued	3/15/2006	3/31/2011	DuBois	Sandy
Murray Freightliner	PAR804872	State issued	7/20/2004	7/31/2009	DuBois	Sandy
Pilot Travel Centers Limited Liability Company #336	PAG054827	State issued	6/1/2003	12/12/2007	DuBois	Sandy
Ramada Inn Sewage Treatment Plant	PA0101150	State issued	10/16/2002	10/31/2007	DuBois	Sandy
Randolph, Catherine	PA0208931	State issued	2/27/2004	2/26/2009	DuBois	Sandy
Rolling Frito Lay Sales Limited Partnership/DuBois	PAR804875	State issued	11/1/2004	10/31/2209	DuBois	Sandy
Slab Run Sewage Treatment Plant	PA0101290	State issued	1/13/2006	1/31/2011	DuBois	Sandy
Total Environmental Solutions Incorporated Sewage Treatment Plant	PA0228061	State issued	11/13/2003	11/30/2008	DuBois	Sandy
Triangle Suspension Sys Incorporated	PA0100161	State issued	10/14/2004	10/31/2009	DuBois	Sandy
United Parcel Service Incorporated	PAR804830	State issued	3/1/2005	2/28/2010	DuBois	Sandy
Wagoners Auto Service	PAR604829	State issued	9/23/2005	9/30/2010	DuBois	Sandy
Walls, George	PAG045002	State issued	9/13/2004	2/4/2009	DuBois	Sandy
<b>Jefferson County</b>						
Beverage Air	PAR118339	State issued	4/2/2003	4/1/2008	Brookville	Rose
Brookville Municipal Authority	PA0020141	State issued	12/17/2001	12/16/2006	Brookville	Rose
Brookville Wood Products Incorporated	PAR218323	State issued	10/7/2005	10/6/2010	Brookville	Rose
Clearfield-Jefferson Counties	PA0222381	State issued	2/24/2003	2/23/2008	Brookville	Rose
Clearfield-Jefferson County Regional Airport	PAR808319	State issued	8/5/2002	8/4/2007	Reynoldsville	Winslow
Corsica Municipal Building	PA0222283	State issued	9/4/2002	9/3/2007	Corsica	Union
Davis Used Cars & Parts	PAR608336	State issued	12/19/2001	12/18/2006	Brookville	Rose
Falls Creek Water Filtration Plant	PA0101192	State issued	11/12/2002	11/11/2007	Falls Creek	Washington
Flying J Travel Plaza	PAS808301	State issued	5/7/2003	5/6/2008	Brookville	Rose

Site/Facility Name	Permit #	Permit Type	Issue Date	Expire Date	City	Municipality
<b>Jefferson County</b>						
Glen-Gery Corp./Hanley Plant	PAR218315	State issued	9/21/2005	9/20/2010	Summerville	Clover
Good, David and Irene	PAG048548	State issued	10/15/2003	10/14/2008	Reynoldsville	Winslow
HRI Inc Plant 109	PA0221775	State issued	8/5/2002	8/4/2007	Brookville	Rose
Knox Twp. Municipal Authority	PA0210030	State issued	5/14/2001	9/30/2006	Knoxdale	Knox
Matson Lumber Company	PAR228322	State issued	9/9/2005	9/8/2010	Brookville	Rose
Matson Timber-Land Company	PA0221902	State issued	9/26/2001	9/25/2006	Corsica	Rose
Miller Welding & Machine Company	PAR118324	State issued	3/20/2002	3/19/2007	Brookville	Rose
Miller Welding & Machine Company	PAR118335	State issued	6/8/2005	6/7/2010	Brookville	Rose
Miller Welding & Machine Company	PAR118330	State issued	5/10/2001	5/9/2006	Brookville	Rose
Morrison, James & Teresa	PAG049193	State issued	8/23/2005	2/4/2009	Brookville	Rose
Pennsylvania Department of Transportation -Rest Area #25	PA0033049	State issued	8/20/2003	8/19/2008	Reynoldsville	Winslow
Pennsylvania Department of Transportation -Rest Area #26	PA0033073	State issued	8/20/2003	8/19/2008	Reynoldsville	Winslow
Pittsburgh & Shawmut Railroad	PAR808325	State issued	12/16/2002	12/15/2007	Brookville	Rose
Preston Trucking Company	PA0041840	State issued	1/8/1998	1/7/2003	Falls Creek	Washington
Proshort Stamping Services Incorporated	PAG049158	State issued	5/18/2004	2/4/2009	Falls Creek	Washington
PW Hardwood Limited Liability Company	PA0221686	State issued	2/23/2001	2/22/2006	Brookville	Rose
PW Hardwood Limited Liability Company	PA0223077	State issued	10/4/2005	10/3/2010	Brookville	Rose
Reynoldsville Sewage Authority	PA0028207	State issued	12/2/2002	12/1/2007	Reynoldsville	Rose
Sheetz Incorporated	PAR804848	State issued	12/9/2003	12/31/2008	Falls Creek	Washington
Soldier Wesleyan Methodist Church	PAG049015	State issued	11/10/2004	2/4/2009	Reynoldsville	Winslow
Summerville Borough Municipal Authority	PA0222496	State issued	6/10/2003	6/9/2008	Summerville	Clover
Travel Center of America-Brookville	PA0100625	State issued	3/30/2004	3/29/2009	Brookville	Rose
Village Farms Limited Partnerships	PA0104396	State issued	5/7/2003	5/6/2009	Ringold	Ringold
Watt, Mark & Wendy	PA0210714	State issued	3/10/2003	3/9/2008	Reynoldsville	Winslow
Wells Auto Wreckers	PAR608312	State issued	10/10/2002	10/9/2007	Reynoldsville	Winslow

**APPENDIX G. SPECIES OF CONCERN**

Common Name	Scientific Name	Global Rank	State Rank	State Status	Proposed	
					State Status	Federal Status
<b>Plants</b>						
Alleghany Plum	Prunus alleghaniensis	G4	S2S3	N	PT	
Blue False-indigo	Baptisia australis	G5	S3	N	TU	
Broad-leaved Willow	Salix myricoides	G4	S2	N	TU	
Canadian Milkvetch	Astragalus canadensis	G5	S2	N	TU	
Declined Trillium	Trillium flexipes	G5	S2	TU	TU	
Drooping Bluegrass	Poa languida	G3G4Q	S2	TU	PT	
Featherbells	Stenanthium gramineum	G4G5	S1S2	N	TU	
Hairy Honeysuckle	Lonicera hirsuta	G4G5	S1	TU	PE	
Heartleaf Meehanian	Meehanian cordata	G5	S1	TU	PE	
Highbush-cranberry	Viburnum trilobum	G5T5	S3S4	TU	PR	
Lobed Spleenwort	Asplenium pinnatifidum	G4	S3	N	PR	
Meadow Willow	Salix x subsericea	G5	SNA	TU	DL	
Mountain Starwort	Stellaria borealis	G5	S1S2	N	TU	
Queen-of-the-prairie	Filipendula rubra	G4G5	S1S2	TU	TU	
Red-head Pondweed	Potamogeton richardsonii	G5	S3	PT	PR	
Small Wood Sunflower	Helianthus microcephalus	G5	S3	N	TU	
Virginia Bunchflower	Melanthium virginicum	G5	SU	N	TU	
Wild Kidney Bean	Phaseolus polystachios	G5	S1S2	N	TU	

**Bats**

Eastern Small-footed Myotis	Myotis leibii	G3	S1B,S1N	PT	PT	
Indiana or Social Myotis	Myotis sodalis	G2	SUB,S1N	PE	PE	LE
Northern Myotis	Myotis septentrionalis	G4	S3B,S3N		CR	

**Birds**

American Bittern	Botaurus lentiginosus	G4	S1B	PE	PE	
Dickcissel	Spiza americana	G5	S2B	PE	PE	
Great Blue Heron	Ardea herodias	G5	S3S4B,S4N			
Long-eared Owl	Asio otus	G5	S2B,S2S3N		CU	
Northern Harrier	Circus cyaneus	G5	S3B,S4N		CA	
Short-eared Owl	Asio flammeus	G5	S1B,S3N	PE	PE	

**Fish**

Bluebreast Darter	Etheostoma camurum	G4	S2	PT	PT	
Channel Darter	Percina copelandi	G4	S2	PT	PT	
Goldeye	Hiodon alosoides	G5	S2?	PT	PT	
Longhead Darter	Percina macrocephala	G3	S2S3	PT	PT	
Longnose Gar	Lepisosteus osseus	G5	S3	PC	CR	

Redbank Creek Watershed Conservation Plan

Common Name	Scientific Name	Global Rank	State Rank	State Status	Proposed	
					State Status	Federal Status
<i>Fish (continued)</i>						
Mooneye	Hiodon tergisus	G5	S2S3	PT	PT	
Ohio Lamprey	Ichthyomyzon bdellium	G3G4	S2S3	PC	C	
Popeye Shiner	Notropis ariommus	G3	SX		PX	
River Redhorse	Moxostoma carinatum	G4	S3S4	PC	CU	

*Reptiles*

Eastern Hognose Snake	Heterodon platirhinos	G5	S3S4			
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*Invertebrates*

Butterfly Mussel	Ellipsaria lineolata	G4	S1S2		CU	
Clubshell	Pleurobema clava	G2	S1S2	PE	PE	LE, XN
Elephant Ear	Elliptio crassidens	G5	SX		CU	
Elktoe	Alasmidonta marginata	G4	S4		N	
Fanshell	Cyprogenia stegaria	G1	SX		PX	LE
Fragile Papershell	Leptodea fragilis	G5	S2		CR	
Lilliput	Toxolasma parvum	G5	S1S3		PE	
Long-solid	Fusconaia subrotunda	G3	S1		PE	
Mapleleaf	Quadrula quadrula	G5	S1S2		PT	
Monkeyface	Quadrula metanevra	G4	SX		PX	
Northern Riffleshell	Epioblasma torulosa rangiana	G2T2	S2	PE	PE	LE
Ohio Pigtoe	Pleurobema cordatum	G3	SX		PE	
Paper Pondshell	Utterbackia imbecillis	G5	S3S4		CU	
Pimpleback	Quadrula pustulosa	G5	SX		PX	
Pink Heelsplitter	Potamilus alatus	G5	S2		CR	
Pink Mucket	Lampsilis abrupta	G2	SX		PX	LE
Pistolgrip Mussel	Tritogonia verrucosa	G4	S1		PE	
Purple Wartback	Cyclonaias tuberculata	G5	SX		PX	
Pyramid Pigtoe	Pleurobema rubrum	G2	SX		PX	
Rabbitsfoot	Quadrula cylindrica	G3	S1		PE	PS
Rainbow Mussel	Villosa iris	G5	S1		PE	
Rayed Bean Mussel	Villosa fabalis	G1G2	S1S2		PE	C
Rough Pigtoe	Pleurobema plenum	G1	SX		PX	LE
Round Hickorynut	Obovaria subrotunda	G4	S1		PE	
Round Pigtoe	Pleurobema sintoxia	G4	S2		PE	
Sable Clubtail	Gomphus rogersi	G4	S1			
Salamander Mussel	Simpsonaias ambigua	G3	S1?		PT	
Sheepnose Mussel	Plethobasus cyphus	G3	S1		PE	C
Snuffbox	Epioblasma triquetra	G3	S1		PE	
Wabash Pigtoe	Fusconaia flava	G5	S2		PE	

Redbank Creek Watershed Conservation Plan

Common Name	Scientific Name	Global Rank	State Rank	State Status	Proposed	
					State Status	Federal Status
<i>Invertebrates (continued)</i>						
Wavy-rayed Lampmussel	Lampsilis fasciola	G4	S4		N	

*Natural Communities*

High-gradient Clearwater Creek	High-gradient clearwater creek	GNR	S3			
Northern hardwood forest		GNR	S4			

**Basic Global Rank Codes and Definitions**

<b>Rank Code</b>	<b>Description</b>	<b>Definition</b>
GX	Presumed Extinct	Believed to be extinct throughout its range. Not located despite intensive searches of historic sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.
GH	Possibly Extinct	Known from only historical occurrences. Still some hope of rediscovery.
G1	Critically Imperiled	Critically imperiled globally because of extreme rarity or because of some factor(s) making it especially vulnerable to extinction. Typically 5 or fewer occurrences or very few remaining individuals (<1,000) or acres (<2,000) or stream miles (<10).
G2	Imperiled	Imperiled globally because of rarity or because of some factor(s) making it very vulnerable to extinction. Typically 6 to 20 occurrences or few remaining individuals (1,000 to 3,000) or acres (2,000 to 10,000) or stream miles (10 to 50).
G3	Vulnerable	Vulnerable globally either because very rare and local throughout its range, found only in a restricted range (even if abundant at some locations), or because of other factors making it vulnerable to extinction. Typically 21 to 100 occurrences or between 3,000 and 10,000 individuals.
G4	Apparently Secure	Uncommon but not rare, and usually widespread. Possibly cause for long-term concern. Typically more than 100 occurrences and more than 10,000 individuals.
G5	Secure	Common, typically widespread and abundant. Typically with considerably more than 100 occurrences and more than 10,000 individuals.
G#G#	Range Rank	A numeric range rank (e.g., G2G3) is used to indicate uncertainty about the exact status of a taxon.
T	Intraspecific Taxon (trinomial)	The status of intraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank. Rules for assigning T ranks follow the same principles outlined above. For example, the global rank of a critically imperiled subspecies of an otherwise widespread and common species would be G5T1. A T subrank cannot imply the subspecies or variety is more abundant than the species= basic rank (e.g., a G1T2 subrank should not occur). A population (e.g., listed under the U.S. Endangered Species Act or assigned candidate status) may be tracked as an intraspecific taxon and given a T rank; in such cases a Q is used after the T rank to denote the taxon's questionable taxonomic status.

**Global Rank Qualifiers**

<b>Qualifier</b>	<b>Description</b>	<b>Definition</b>
?	Inexact Numeric Rank	Denotes inexact numeric rank.
Q	Questionable Taxonomy	Taxonomic status is questionable; numeric rank may change with taxonomy.
C	Captive or Cultivated Only	Taxon at present is extant only in captivity or cultivation, or as a reintroduced population not yet established.

**State Rank Codes and Definitions**

<b>Rank Code</b>	<b>Description</b>	<b>Definition</b>
SX	Extirpated	Element is believed to be extirpated from the "state" (or province or other subnational unit).
SH	Historical	Element occurred historically in the state (with expectation that it may be rediscovered), perhaps having not been verified in the past 20 years, and suspected to be still extant. Naturally, an element would become SH without such a 20-year delay if the only known occurrences in a state were destroyed or if it had been extensively and unsuccessfully looked for. Upon verification of an extant occurrence, SH-ranked elements would typically receive an S1 rank. The SH rank should be reserved for elements for which some effort has been made to relocate occurrences, rather than simply ranking all Elements not known from verified extant occurrences with this rank.
S1	Critically Imperiled	Critically imperiled in the state because of extreme rarity or because of some factor(s) making it especially vulnerable to extirpation from the state. Typically 5 or fewer occurrences or very few remaining individuals or acres.
S2	Imperiled	Imperiled in the state because of rarity or because of some factor(s) making it very vulnerable to extirpation from the state. Typically 6 to 20 occurrences or few remaining individuals or acres.
S3	Vulnerable	Vulnerable in the state either because rare and uncommon, or found only in a restricted range (even if abundant at some locations), or because of other factors making it vulnerable to extirpation. Typically 21 to 100 occurrences.
S4	Apparently Secure	Uncommon but not rare, and usually widespread in the state. Usually more than 100 occurrences.
S5	Secure	Demonstrably widespread, abundant, and secure in the state, and essentially ineradicable under present conditions.
S?	Unranked	State rank is not yet assessed.
SU	Unrankable	Currently unrankable due to lack of information or due to substantially conflicting information about status or trends. NOTE: Whenever possible, the most likely rank is assigned and a question mark added (e.g., S2?) to express uncertainty, or a range rank (e.g., S2S3) is used to delineate the limits (range) of uncertainty.
S#S#	Range Rank	A numeric range rank (e.g., S2S3) is used to indicate the range of uncertainty about the exact status of the Element. Ranges cannot skip more than one rank (e.g., SU should be used rather than S1S4).
HYB	Hybrid	Element represents an interspecific hybrid.
SE	Exotic	An exotic established in the state; may be native in nearby regions (e.g., house finch or catalpa in eastern U.S.).
SE#	Exotic Numeric	An exotic established in the state that has been assigned a numeric rank to indicate its status, as with S1 through S5.

**State Rank Codes and Definitions (continued)**

<b>Rank Code</b>	<b>Description</b>	<b>Definition</b>
SA	Accidental	Accidental or casual in the state (i.e., infrequent and outside usual range). Includes species (usually birds or butterflies) recorded once or only a few times. A few of these species may have bred on the one or two occasions they were recorded. Examples include European strays or western birds on the East Coast and vice-versa.
SZ	Zero Occurrences	Not of practical conservation concern in the state because there are no definable occurrences, although the taxon is native and appears regularly in the state. This rank will generally be used for long distance migrants whose occurrences during their migrations have little or no conservation value for the migrant as they are typically too irregular (in terms of repeated visitation to the same locations), transitory, and dispersed to be reliably identified, mapped, and protected. Typically, the SZ rank applies to a non-breeding population in the subnation -- for example, birds on migration. An SZ rank may in a few instances also apply to a breeding population, for example certain Lepidoptera which regularly die out every year with no significant return migration. Although the SZ rank typically applies to migrants, it should not be used indiscriminately. Just because a species is on migration does not mean it receives an SZ rank. SZ only applies when the migrants occur in an irregular, transitory, and dispersed manner.
SP	Potential	Potential that Element occurs in the state but no extant or historic occurrences reported.
SR	Reported	Element reported in the state but without a basis for either accepting or rejecting the report. Some of these are very recent discoveries for which the program hasn't yet received first-hand information; others are old, obscure reports.
SRF	Reported Falsely	Element erroneously reported in the state (e.g., misidentified specimen) and the error has persisted in the literature
SSYN	Synonym	Element reported as occurring in the state, but state does not recognize the taxon; therefore the Element is not ranked by the state.
*		S rank has been assigned and is under review. Contact the individual state Natural Heritage program for assigned rank.
Not Provided		Species is known to occur in this state. Contact the individual state Natural Heritage program for assigned rank.

**State Rank Qualifiers**

Qualifier	Description	Definition
B	Breeding	Basic rank refers to the breeding population of the Element in the state.
N	Non-breeding	Basic rank refers to the non-breeding population of the Element in the state.
?	Inexact or Uncertain	Denotes inexact or uncertain numeric rank. For SE denotes uncertainty of exotic status. (The ? qualifies the character immediately preceding it in the SRANK.)
C	Captive or Cultivated	Element is presently extant in the state only in captivity or cultivation, or as a reintroduced population not yet established.

NOTE - A breeding status subrank is only used for species that have distinct breeding and/or non-breeding populations in the state. A breeding-status SRANK can be coupled with its complementary non-breeding-status SRANK. The two are separated by a comma, with the higher-priority rank listed first in their pair (e.g., AS2B,S3N@ or ASHN,S4S5B@).

**Pennsylvania Status Definitions - Plants**

Status	Description	Definition
PE	Pennsylvania Endangered	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
PT	Pennsylvania Threatened	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.
PR	Pennsylvania Rare	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.
	Disjunct	Significantly separated from their main area of distribution
	Endemic	Confined to a specialized habitat.
	Limit of Range	At or near the periphery of their natural distribution
PX	Restricted	Found in specialized habitats or habitats infrequent in Pennsylvania.
	Pennsylvania Extirpated	Plant species believed by the Department to be extinct within this Commonwealth. These plants may or may not be in existence outside the Commonwealth.
PV	Pennsylvania Vulnerable	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.
TU	Tentatively Undetermined	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.

**Pennsylvania Status Definitions - Plants**

Status	Description	Definition
N		No current legal status exists, but is under review for future listing.

**Pennsylvania State Status - Wild Birds and Mammals**

Status	Description	Definition
PE	Pennsylvania Endangered	Species in imminent danger of extinction or extirpation throughout their range in Pennsylvania if the deleterious factors affecting them continue to operate. These are: 1) species whose numbers have already been reduced to a critically low level or whose habitat has been so drastically reduced or degraded that immediate action is required to prevent their extirpation from the Commonwealth; or 2) species whose extreme rarity or peripherality places them in potential danger of precipitous declines or sudden extirpation throughout their range in Pennsylvania; or 3) species that have been classified as "Pennsylvania Extirpated", but which are subsequently found to exist in Pennsylvania as long as the above conditions 1 or 2 are met; or 4) species determined to be "Endangered" pursuant to the Endangered Species Act of 1973, Public Law 93 205 (87 Stat. 884), as amended.
PT	Pennsylvania Threatened	Species that may become endangered within the foreseeable future throughout their range in Pennsylvania unless the casual factors affecting the organism are abated. These are: 1) species whose populations within the Commonwealth are decreasing or have been heavily depleted by adverse factors and while not actually endangered, are still in critical condition; 2) species whose populations may be relatively abundant in the Commonwealth but are under severe threat from serious adverse factors that have been identified and documented; or 3) species whose populations are rare or peripheral and in possible danger of severe decline throughout their range in Pennsylvania; or 4) species determined to be "Threatened" pursuant to the Endangered Species Act of 1973, Public Law 93205 (87 Stat. 884), as amended, that are not listed as "Pennsylvania Endangered".
N		No current legal status but is under review for future listing.

**Pennsylvania State Status - Fish, Amphibians, Reptiles, and Aquatic Organisms**

Status	Description	Definition
PE	Pennsylvania Endangered	All species declared by: 1) the Secretary of the United States Department of the Interior to be threatened with extinction and appear on the Endangered Species List or the Native Endangered Species List published in the Federal Register; or 2) have been declared by the Pennsylvania Fish Commission, Executive Director to be threatened with extinction and appear on the Pennsylvania Endangered Species List published by the Pennsylvania Bulletin.
PT	Pennsylvania Threatened	All species declared by: 1) the Secretary of the United States Department of the Interior to be in such small numbers throughout their range that they may become endangered if their environment worsens, and appear on a Threatened Species List published in the Federal Register; or 2) have been declared by the Pennsylvania Fish Commission Executive Director to be in such small numbers throughout their range that they may become endangered if their environment worsens and appear on the Pennsylvania Threatened Species List published in the Pennsylvania Bulletin.
PC		Animals that could become endangered or threatened in the future. All of these are uncommon, have restricted distribution or are at risk because of certain aspects of their biology.
N		No current legal status, but is under review for future listing.

**Pennsylvania State Status - Invertebrates**

Status	Description	Definition
N		No current legal status but is under review for future listing.

**Pennsylvania Biological Survey Suggested Status Definitions**

Status	Description	Definition
PE	Pennsylvania Endangered	Species in imminent danger of extinction or extirpation throughout their range in Pennsylvania if the deleterious factors affecting them continue to operate. These are: 1) species whose numbers have already been reduced to a critically low level or whose habitat has been so drastically reduced or degraded that immediate action is required to prevent their extirpation from the Commonwealth; or 2) species whose extreme rarity or peripherality places them in potential danger of precipitous declines or sudden extirpation throughout their range in Pennsylvania; or 3) species that have been classified as "Pennsylvania Extirpated", but which are subsequently found to exist in Pennsylvania as long as the above conditions 1 or 2 are met; or 4) species determined to be "Endangered" pursuant to the Endangered Species Act of 1973, Public Law 93 205 (87 Stat. 884), as amended.
PT	Pennsylvania Threatened	Species that may become endangered within the foreseeable future throughout their range in Pennsylvania unless the casual factors affecting the organism are abated. These are: 1) species whose populations within the Commonwealth are decreasing or have been heavily depleted by adverse factors and while not actually endangered, are still in critical condition; 2) species whose populations may be relatively abundant in the Commonwealth but are under severe threat from serious adverse factors that have been identified and documented; or 3) species whose populations are rare or peripheral and in possible danger of severe decline throughout their range in Pennsylvania; or 4) species determined to be "Threatened" pursuant to the Endangered Species Act of 1973, Public Law 93205 (87 Stat. 884), as amended, that are not listed as "Pennsylvania Endangered".
PR	Pennsylvania Rare	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.
	Disjunct	Significantly separated from their main area of distribution
	Endemic	Confined to a specialized habitat.
	Limit of Range	At or near the periphery of their natural distribution
CP	Candidate Proposed	Species comprising taxa for which the Pennsylvania Biological Survey (PBS) currently has substantial information on hand to support the biological appropriateness of proposing to list as Endangered or Threatened.
CA	Candidate at Risk	Species that although relatively abundant now are particularly vulnerable to certain types of exploitation or environmental modification.
CR	Candidate Rare	Species which exist only in one of a few restricted geographic areas or habitats within Pennsylvania, or they occur in low numbers over a relatively broad area of the Commonwealth.
CU	Condition Undetermined	Species for which there is insufficient data available to provide an adequate basis for their assignment to other classes or categories.

**Pennsylvania Biological Survey Suggested Status Definitions (continued)**

<b>Status</b>	<b>Description</b>	<b>Definition</b>
PX	Pennsylvania Extirpated	Species that have disappeared from Pennsylvania since 1600 but still exist elsewhere.
DL	Delisted	Species which were once listed but are now cited for delisting.
N		No current legal status, but is under study for future listing.

**Federal Status Codes and Definitions**

LE	Listed Endangered	A species which is in danger of extinction throughout all or a significant portion of its range.
LT	Listed Threatened	Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
LELT	Listed Endangered in part of range; listed Threatened in the remaining part.	
PE	Proposed Endangered	Taxa proposed to be listed as endangered.
PT	Proposed Threatened	Taxa proposed to be listed as threatened
PEPT		Proposed Endangered in part of range; proposed Threatened in the remaining part.
C	Candidate for listing.	
E(S/A)		Treat as Endangered because of similarity of appearance.
T(S/A)		Treat as Threatened because of similarity of appearance.
XE	Essential Experimental population	
XN	Nonessential Experimental population	
"xy" (mixed status)		Status varies for different populations or parts of range.
"x" NL		Status varies for different populations or parts of range with at least one part not listed.

APPENDIX H. Fish Species

Fish Species

Stream	Banded darter	Blacknose dace	Blackside darter	Bluegill	Bluntnose minnow	Brook trout	Brown bullhead	Brown trout	Central stoneroller	Common Carp	Common shiner	Creek Chub	Fantail darter	Gilt darter	Golden redhorse	Golden shiner	Greenside darter	Green sunfish	Johnny darter	Lamprey unid	Largemouth bass	Mimic shiner	Mottled sculpin	Northern hog sucker	Northern pike	Palomino trout	Pearl dace	Pumpkinseed	Rainbow darter	Rainbow trout	Redside dace	Redside darter	River chub	Rock bass	Roseface shiner	Silver shiner	Silverjaw minnow	Smallmouth bass	Stripped shiner	White sucker	Yellow bullhead						
<i>North Fork Redbank Creek</i>																																															
North Fork Section 1		X	X			X	X					X							X	X			X				X	X														X					
North Fork, South Branch						X						X																																			
North Fork (section 2)*		X	X	X		X	X	X			X	X	X						X				X	X				X																X			
Clear Run		X				X						X											X																								
North Fork Section 2		X	X			X						X							X				X																					X			
North Fork (section 3)*		X						X	X		X	X	X	X									X	X																					X		
Shippen Run						X																																									
Craft Run		X				X						X																																			
North Fork (section 4)*		X							X		X	X	X										X	X																							
Pekin Run						X		X																																							
North Fork (section 6)*		X				X		X				X	X										X	X				X																	X		
<i>Sandy Lick Creek</i>																																															
Sandy Lick 1		X				X	X					X							X				X					X																		X	
Laborde Branch 1		X				X		X				X											X								X	X														X	
Laborde Branch 2		X				X		X	X			X											X							X	X																X
Sandy Lick 2-3		X	X		X														X				X	X	X			X																		X	
Sandy Lick 2-2		X	X		X				X	X		X				X			X		X		X	X	X																				X	X	
Sandy Lick 2-1		X	X	X	X				X	X		X	X						X		X		X	X																						X	X
Soldier Run 2		X										X																																			
Wolf Run		X										X	X										X	X				X																			
Panther Run		X				X						X	X										X																						X		
Trout Run 1		X	X			X		X	X		X	X	X										X	X				X		X					X										X	X	
Trout Run 2		X	X	X	X						X	X	X						X				X																						X		

Stream	Banded darter	Blacknose dace	Blackside darter	Bluegill	Bluntnose minnow	Brook trout	Brown bullhead	Brown trout	Central stoneroller	Common Carp	Common shinner	Creek Chub	Fantail darter	Gilt darter	Golden redbhorse	Golden shiner	Greenside darter	Green sunfish	Johnny darter	Lamprey unid	Largemouth bass	Mimic shiner	Mottled sculpin	Northern hog sucker	Northern pike	Palomino trout	Pearl dace	Pumpkinseed	Rainbow darter	Rainbow trout	Redside dace	Redside darter	River chub	Rock bass	Roseyface shiner	Silver shiner	Silverjaw minnow	Smallmouth bass	Stripped shiner	White sucker	Yellow bullhead					
<i>Sandy Lick Creek</i>																																														
Sandy Lick 3-1			X								X	X						X				X											X	X	X			X		X	X					
Sandy Lick 3-2			X	X	X				X		X						X	X										X					X	X							X					
O'Donnell Run		X				X		X			X	X										X	X	X						X												X				
Sandy Lick 4-3		X		X	X		X	X														X	X	X									X	X	X											
Sandy Lick 4-2						X		X				X										X	X	X									X	X	X							X				
Sandy Lick 4-1		X		X	X			X		X		X										X		X									X		X		X					X				
Mill Creek		X	X				X	X		X	X	X											X	X				X									X									
Horm Run		X				X	X	X			X												X										X										X			
Little Mill Creek		X				X	X																X	X																			X			
Five Mile Run		X	X	X			X			X	X												X	X					X		X	X											X			
Sandy Lick 5-1		X	X		X				X	X	X	X										X	X	X																			X			
Unnamed Trib Sandy Lick	X					X						X	X															X															X			
<i>Redbank Creek Mainstem</i>																																														
Red Bank Creek mainstem to Little Sandy			X		X				X		X	X	X				X						X	X						X				X										X		
Red Bank Section 1			X		X				X		X	X	X				X						X	X					X				X												X	
Little Sandy Creek		X				X		X				X	X						X				X	X					X																X	
Red Bank Section 2				X	X		X	X		X	X	X			X	X					X			X				X						X	X								X	X	X	
Leatherwood Creek		X										X							X				X				X					X												X		
Red Bank Section 3	X			X											X																												X	X		

\* Sampling sites have changed since original study was completed

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APPENDIX I. PUBLIC COMMENTS

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Pending forthcoming input from January 2007 public meetings.

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**APPENDIX J. SURVEYS AND INTERVIEWS**

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**Redbank Creek Watershed Conservation Plan**

Thank you for taking the time to complete this very important survey. The survey is being conducted by the Redbank Creek Watershed Conservation Plan Steering Committee and Western Pennsylvania Conservancy.

The purpose of this study is to help us understand what residents of the communities within the watershed think of current conditions and their future visions. Your ideas provide a basis for making recommendations and priorities for the watershed in the plan. Should you have any questions about the survey, or if you would like to find out more information or become involved in the planning process, please do not hesitate to contact Carla Ruddock of the Western Pennsylvania Conservancy at 724-459-0953.

Thanks again for your time to complete this survey. We truly value your input.

**Public Survey**

**1.) In what county and municipality do you reside?**

County \_\_\_\_\_ Municipality \_\_\_\_\_

**2.) In what watershed do you reside?**

- Mainstem Redbank Creek
- Sandy Lick Creek
- Other \_\_\_\_\_
- North Fork Creek
- Don't Know

**3.) What do you think are the two most common land uses in your area?**

- Residential
- Commercial
- Industrial
- Other \_\_\_\_\_
- Forested
- Agricultural
- Recreation

**4.) Number the following list in order of importance in regards to your future visions of the watershed. One being the most important.**

- |                                   |                                 |
|-----------------------------------|---------------------------------|
| _____ Attractive Natural Settings | _____ Preserving Historic Sites |
| _____ Recreation Opportunities    | _____ Water Quality Improvement |
| _____ New Business/Jobs           | _____ Community Activities      |
| _____ Residential Development     | _____ Educational Opportunities |
| _____ Other _____                 |                                 |

**5.) Number the following list of outdoor recreational opportunities in order of your interest. One being the most important.**

- |                              |                        |                   |
|------------------------------|------------------------|-------------------|
| _____ Boating                | _____ Hiking           | _____ Fishing     |
| _____ Canoeing/Kayaking      | _____ Horseback Riding | _____ Swimming    |
| _____ Hunting                | _____ Bird Watching    | _____ Picnicking  |
| _____ Visiting Scenic Vistas | _____ Organized Sports | _____ Photography |
| _____ Visiting Public Parks  | _____ ATV Riding       | _____ Biking      |
| _____ Other _____            |                        |                   |

**6.) List three things you like about the area in which you live.**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

**7.) List three things you don't like about the area in which you live.**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

**8.) List three suggestions to improve conditions in the watersheds.**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

**9.) Other comments or concerns.**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**If you would like to be informed of public meetings regarding this project and project updates, please complete the information below.**

Name _____	E-mail _____
Address _____	Home Phone _____
_____	Work Phone _____

Completed Surveys can be sent to  
Redbank Creek Watershed Conservation Plan, 246 South Walnut Street, Blairsville, PA 15717

## Redbank Creek Watershed Conservation Plan

Thank you for taking the time to complete this very important survey. The survey is being conducted by the Redbank Creek Watershed Conservation Plan Steering Committee and Western Pennsylvania Conservancy.

The purpose of this study is to help us understand what residents of the communities within the Redbank Creek watershed think of current conditions and how they would like to see the watershed resources and characteristics progress in the future. This will give the steering committee a basis for making recommendations for the watershed in the plan. Should you have any questions about the survey, or if you would like to find out more information or become involved in the planning process, please do not hesitate to contact Carla Ruddock of Western Pennsylvania Conservancy at 724-459-0953 ext. 107.

Thank you again for taking the time to complete this survey. We truly value your input.

### Municipal Survey

**1.) In what county and municipality do you reside?**

County \_\_\_\_\_ Municipality \_\_\_\_\_

**2.) In what watershed(s) is your municipality located?**

- North Fork
- Redbank Creek (mainstem)
- Other \_\_\_\_\_
- Sandy Lick
- Don't Know

**3.) What do you think are the two most common land uses in your area?**

- Residential
- Commercial/Industrial
- Water/Wetlands
- Other \_\_\_\_\_
- Forested
- Agricultural
- Recreational

**4.) Number the following list in order of importance with regards to your county/municipality's future visions of the watershed. One being the most important.**

- |                                   |                                 |
|-----------------------------------|---------------------------------|
| _____ Attractive Natural Settings | _____ Preserving Historic Sites |
| _____ Recreation Opportunities    | _____ Water Quality Improvement |
| _____ New Business/Jobs           | _____ Community Activities      |
| _____ Residential Development     | _____ Educational Opportunities |
| _____ Other _____                 |                                 |

**5.) Number the following list of outdoor recreational opportunities in order of interest in your county/municipality. One being the most important.**

- |                              |                        |                   |
|------------------------------|------------------------|-------------------|
| _____ Boating                | _____ Hiking           | _____ Fishing     |
| _____ Canoeing/Kayaking      | _____ Horseback Riding | _____ Swimming    |
| _____ Hunting                | _____ Bird Watching    | _____ Picnicking  |
| _____ Visiting Scenic Vistas | _____ Organized Sports | _____ Photography |
| _____ Visiting Public Parks  | _____ ATV Riding       | _____ Biking      |
| _____ Other _____            |                        |                   |

**6.) Does your municipality have a comprehensive plan? YES or NO  
If yes, what is the name of the plan(s) and when was it adopted?**

\_\_\_\_\_

**7.) Does your municipality currently utilize zoning and subdivision ordinances? YES or NO  
If yes, what types of ordinances do you have?**

\_\_\_\_\_

**8.) What are the three most critical needs or challenges in your county or municipality that affect the Redbank Creek watershed?**

- 4. \_\_\_\_\_
- 5. \_\_\_\_\_
- 6. \_\_\_\_\_

**9.) a. Does your municipality have any public water services in the Redbank Creek watershed area? YES or NO  
If yes, please list the name and capacity of each facility.**

\_\_\_\_\_

**b. Do you foresee the need to upgrade or establish a public water supply in your municipality in the Redbank Creek watershed area within the next ten years? YES or NO**

**10.) Does your municipality have any public sewage systems in the Redbank Creek watershed area? YES or NO  
If yes, please list the name and capacity of each facility.**

\_\_\_\_\_

**11.) What projects would you like to see implemented in the area that you represent that could be included in the Redbank Creek Watershed Conservation Plan? Please list short-term and long-term projects and goals.**

**a.) Land Use/Land Resources (farmland preservation, development, planning, etc.)**

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**b.) Water Resources (quality, quantity, etc.)**

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**c.) Biological Resources (plant, animal, terrestrial, aquatic, areas of concern, etc.)**

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**d.) Cultural Resources (historical, recreational, environmental education, etc.)**

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**e.) Other (roads/other transportation, economy/jobs, population & demographic trends)**

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Completed surveys can be sent to: Redbank Creek Watershed Conservation Plan, 246 South Walnut Street, Blairsville, PA 15717, Attention: Carla Ruddock

Redbank Creek Watershed Conservation Plan  
Key Individual Interviews

Name: \_\_\_\_\_  
Date: \_\_\_\_\_

- 1. How has the watershed changed in the past 10 years? (Were these changes good, bad, indifferent?)

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- 2. How do the following currently meet the needs of the watershed community? (Are there too many, not enough, or correct amount? What condition are they in? Recommended solutions?)

- a. Transportation

- ---

---

- b. Infrastructure

- ---

---

- c. Employment Opportunities

- ---

---

- d. Educational Opportunities

- ---

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- e. Land Use Controls/Zoning Ordinances

- ---

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- 3. Do the recreational opportunities currently meet the needs of the watershed community? (Are there too many, not enough, or correct amount? What condition are they in? Are they easy to access? Recommended solutions?)

a. Parks/Picnic Sites

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b. Hiking/Biking Trails

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c. Off Road Vehicle Riding

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d. Scenic Vistas/Photography

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e. Wildlife/Bird Watching

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f. Hunting/Fishing

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g. Boating/Swimming

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h. Historical Sites/Structures

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i. Other

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4. What are some of the impacts currently affecting the land, water, and biological resources?

a. Land Resources (Examples: agricultural lands, logging, development)

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b. Water Resources (Examples: sedimentation, acid rain, runoff)

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c. Biological Resources (Examples: invasive species, habitat destruction)

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d. Other (Examples: air quality, historical preservation, recreation, economy)

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5. Do you have any specific projects or type of projects that you would like to see identified in the plan?

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6. What must the watershed conservation plan say to be successful?

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7. What must the watershed conservation plan not say to be successful?

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8. Do you know of any other people we should interview?

Name \_\_\_\_\_ Phone \_\_\_\_\_  
Address \_\_\_\_\_

9. Do you have any other questions or comments before we conclude this interview?

**APPENDIX K. FUNDING SOURCES**

<b>Sponsoring Organization</b>	<b>Description / Restrictions</b>
<b>BMP</b>	
State Conservation Commission-Dirt and Gravel Roads Maintenance	Available to local municipalities and state agencies for projects dealing with the BMPs for erosion and sedimentation control problems and fugitive dust in watersheds; dirt and gravel road jurisdiction required.
<b>Community</b>	
Pittsburgh Foundation	Economic, community development and the environment. Activities that increase employment, build strong neighborhoods, and promote civic engagement by all segments of the population. Funds for quality of life.
<b>Energy</b>	
DEP - Alternative Fuels	The Alternative Fuels Incentive Grants program continues to fund a considerable number of projects that use alternative fueled energy sources to reduce air pollution and our dependence on foreign oil. Alternative fuels include compressed natural gas.
<b>Environmental</b>	
Beldon II Fund	Support environmental organizations working at the state-level. Some grants are made to regional and national organizations for efforts that support the work of state level groups.
Ben & Jerry's Foundation	Grant applications need to demonstrate that the project will lead to environmental change, address the root causes of environmental problems, and must help ameliorate an unjust or destructive situation by empowering constituents and facilitating leadership.
Eddie Bauer	Fund projects in certain local areas that support environmental goals such as clean rivers and streams or beautifying parks and school grounds. Must be 501(c) 3 and proposal should be kept between 2-3 pages.
Howard Heinz Endowment	This program promotes environmental quality and sustainable development by supporting efforts to eliminate waste, harness the power of the market, and create a restorative economy. Should Promote sustainable urban design. Concentrated in Western Pennsylvania.

Sponsoring Organization	Description / Restrictions
<b>Environmental (continued)</b>	
Raymond Proffitt Foundation	The foundation's purpose is to protect and restore the quality of the natural and human environment by informing and educating the general public about the impact of human endeavors upon the natural environment. The RPF strives to advance this understanding.
Surdna Foundation	The foundation's goal is to prevent damage to the environment and to promote more efficient, economically sound, environmentally beneficial, and equitable use of land and natural resources. Does not fund environmental education, sustainable agriculture, food production or toxic and hazardous waste.
Vira I Heinz Endowment	This program promotes environmental quality and sustainable development by supporting efforts to eliminate waste, harness the power of the market, and create a restorative economy. The program's goal is to promote sustainable urban design. Western Pennsylvania watersheds only.

**Environmental / Watershed**

EPA-Clean Water State Revolving Fund	May also contact: Beverly Reinhold (717) 783-6589. Infrastructure Investment Authority, Keystone Building 22 South Third Street, Harrisburg, PA 17101. email: breinhold@state.pa.us or Peter Slack, (717) 772-4054; DEP 400 Market Street, Harrisburg, PA 17105
WREN - Conference/Training Scholarships	The activities funded must be educational and relate to drinking water source protection or watershed education. Applicant is required to provide a five percent match.
River Network Watershed Assistance Grants	Watershed projects and group start-ups.
Western Pennsylvania Watershed Program, Howard Heinz Endowments	Provides funding to grassroots organizations and watershed associations for specific watershed remediation in western Pennsylvania. Select western Pennsylvania watersheds only.

**Environmental Education**

Captain Planet	Supports hands-on environmental projects for children and youth to encourage innovative programs that empower children and youth around the world to work individually and collectively to solve environmental problems. Only for environmental education of children. Online only.
DEP Environmental Education Grants	Open to schools, conservation districts, and non-profits. Open in summer, awarded in spring. Final application due dates vary. Application available online. Requires twenty percent match and reimbursement program.

Sponsoring Organization	Description / Restrictions
<b>Environmental Education (continued)</b>	
Education Mini Projects Program	Small grants for Pennsylvania-based grassroots educational projects that address non-point source watershed concepts.
Emerson Charitable Trust	Strong emphasis on cultural aspects and youth education, also science and education.
EPA Environmental Education Grants Region III	Grants awarded to small non-profit groups for various projects in Region III.
National Environmental Education and Training Foundation	To increase environmental awareness, environmental education, partnerships, etc. May also be reached at (202) 261-6464. Proposal deadlines: Jan. 1, March 1, July 15, and Sept. 1
PACD - Mini Projects	The objectives of the Educational Mini-Project must promote the We All Live Downstream message by: stimulating an awareness of and interest in Pennsylvania's non-point source water pollution problems and solutions; salaries are not an approved expenditure.
Project Wild	Project Wild is an interdisciplinary supplementary environmental and conservation program for educators of children in grades K-12. Small grants only.
The Dunn Foundation	Promote the issues of the negative effect that sprawl, visual pollution, and poorly planned development have on the visual environment of communities and the resulting loss of quality of life. Encourage dialogue within and between communities. Do not fund property acquisition, capital improvement projects, capital campaigns, endowments, individuals, religious groups, or political organizations.
The Pathways to Nature Conservation Fund National Fish and Wildlife Foundation	A partnership between the more than 270 Wild Birds Unlimited, Inc. franchises and the National Fish and Wildlife Foundation. The Pathways to Nature Conservation Fund offers grants to enhance environmental education activities and bird and wildlife viewing opportunities at significant sites.
Water Resources Education Network - LWV	Funding to develop education programs for water issues facing communities. Local contact is shrenehess@yourinter.net, Indiana PA, 724-465-2595. Must be 501(c)3
WREN - Opportunity Grants	The activities funded must be educational and relate to drinking water source protection or watershed education.

Sponsoring Organization	Description / Restrictions
<b>Environmental Justice</b>	
EPA-Environmental Justice Small Grant Program	The program provides financial assistance to eligible affected local community-based organizations working on or planning to work on projects to address local environmental and/or public health concerns.
Nathan Cummings Foundation	The foundation's purpose is to facilitate environmental justice and environmentally sustainable communities by supporting the accountability of corporations, governments, and other institutions for their environmental practices. Does not fund individuals, scholarships, or capital or endowment campaigns.
Norman Foundation	Support efforts that strengthen the ability of communities to determine their own economic, environmental, and social well-being, and that help people control those forces that affect their lives. Only fund in U.S. They do not fund individuals, universities, conferences, scholarships, research, films, media, arts projects, capital campaigns, fundraising drives, or direct social service programs .
<b>Environmental Planning</b>	
Coldwater Heritage Partnership	Grants for prioritizing watersheds in need of protection, for assessment of coldwater ecosystems, and for the development of watershed conservation plans.
DEP Nonpoint Source Control	Grants for planning and non-point source pollution control projects.
DCNR - Community Conservation Partnership Program	Available to organizations that conserve and enhance river resources. Planning grants are available to identify significant natural and cultural resources, threats, concerns, and special opportunities, and the development of river conservation plans. Grants requires 50 percent match.
NRCS Watershed Surveys and Planning	Providing assistance for planning in water and coordinated water and related land resource programs in watersheds and river basins. Types of surveys and plans funded include watershed plans, river basin surveys and studies, flood hazard analyses, and floodplain studies.
<b>Flood Protection</b>	
DEP Flood Protection Grant Program	Open to communities that need to perform non-routine maintenance or improvements to already existing flood protection projects. Also applies to the purchase of specialized equipment. Open to communities that have flood protection projects that are deemed operable.

Sponsoring Organization	Description / Restrictions
<b>General</b>	
Archer-Daniels-Midland Foundation	Proposals can be sent in letter form containing: 1) Description of the organization applying. 2) Description of the project/What funding would be used for. 3) A budget including how much is going to administrative costs. Emphasis is given to corporate operating locations.
Audrey Hillman Fisher Foundation, Inc.	Must refer to Application Procedures for more information. Preference given to southwestern Pennsylvania and central New Hampshire.
Eureka Company	No specific interest, but, general focus is on social services, health, and the environment (wildlife, fisheries, habitat, and sustainable community development)
Henry Hillman Foundation	Preference is given to organizations in the Pittsburgh/southwestern Pennsylvania area.
Patagonia, Inc. Environmental Grants Program	Supports small grassroots organizations. Does not fund land acquisition.
The Boeing Company	Provides contributions for capital campaigns, seed money (one-time grants) for new programs or projects that address community needs and priorities, and one-time grants to buy equipment, improve facilities, or enable special projects.
The Education Foundation for America	EFA's priorities include supporting the monitoring of the utility restructuring process as it impacts the environment, combating the growth of the "wise-use" movement, opposing large-scale live-stock confinement, and cutting federal "pollution." Letter limited to two pages.
The Prospect Hill Foundation	The foundation's environmental grant making concentrates on habitat and water protection in the northeastern region of the United States. Must have 501(c)3. The organization does not fund individuals, basic research, sectarian religious activities, or organizations that lack tax exemption under U.S. Law.
<b>GIS</b>	
DEP-GIS Software Grant	The grants consist of the latest commercial release of ArcView GIS software; several texts about utilizing GIS for environmental applications and land-use planning; CD-ROM containing spatial data about the commonwealth. Only issue 10 per quarter.

Sponsoring Organization	Description / Restrictions
<b>Habitat</b>	
General Challenge Grant Program -National Fish and Wildlife Foundation	Requires non-federal match of 2:1. Address actions promoting fish and wildlife conservation and habitat; should involve conservation and community interest; leverage available funding and evaluate project outcomes.
Keep the Wild Alive (KWA) Species Recovery Fund	Fund on-the-ground projects that directly improve conditions for the endangered species highlighted in the KWA campaign. Current National Wildlife Federation employees are ineligible and applications must be submitted in English.
Small Grants Program - National Fish and Wildlife Foundation	Address priority actions promoting fish and wildlife conservation and the habitats on which they depend; work proactively to involve other conservation and community interest; leverage available funding, and evaluate project outcomes. A 2:1 match of non-federal funds is required.
<b>Internship</b>	
Office of Surface Mining Intern Program	Candidates must organize their work, work well with community groups and on their own, quickly internalize the requirements of acid mine drainage remediation and the national Clean Streams program, write well and enjoy public presentations. Academic credit. Can be undergraduate or graduate student. Positions available in AL, IL, IN, IA, KY, MD, MS, OH, OK, PA, TN, VA, WV. Must provide housing for interns.
<b>Land Protection</b>	
DCNR - Land Trust Grants	Provide funding for acquisition and planning of open space and natural areas which face imminent loss. Lands must be open to public use and priority is given to habitat for threatened species. Eligible applicants are non-profit land trusts and 501(c)3. Requires 50 percent match.
Lowe's Charitable Foundation	Environmental initiatives that support the continued enhancement of the natural landscape, natural environment enhancers, and/or park improvement projects. Must apply online. Must be a 501(c)3.
Michael D. Ferguson Charitable Foundation	General environment, wildlife, fisheries, habitat, sustainable community, and development.
Nationals Parks Service - Land & Water Conservation Fund	Provide federal grants for land acquisition and conservation to federal and state agencies.

<b>Sponsoring Organization</b>	<b>Description / Restrictions</b>
<b>Land Protection (continued)</b>	
The Wilderness Society	To preserve wilderness and wildlife, protect America's prime forest, parks, rivers, and shore lands, and foster an American land ethic. Alternate address Montana Regional Office, 105 West Main St., Suite E, Bozeman, MT 59715-4689
Town Creek Foundation	Environmental issues of interest to the foundation include: 1) Preserving the ecological richness of our natural heritage, with a major focus on our federal public lands. 2) Promoting policies and practices to protect the land, estuaries, and coastal bays.
<b>Loan</b>	
Environmental Loan Fund	The loan can be used for membership development, creating and implementing a workplace giving program, cause-related marketing, donor development, special events, direct mail campaigns, mission related business enterprises, or capital campaign work.
Pennsylvania Infrastructure Investment Authority Drinking Water Loans	Must show water quality impact, must have qualified loan candidate. Loans to stormwater projects and non-point source projects. Interest is 1-2.8 percent over 20 years.
<b>Multiple</b>	
Acorn Foundation	Interested in small and innovative community-based projects which preserve and restore habitats supporting biological diversity and wildlife, and advocate for environmental justice. Does not fund the following: direct services, capital expenditure, construction or renovation programs, programs undertaken by tax-supported institutions or government initiatives, emergency funding, scholarship funds, or other individual aid.
Allegheny Foundation	The Allegheny Foundation concentrates its giving in the western Pennsylvania area and confines its grant awards to programs for historic preservation, civic development, and education. No event sponsoring. Does not fund individuals.
Anne & George Clapp Charitable & Educational Trust	Fields of interest include education, social services, youth and child welfare, and aging. Limited support for cultural programs, historic preservation, and conservation. Southwestern Pennsylvania only; grants are not made to individuals. No grants are made for medical research, research projects, filmmaking, conferences, or field trips.
Charlotte and Donald Teast Foundation	Sustainable communities, arts, humanities, civic and public affairs, education, the environment, health, and social services.

Sponsoring Organization	Description / Restrictions
<b>Multiple (continued)</b>	
DCNR Community Conservation Partnership Program	Conserve and enhance river resources by offering planning grants, technical assistance, implementation grants, development grants, and acquisition grants.
Ford Foundation	Interested in general/operating support, continuing support, endowment funds, program development, conferences/seminars, professorships, publication, seed money, fellowships, internships, research, technical assistance, consulting services, and program-related investments.
Max and Victoria Dreyfus Foundation	Consider support for museums, schools, educational and skill training projects, programs for youth, seniors, and the handicapped. Must be located in the U.S. Does not issue grants to individuals.
National Fish and Wildlife Fund -Five Star Restoration Challenge	Projects must involve diverse partnerships of, ideally, five organizations that contribute funding, land, technical assistance, workforce support, and/or other in-kind services. Projects involving only research, monitoring, or planning are not eligible. No mitigation work.
National Parks Foundation	Education, training, preservation, and conservation. The grants that are available change often. See the website for current funding opportunities. Projects must connect with National Parks, be located on or next to National Park or River, and work in cooperation with the National Park. Alternate Phone: 202-785-3539.
Native Plant Conservation Initiative - National Fish and Wildlife Foundation	Through this initiative, grants of federal dollars will be provided to non-profit organizations and agencies at all levels of government to promote the conservation of native plants. There is a strong preference for "on-the-ground" projects that involve local communities and citizen volunteers in the restoration of native plant communities. Projects that include a pollinator conservation component are also encouraged.
Public Welfare Foundation	The Public Welfare Foundation supports organizations that address human needs in disadvantaged communities, with strong emphasis on organizations that include service, advocacy and empowerment in their approach: service that remedies specific problems; advocacy that addresses those problems in a systemic way through changes in public policy; and strategies to empower people in need to play leading roles in achieving those policy changes and in remedying specific problems.

Sponsoring Organization	Description / Restrictions
<b>Multiple (continued)</b>	
Robertshaw Charitable Foundation	Money to assist those organizations who work to enhance the educational, health and welfare, cultural, youth development, social welfare, and community development needs of the area. Only one grant per year will be awarded to any organization. Preference to southwestern Pennsylvania organizations.
Scaife Family Foundation	Grants awarded will support programs that strengthen families, address the health and welfare of women and children, or promote animal welfare. No event sponsorships, endowments, capital campaigns, renovations, or government agencies. No grants to individuals.
The French Foundation	Environment, and natural resources
The Lawrence Foundation	The mission of The Lawrence Foundation is to make a difference in the world by providing contributions and grants to organizations that are working to solve pressing educational, environmental, health, and other issues.
The Max and Anna Levinson Foundation	Interested in the environment, including preservation of ecosystems and biological diversity, but also environmental justice, alternative energy, alternative agriculture, and toxics. Must have 501(c)3 status. Rarely fund organizations with budgets in excess of \$500,000.
Turner Foundation	Supports activities to preserve the environment, conserve natural resources, protect wildlife, and develop and implement sound population policies. Interested in protecting rivers, lakes, wetlands, aquifers, oceans. Does not provide funding for buildings, land acquisition, endowments, start-up funds, films, books, magazines, or other specific media projects. Alternate Phone: 404-681-0172.
<b>Natural Resources</b>	
Beneficia Foundation	Only applications for projects focusing on conservation of the environment or the arts will be considered. Beneficia has no geographic preferences, but favors requests for project support over general support and does not look favorably upon requests for general overhead or construction of facilities.
Canaan Valley Institute	Promotes the development and growth of local associations committed to improving or maintaining the natural resources of their watersheds in the Mid-Atlantic portions of Pennsylvania.

Charles A. and Anne Morrow Lindburgh Foundation	Grants awarded for the conservation of natural resources and water resource management. Grants are awarded to individuals for research and educational programs, not to organizations for institutional programs.
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Sponsoring Organization	Description / Restrictions
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**Natural Resources (continued)**

Dana Corporation	Will consider funding air quality, environment, general, and water resources projects. Emphasis is given to areas where the corporation operates.
DCNR- Community Conservation Partnership Program	Awarded for local recreation, park, and conservation projects, including rehabilitation and development of parks and recreation facilities, acquisition of land for park and conservation purposes, and technical assistance for feasibility studies, and trail studies. Requires 50 percent match, except for some technical assistance and projects eligible as small community projects.
Home Depot	Assistance is provided to non-profit organizations that direct effort toward protecting our natural systems. The grant program focuses on forestry and ecology, clean up, and recycling, green building design, and lead poisoning prevention.
W. Alton Jones Foundation, Inc.	The goals of the foundation are to build a sustainable world by developing new ways for humanity to interact responsibly with the planet's ecological systems, and build a secure world by eliminating the possibility of nuclear war by providing alternative methods of resolving conflicts and promoting security.
Leo Model Foundation	Grants for habitat conservation, watershed conservation, and species preservation in the U.S.
National Fish and Wildlife Fund Challenge Grants for Conservation	The foundation, in partnership with the NRCS and NACD (National Association of Conservation Districts) provides challenge grants. Primary goal of the program is to support model projects which positively engage private landowners.
Rivers, Trails and Conservation Assistance Program	Grants to work with National Park Service to conserve land and river resources, and provides funding for various projects dealing with the conservation of these resources, including the development of trails and greenways.
The River Restoration - NOAA	Submittal by email whenever possible. Encourage contact to discuss project prior to submitting application. Formal non-federal matches not required, but encouraged. Dam removal and fish passage. Available in northeast, Mid-Atlantic, and California.
The Watershed Protection and Flood Prevention Act	Plan development for natural resource concerns within a watershed area; cost sharing available to carry out plan.

Sponsoring Organization	Description / Restrictions
<b>Natural Resources (continued)</b>	
The William C. Kenney Watershed Protection Foundation	Protecting the remaining wild rivers of the west and ensuring the effectiveness of small environmental organizations.
<b>Other</b>	
Charles Stewart Mott Foundation	The environmental program is devoted to reform of international lending and trade policies. Projects must be part of a national demonstration when out of the Flint, Michigan area.
North American Fund for Environmental Cooperation	Funds community based projects in Canada, Mexico and the U.S. to enhance regional co-operation, prevent environmental and trade disputes, and to promote the effective enforcement of environmental law.
PA DEP Brownfields Inventory	Grantees will be paid \$1,000 for each site registered into the PA Site finder. Municipalities and economic development agencies may apply for the grant by submitting an application.
Retired and Senior Volunteer Program (RSVP)	Provides a variety of opportunities for people aged 55+ to volunteer in the management of trails, rivers, and open space. Grants can be used for staff salaries, fringe benefits, travel, equipment, and transportation.
<b>Plantings</b>	
National 4-H Council	Grants are used to stimulate community tree planting and/or reforestation projects. Awarded to communities in support of on-going community planting/reforestation project or to stimulate new and creative youth-led projects. Organization must secure matching funds or in-kind contributions from other sources equal to the amount requested.
National Gardening Association	One hundred grants to be awarded to start-up programs involving children, and 300 will be awarded to established programs. Covers tools, seeds, plant materials, products, and educational resources. Grant restricted to programs involving children. There is a \$10.00 administrative fee.
Plant Material Centers	American Indian Liaison Resource Conservation and Community Assistance Division of USDA/NRCS. PMC select and grow plants that grow naturally and provide them to those people who wish to grow native plants.

Sponsoring Organization	Description / Restrictions
<b>Remediation/Restoration</b>	
Abandoned Mine Land Reclamation Program - Office of Surface Mining	Applications accepted anytime. Provides for the restoration of eligible lands and waters that have been mined, abandoned, or left inadequately restored. Two different grants are available. Protects land and corrects environmental damage caused by coal mining.
AMD Watershed Assessment - Bureau of Mining and Reclamation	Must be a municipality, municipal authority or incorporated non-profit. AMD projects only.
American Canoe Association CFS Grants	For grassroots organizations to improve waterways. Cleanups, riparian corridor, and water quality monitoring projects. Very flexible as long as it is improving waterways and fish habitat. Can not be used to pay staff. However, it can be used to pay a contractor. Must use volunteer help.
PA DEP - BAMR Abandoned Mine Reclamation Grants	Funds must be used for project development, design, construction, and directly related expenses. Site chosen must be located in a watershed or area with an approved rehabilitation plan. No administrative cost. Must be a municipality, municipal authority, or incorporated 501(c)3.
Bring Back the Natives - National Fish and Wildlife Foundation	Supports on-the-ground habitat restoration projects that benefit native aquatic species in their historic range.
Community Foundation	Projects related to abandoned mine drainage remediation, alkaline discharges, streambank preservation, removal of spoil piles, and other issues related to water quality are of interest to the foundation's board of advisors.
EPA - Nonpoint Source Implementation Grants	Funds are provided to the state to carry out non-point source projects and programs pursuant to Section 319 of the Clean Water Act as amended by the Water Quality Act of 1987. Grants are awarded to a single agency in each state, designated by the governor. 40 percent non-federally funded match required. Only one administered to each state.
NOAA Fish Habitat Restoration Program	Financial assistance for community-based habitat restoration projects, to restore fish habitats.
Office of Surface Mining Clean Stream Initiative	This grant is used to treat AMD. Design and administration is covered but the bulk of funding must go into construction. Must have funding partners. Applications available upon request. Review period takes 2.5-3 months, depending on eligibility. Must be a cooperative agreement.
PA DEP -Stream Improvement Project Reimbursements	Provides assistance in an instance where a stream is posing a treat to structures, such as homes or businesses. Must pose threat to structure. Must be applied for by a conservation group or municipality.

<b>Sponsoring Organization</b>	<b>Description / Restrictions</b>
<b>Remediation/Restoration (continued)</b>	
PA Fish and Boat Commission	Habitat improvement and technical assistance.
Partnership with the U.S. Army Corps of Engineers	To foster cooperation on projects of mutual interest, such as fish and wildlife habitat restoration, non-structural flood control opportunities, wetland restoration, and endangered species protection.
Pinellas County Environmental Foundation - National Fish and Wildlife Foundation	A partnership between Pinellas County and the National Fish and Wildlife Foundation. These two groups share the common goals of actively pursuing the protection, restoration and enhancement of fish and wildlife habitat, and developing creative and sustainable solutions to natural resource issues.

**Research**

Conservation & Research Foundation at Connecticut College	The conservation and enlightened use of the earth's resources to encourage research to deepen the understanding of the intricate relationship between people and the environment. Will support higher education, individuals, museums, non-profits, and research. Unsolicited proposals are not accepted; however, letters of inquiry including a budget may be sent.
USDA - Nutrient Science for Improved Watershed Management	Funds for integrated research in extension management of nutrients on a watershed level. Nutrients of interest are nitrogen and phosphorous. Please note that a research foundation maintained by a college or university is not eligible. These grants are for research.

**Stormwater Management**

DEP Stormwater Management Program	Watershed planning for stormwater control and implementation of programs at local levels.
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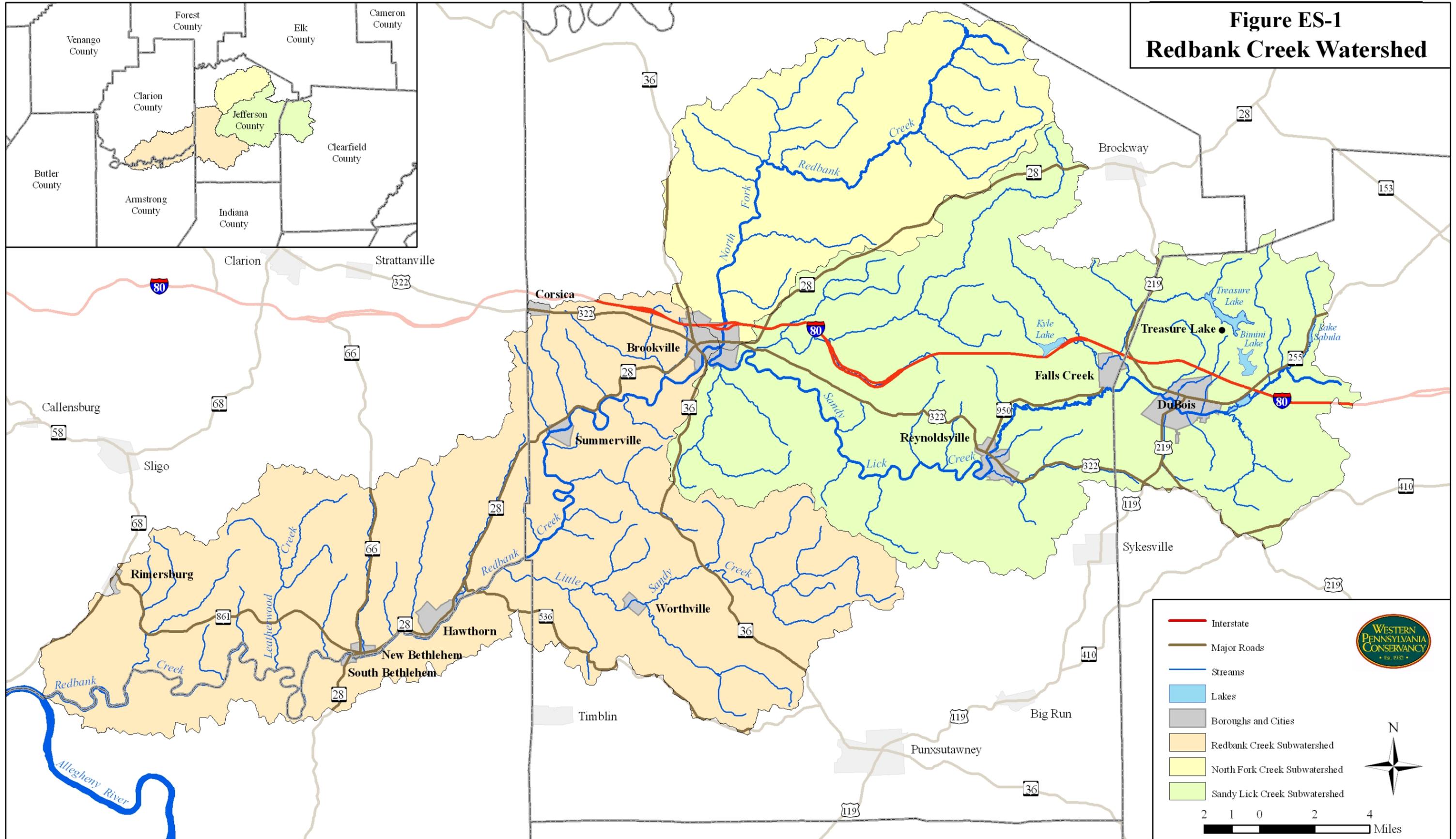
**Streambank Fencing**

Ducks Unlimited - PA Stewardship Program	Provides strong incentives to landowners to create wooded stream buffers, create wider than minimum buffers, and fence cattle out of the stream. Grant is available for fencing and tree planting.
Fish America Foundation	Grants awarded for streambank stabilization materials, instream habitat improvements, contracted heavy equipment, and stream morphology work. Match not required, but is highly recommended.

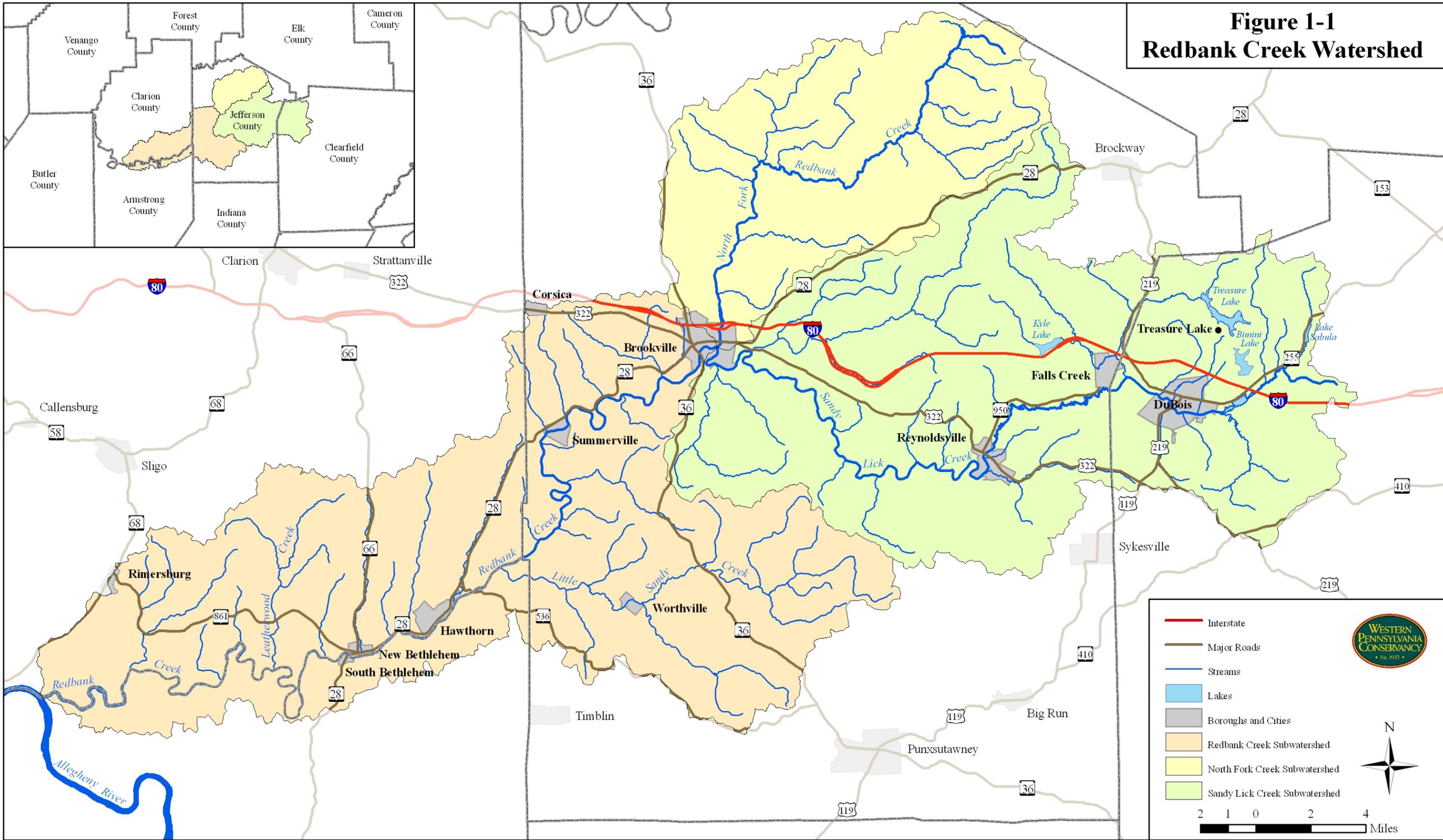
Sponsoring Organization	Description / Restrictions
<b>Streambank Fencing</b>	
Partners for Fish and Wildlife Program	The Partners for Fish and Wildlife Program provides technical and financial assistance to private landowners for habitat restoration on their lands. A variety of habitats can be restored to benefit Federal trust species (for example, migratory birds and fish and threatened and endangered species.) Normally the cost share is 50 percent (the Service and the landowner each pay half of the project costs), but the percentage is flexible. Services or labor can qualify for cost-sharing.
US Fish and Wildlife Service	Assists landowners in installation of high-tensile electric fence to exclude livestock from streams and wetlands. No buffer requirements.
USDA Conservation Reserve Program	Statewide costshare program for creating stream buffers. A 40 percent practice incentive as well as a \$10/acre incentive. Buffers of 35-180 feet per side of the stream. Land must have been pasture.
USDA - Environmental Quality Incentives Program	A statewide program based on environmental problems. It addresses all environmental problems on a farm. They fund BMPs.
USDA Project Grass	A co-operative effort of local farmers, conservation districts, with assistance from USDA, to improve agriculture productivity in southwestern Pennsylvania. For local contacts see information brochure on file. Contact: james.harrold@pasomerset.fsc.usda.gov
<b>Technical Assistance</b>	
Watershed Assistance Grants	Funding supports organizational development and capacity building for watershed partnerships with diverse membership. Match requested but not required. Non-profits, tribes, and local government only.
<b>Trails</b>	
DCNR - PA Recreational Trails Program	Will consider proposals for maintenance and restoration of existing recreational trails; development and rehabilitation of trailside and trailhead facilities and trail linkages; purchase and lease of recreational trail construction and maintenance equipment. Must have 20 percent match. Eligible applicants include federal and state agencies, local governments, and private organizations.

Sponsoring Organization	Description / Restrictions
<b>Trails (continued)</b>	
DCNR - Rails to Trails	Provide 50 percent funding for the planning, acquisition, or development of rail-trail corridors. Applicants include municipalities and non-profit organizations established to preserve and protect available abandoned railroad corridors for use as trails. Grants require 50 percent match.
<b>Volunteers</b>	
3M Foundation	3M sponsors a volunteer program called Community Action Retired Employee Service (CARES). Company favors projects that impact 3M communities. Alternate Phone: 612-737-3061
<b>Wetlands</b>	
U.S. Fish and Wildlife Service	For wetland Conservation projects. Must have 50 percent non-federal match in small-grant program with North American Wetlands Conservation Council.
Wetlands Reserve Program USDA Natural Resources Conservation Service	Restore and protect wetlands on private property; provide landowners with financial incentives to enhance wetlands in exchange for retiring marginal agricultural land.

**Figure ES-1  
Redbank Creek Watershed**

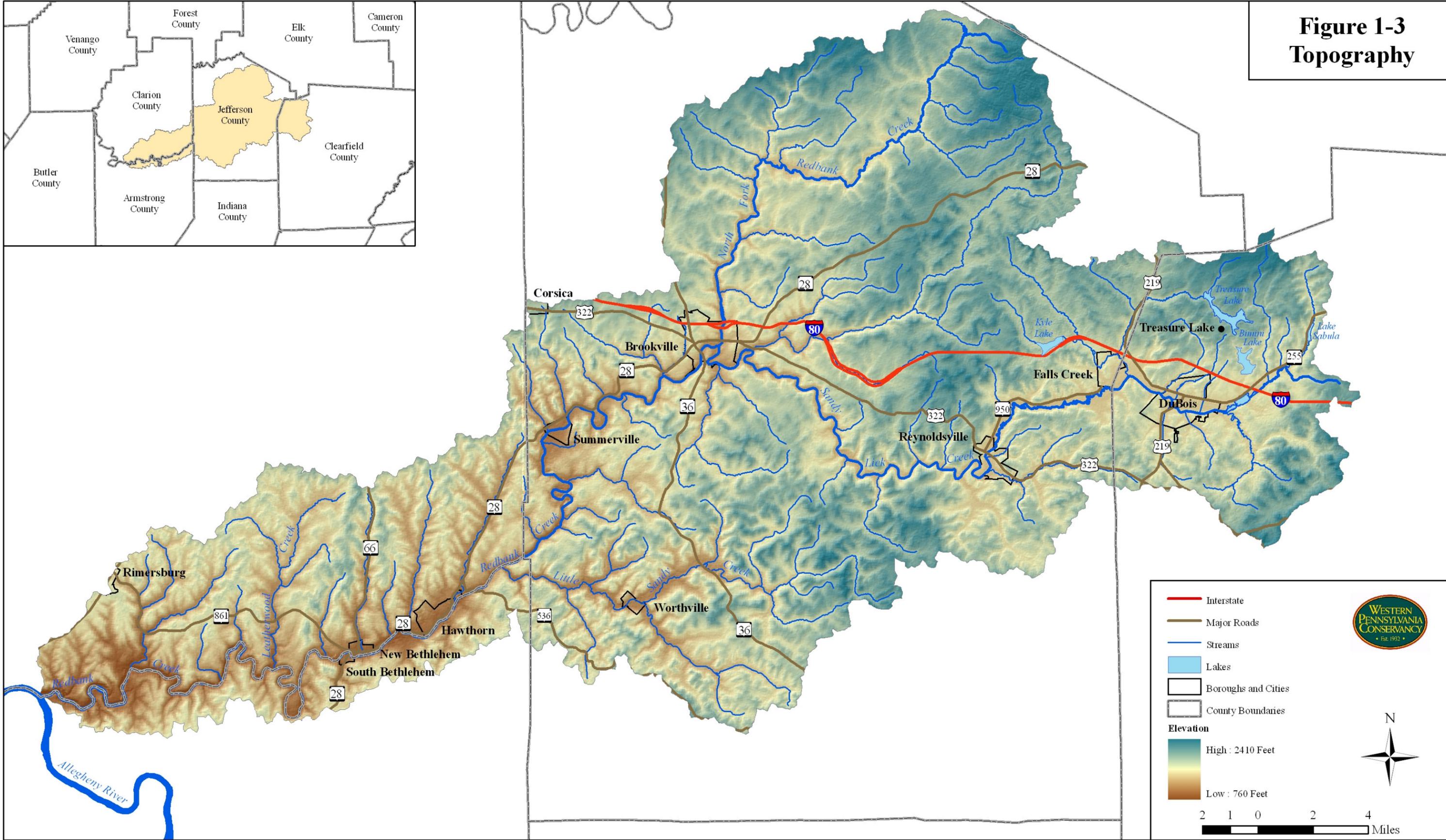


**Figure 1-1  
Redbank Creek Watershed**

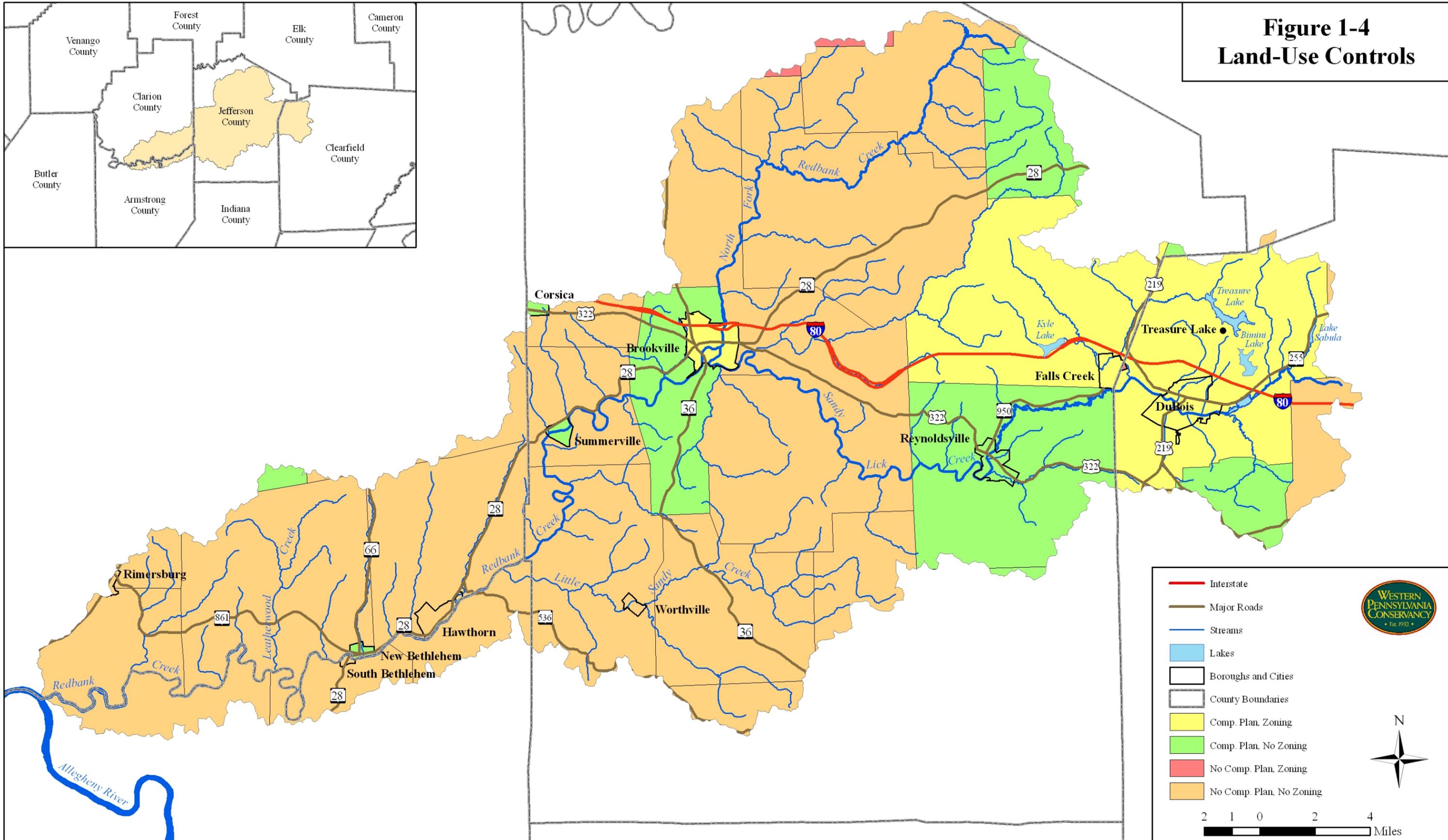




**Figure 1-3  
Topography**

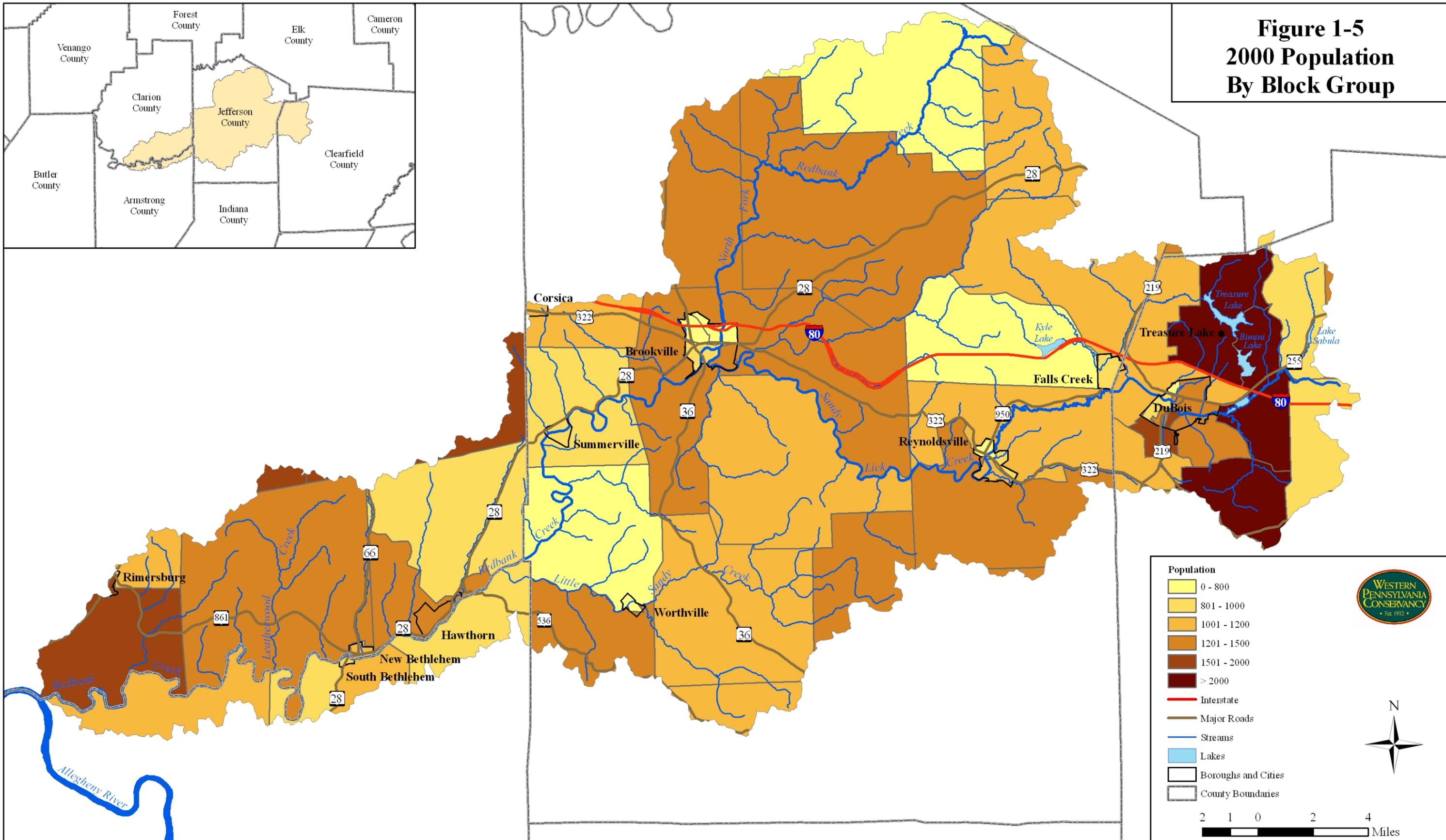


**Figure 1-4  
Land-Use Controls**

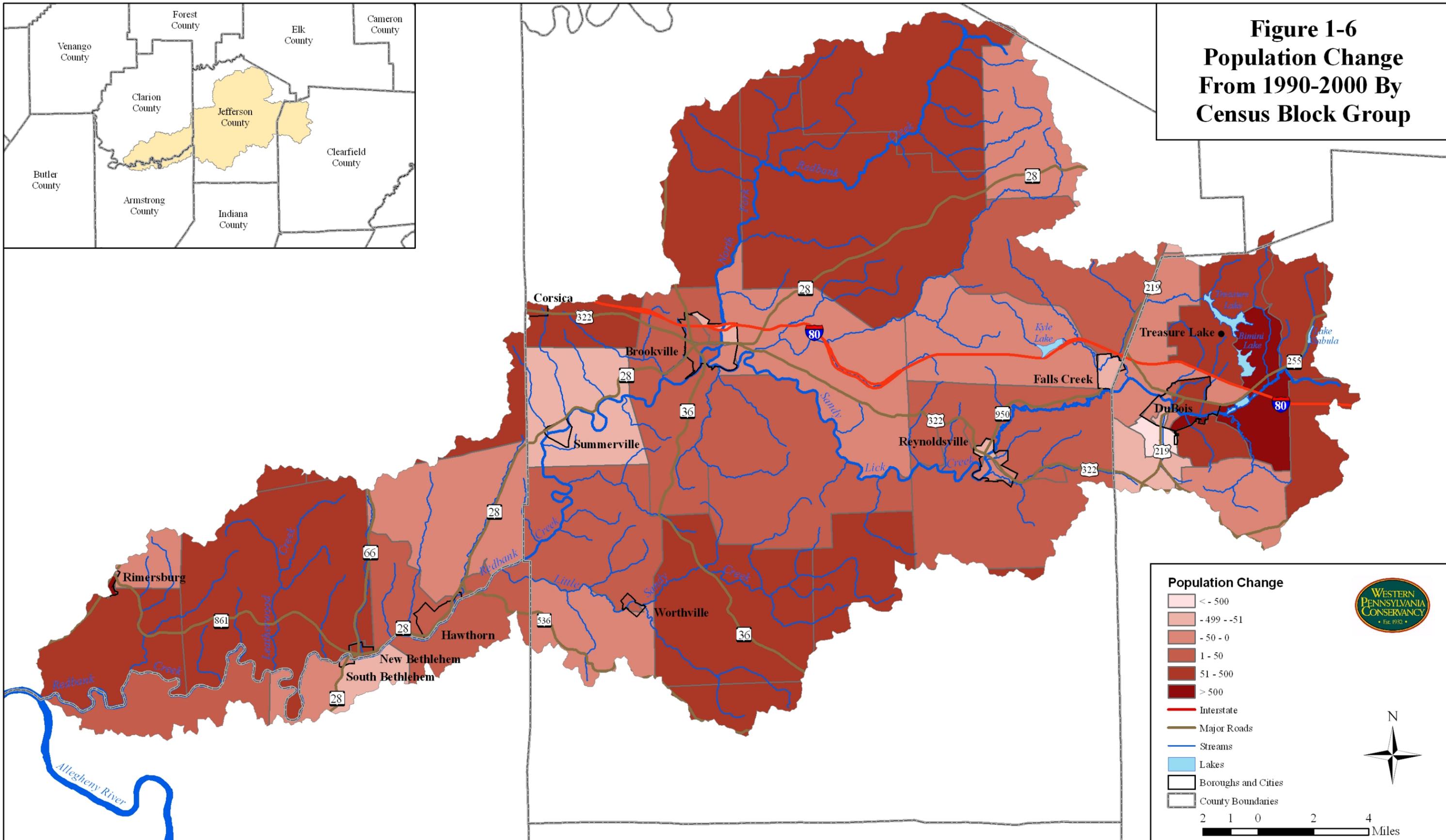
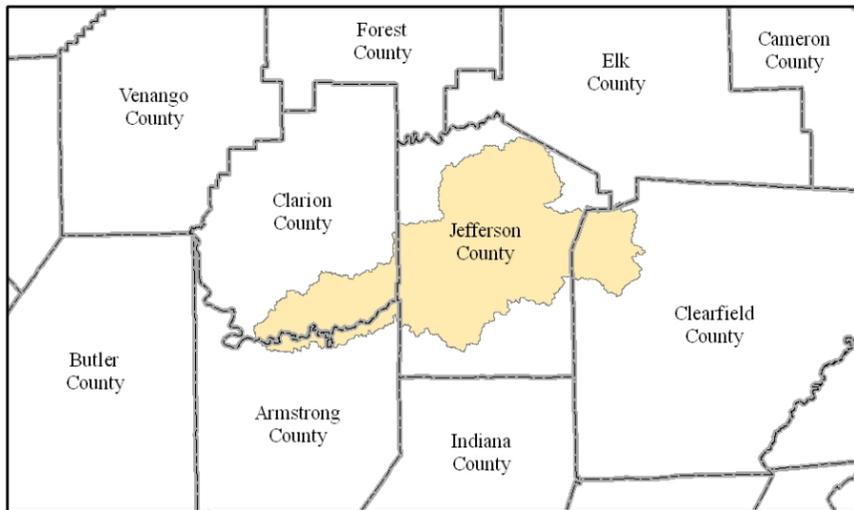


2 1 0 2 4 Miles

**Figure 1-5  
2000 Population  
By Block Group**



**Figure 1-6  
Population Change  
From 1990-2000 By  
Census Block Group**



**Population Change**

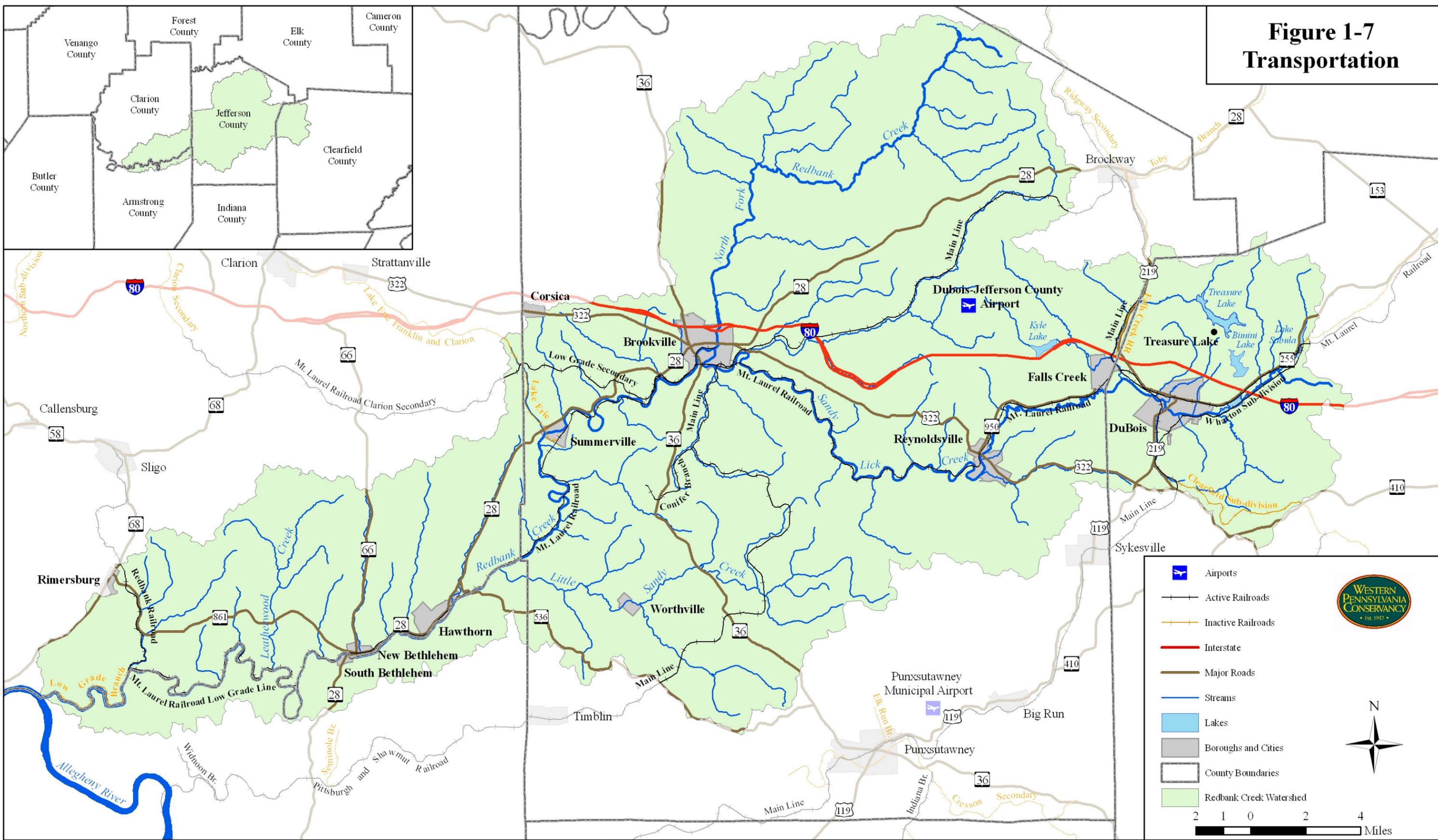
- < - 500
- 499 - -51
- 50 - 0
- 1 - 50
- 51 - 500
- > 500

- Interstate
- Major Roads
- Streams
- Lakes
- Boroughs and Cities
- County Boundaries

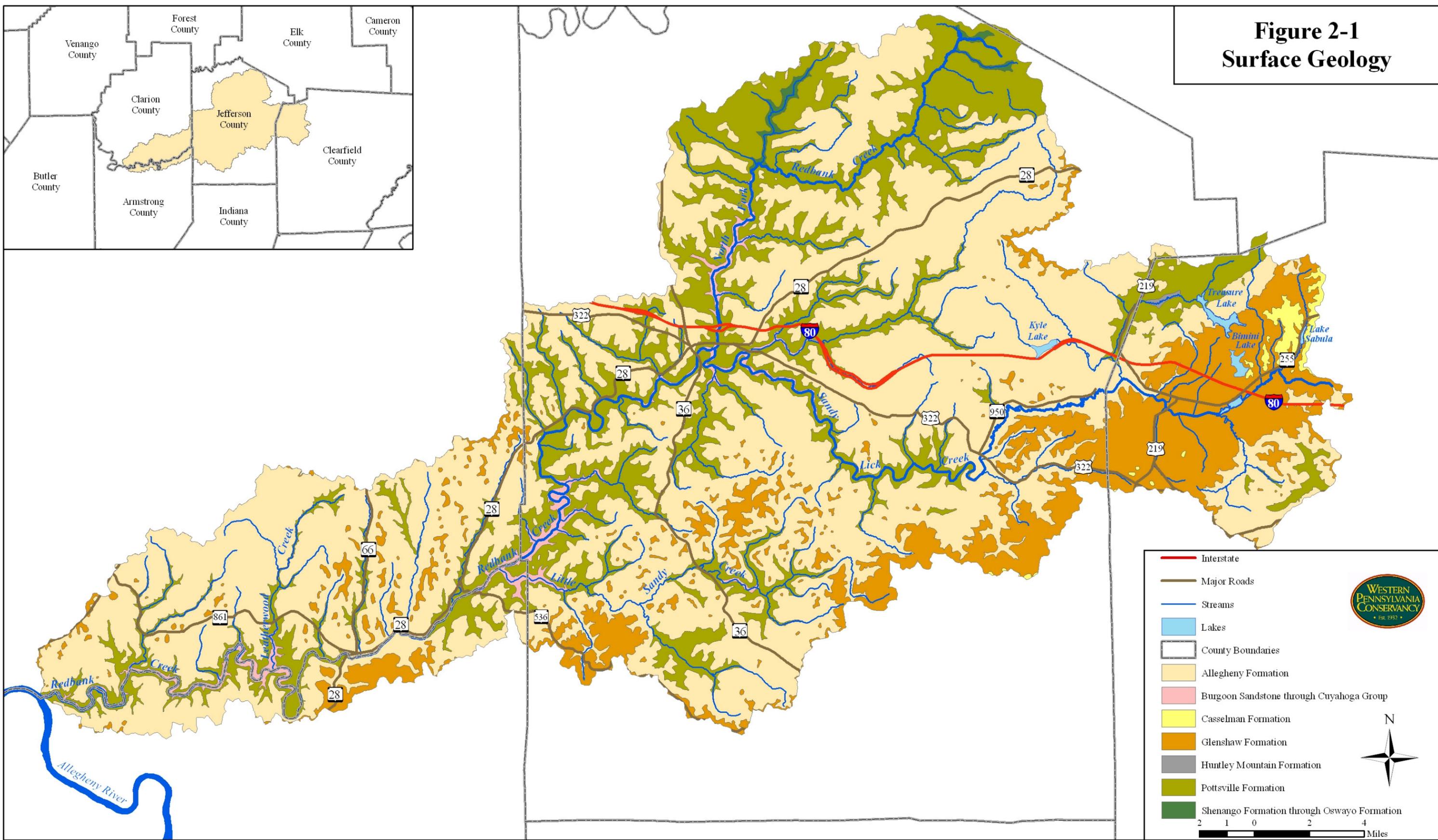
2 1 0 2 4 Miles



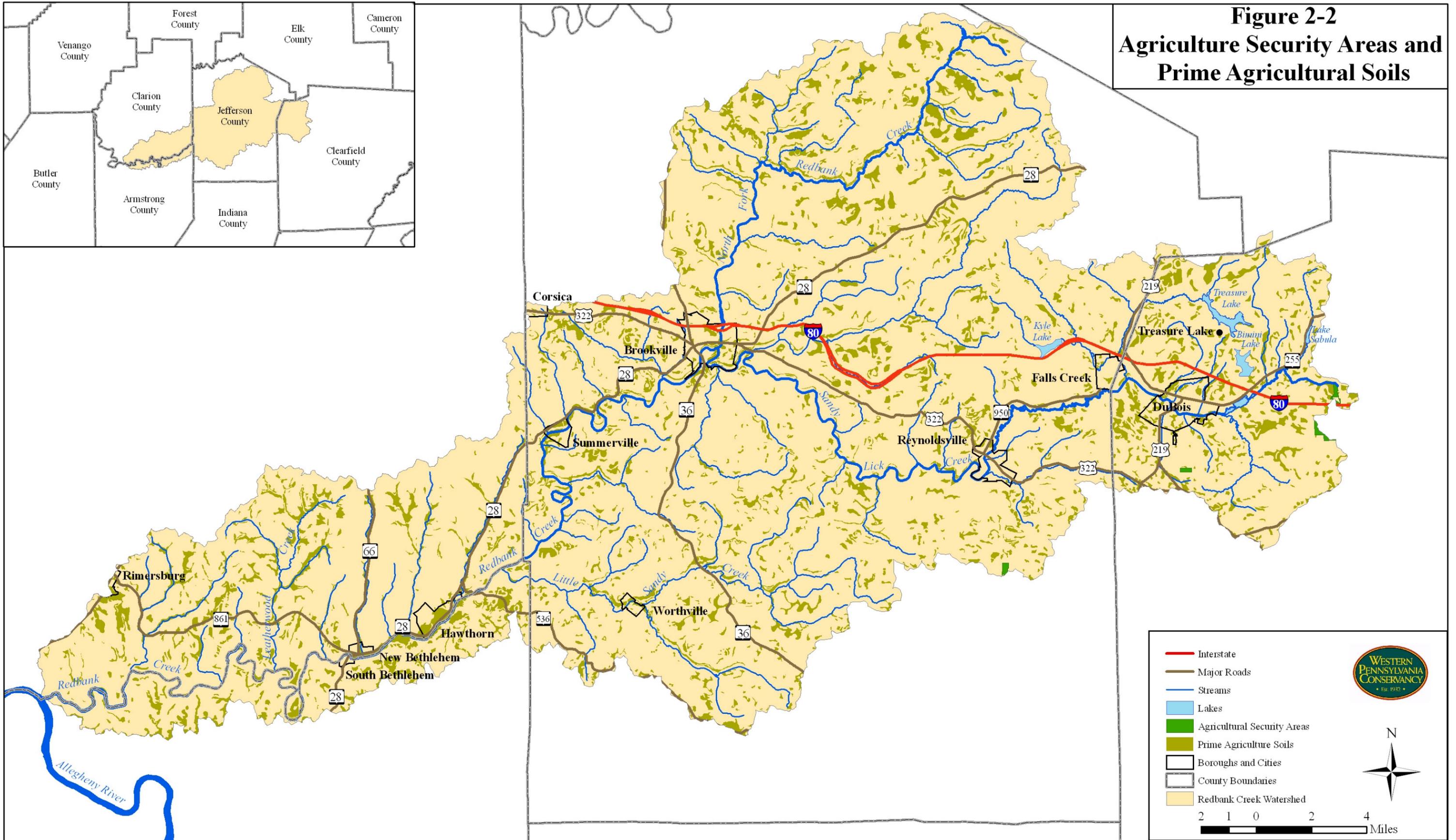
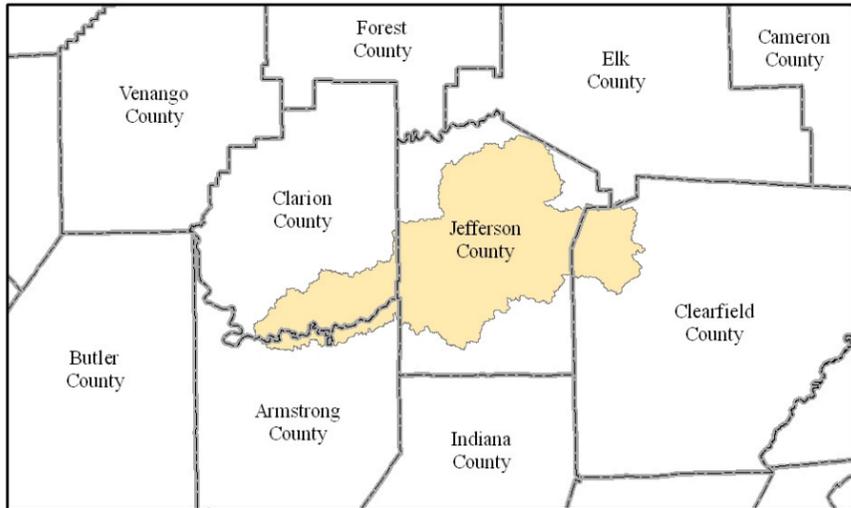

**Figure 1-7  
Transportation**



**Figure 2-1  
Surface Geology**



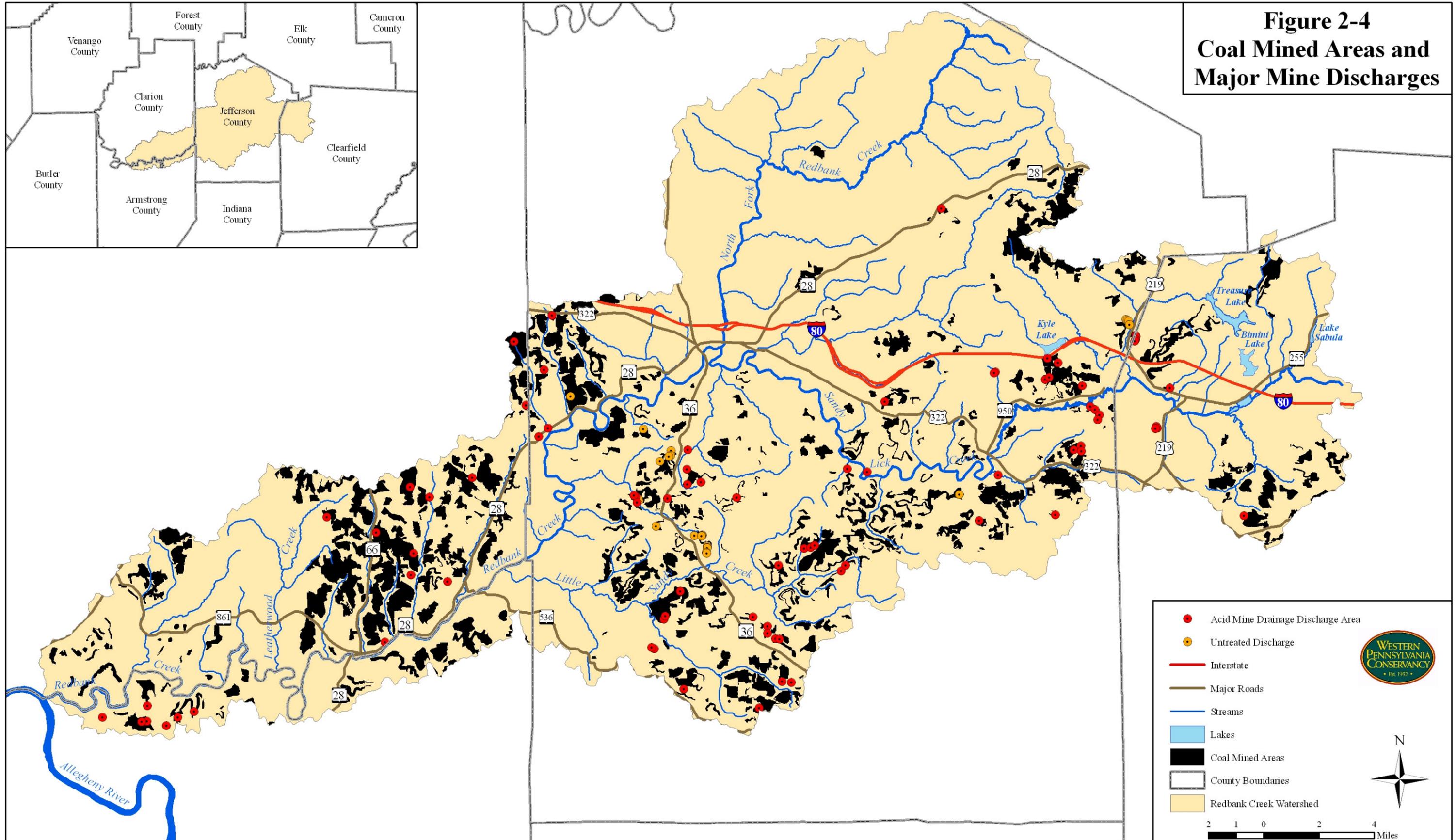
**Figure 2-2**  
**Agriculture Security Areas and**  
**Prime Agricultural Soils**



2 1 0 2 4 Miles



**Figure 2-4  
Coal Mined Areas and  
Major Mine Discharges**

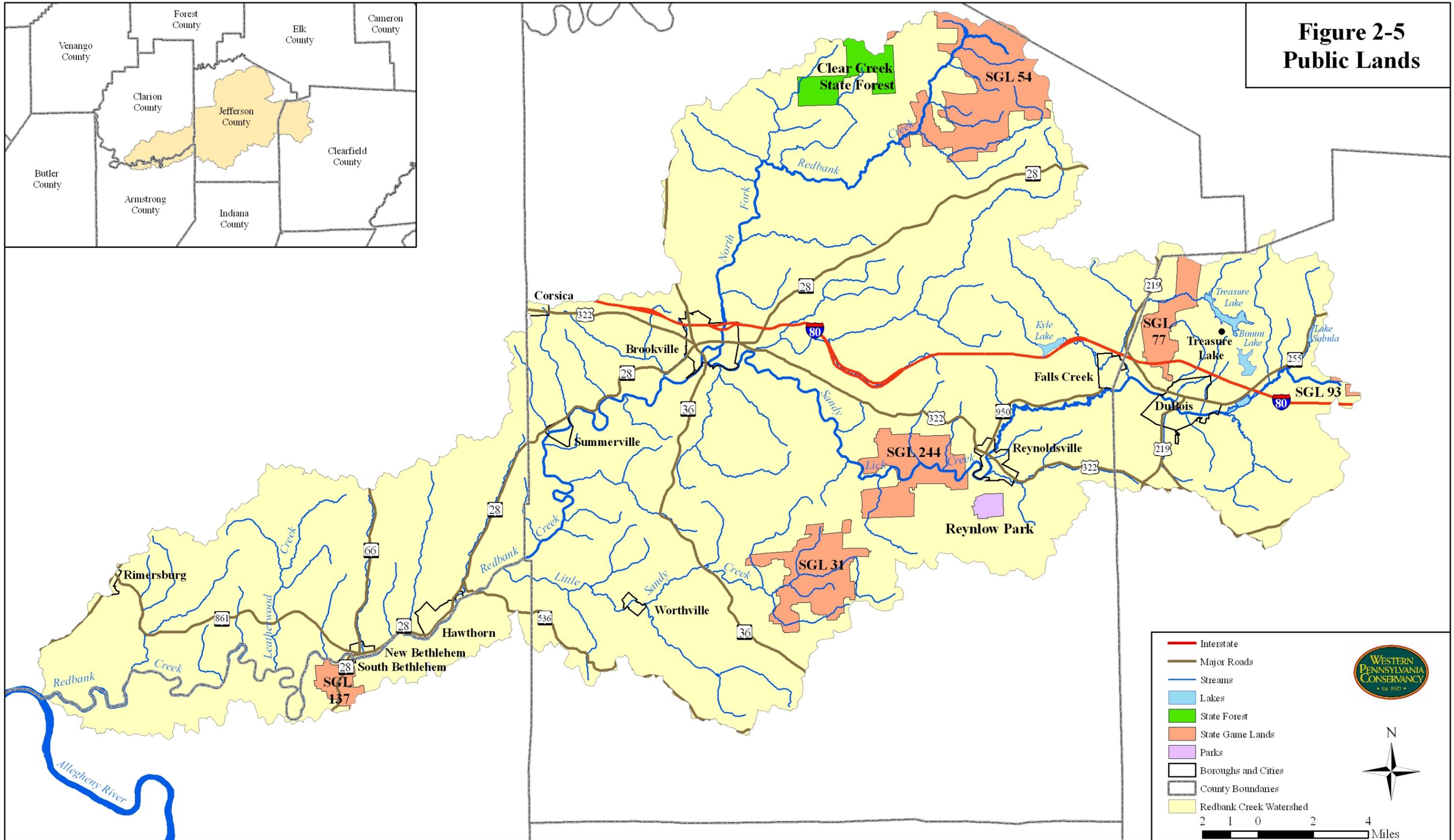


- Acid Mine Drainage Discharge Area
- Untreated Discharge
- Interstate
- Major Roads
- Streams
- ▭ Lakes
- ▭ Coal Mined Areas
- County Boundaries
- Redbank Creek Watershed

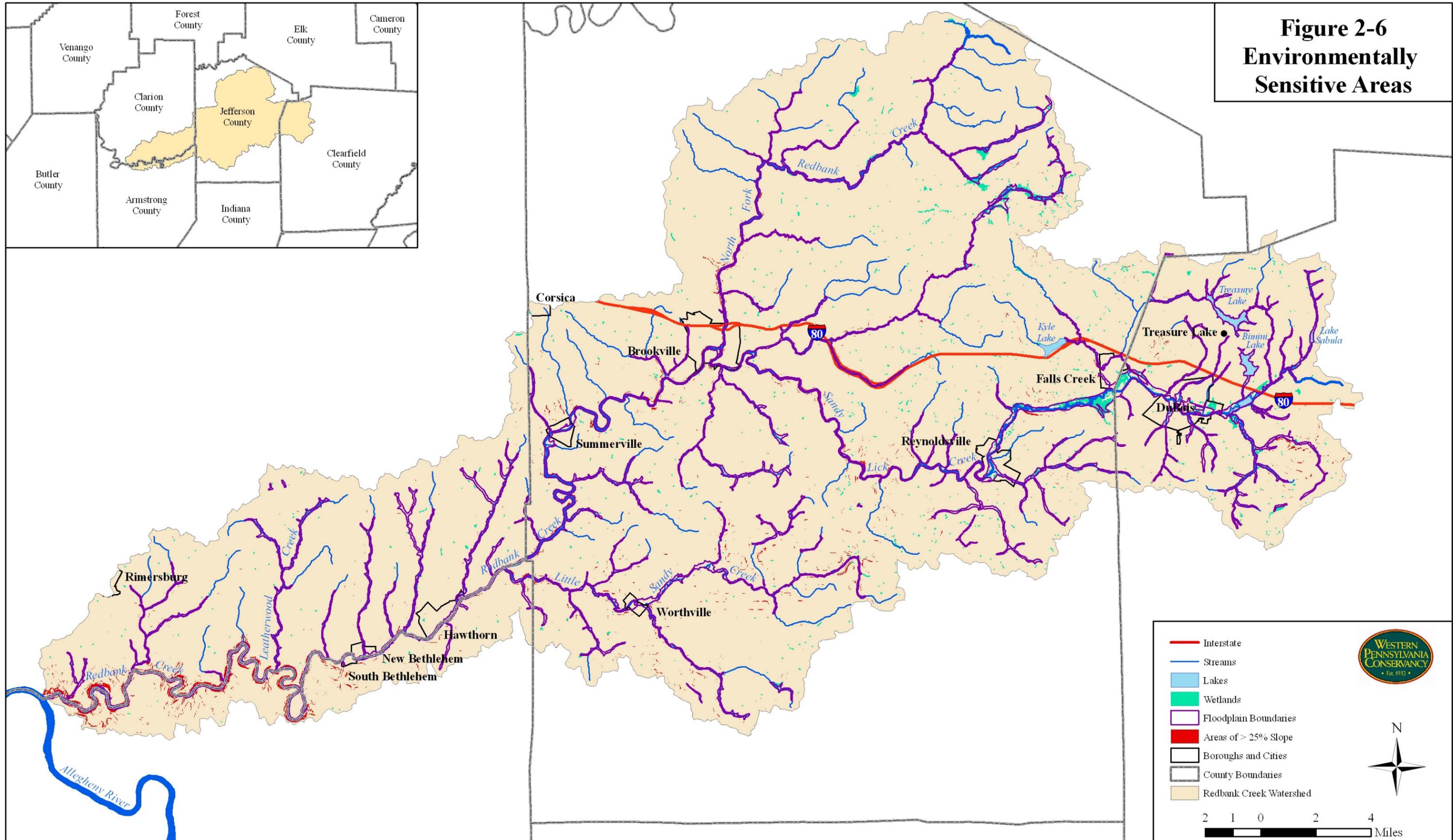
  
 WESTERN PENNSYLVANIA CONSERVANCY  
 • Est. 1957 •

N  
  
 2 1 0 2 4 Miles

**Figure 2-5  
Public Lands**



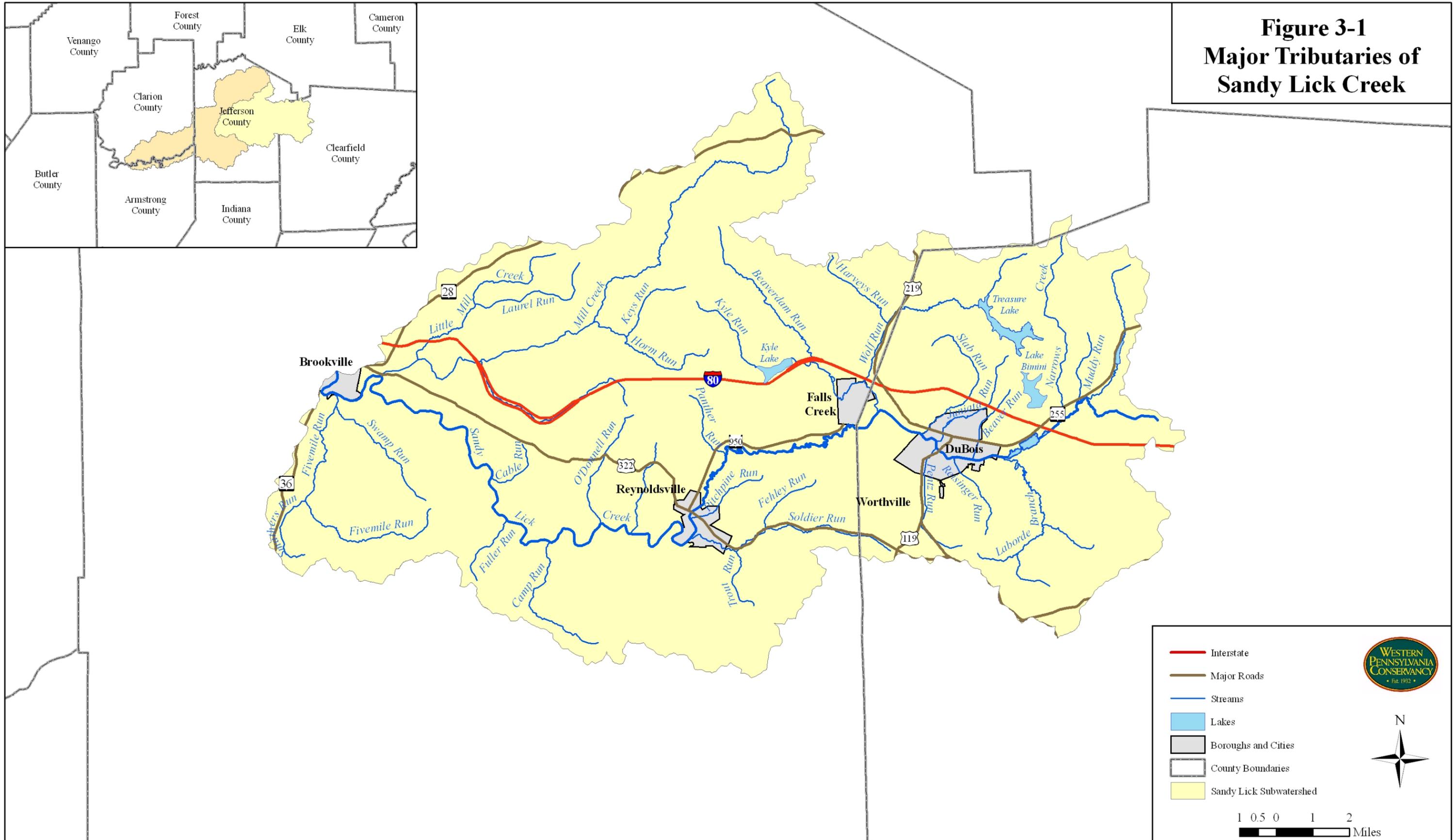
**Figure 2-6  
Environmentally  
Sensitive Areas**



— Interstate  
— Streams  
■ Lakes  
■ Wetlands  
 Floodplain Boundaries  
 Areas of > 25% Slope  
 Boroughs and Cities  
 County Boundaries  
 Redbank Creek Watershed

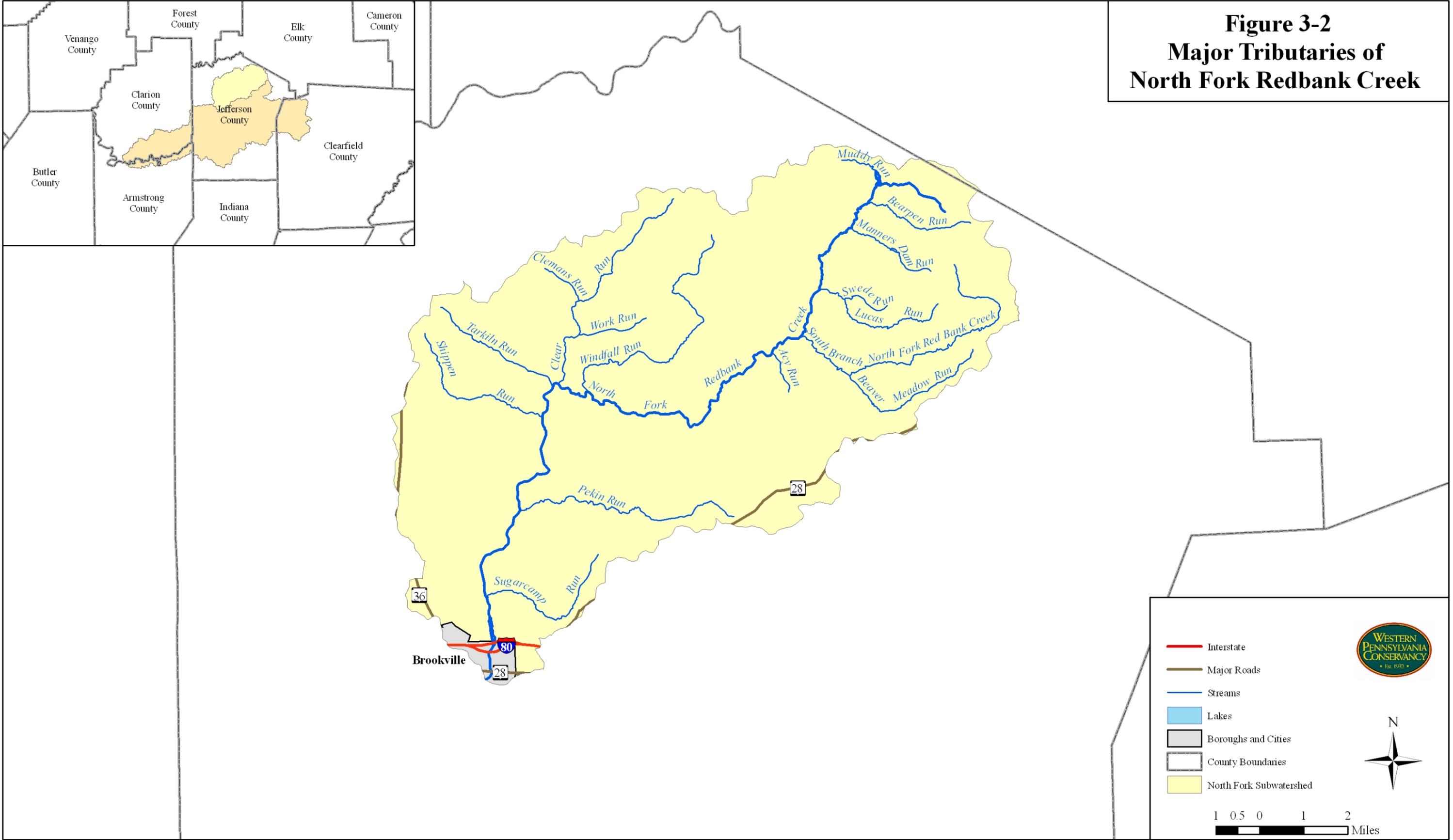
  
 N  
  
 2 1 0 2 4  
 Miles

**Figure 3-1  
Major Tributaries of  
Sandy Lick Creek**



1 0.5 0 1 2  
Miles

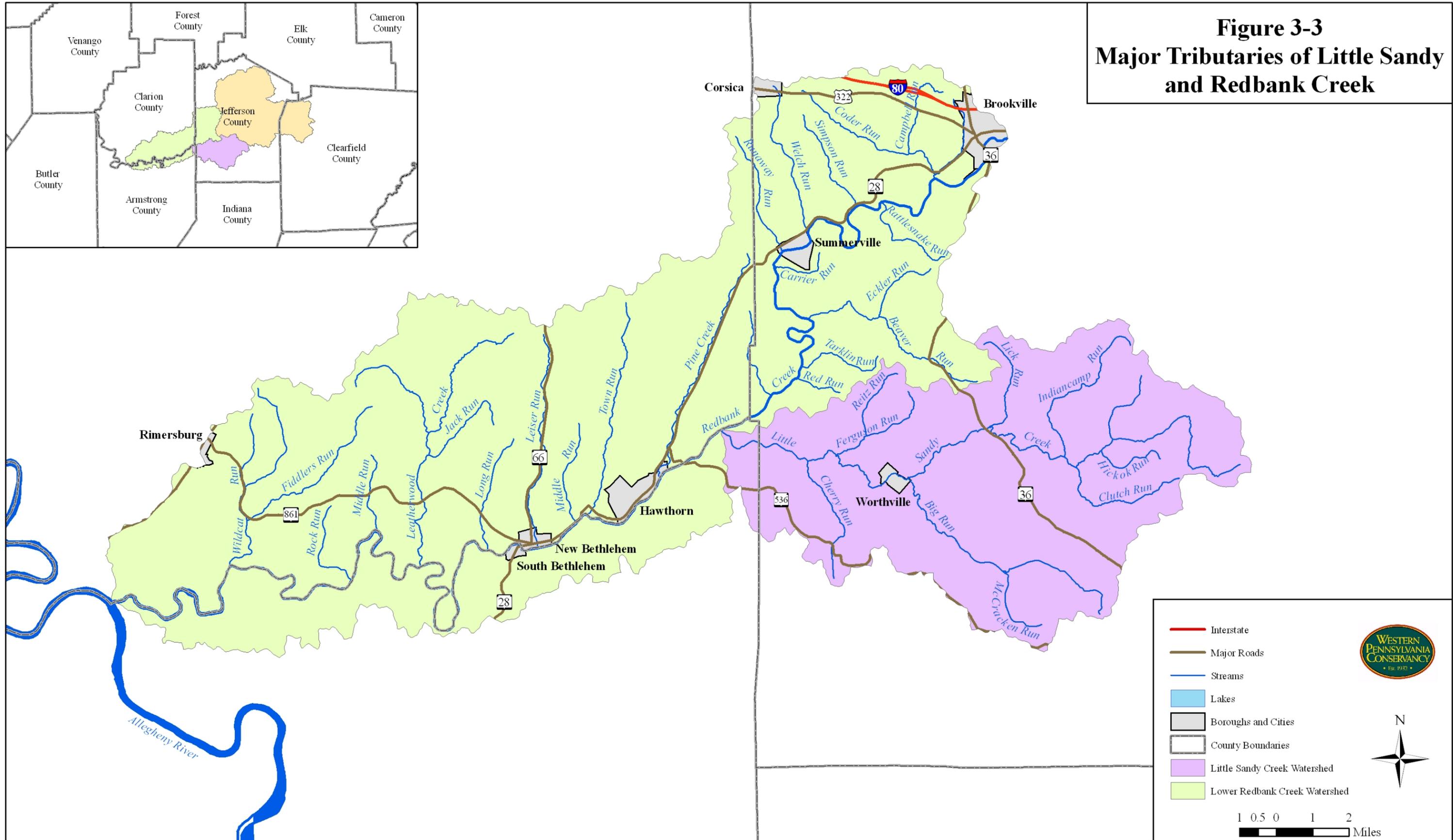
**Figure 3-2**  
**Major Tributaries of**  
**North Fork Redbank Creek**



— Interstate  
— Major Roads  
— Streams  
 Lakes  
 Boroughs and Cities  
 County Boundaries  
 North Fork Subwatershed

  
  
 1 0.5 0 1 2 Miles

**Figure 3-3**  
**Major Tributaries of Little Sandy and Redbank Creek**



**Legend**

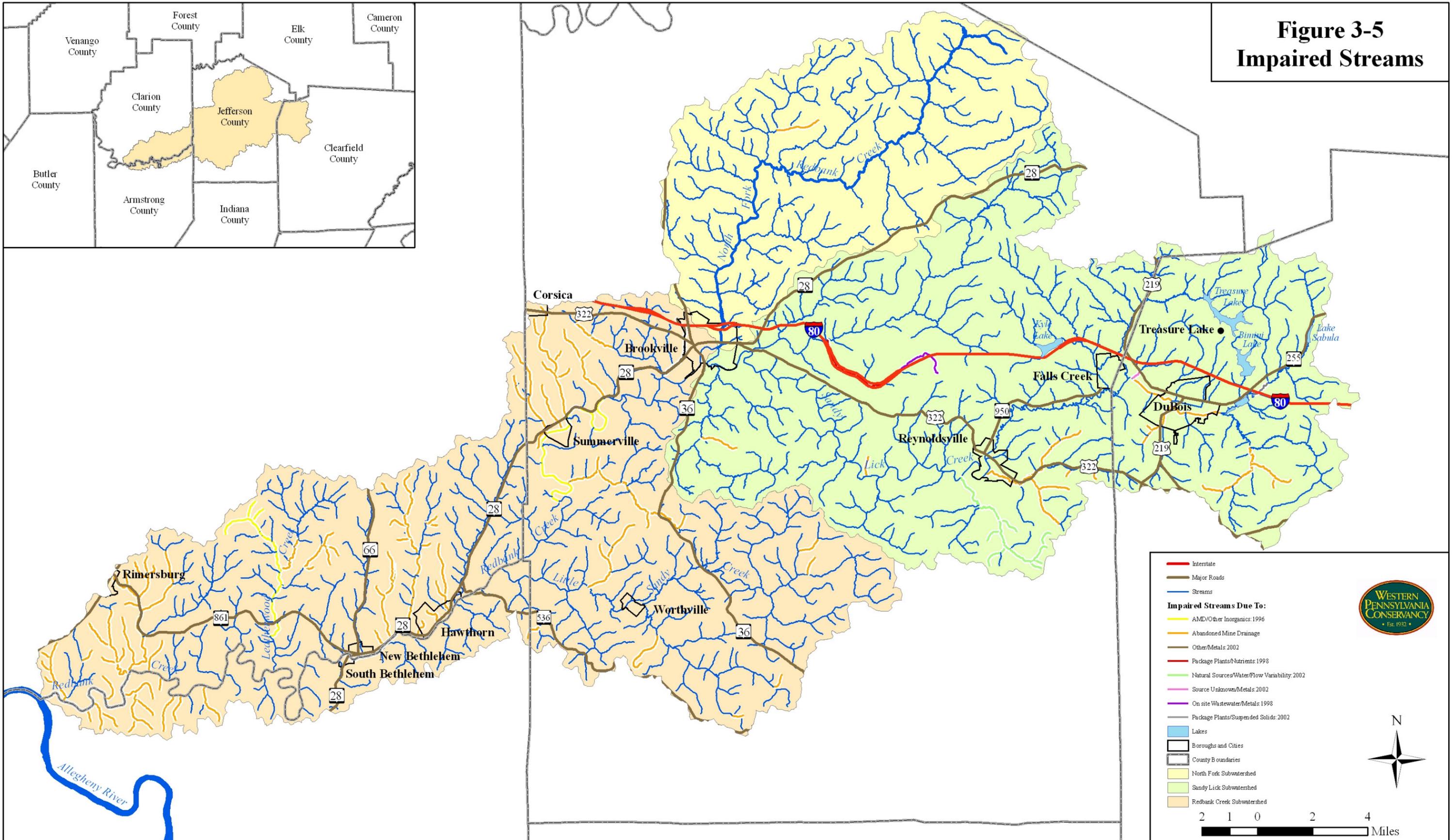
- Interstate
- Major Roads
- Streams
- Lakes
- Boroughs and Cities
- County Boundaries
- Little Sandy Creek Watershed
- Lower Redbank Creek Watershed

Scale: 1 0.5 0 1 2 Miles

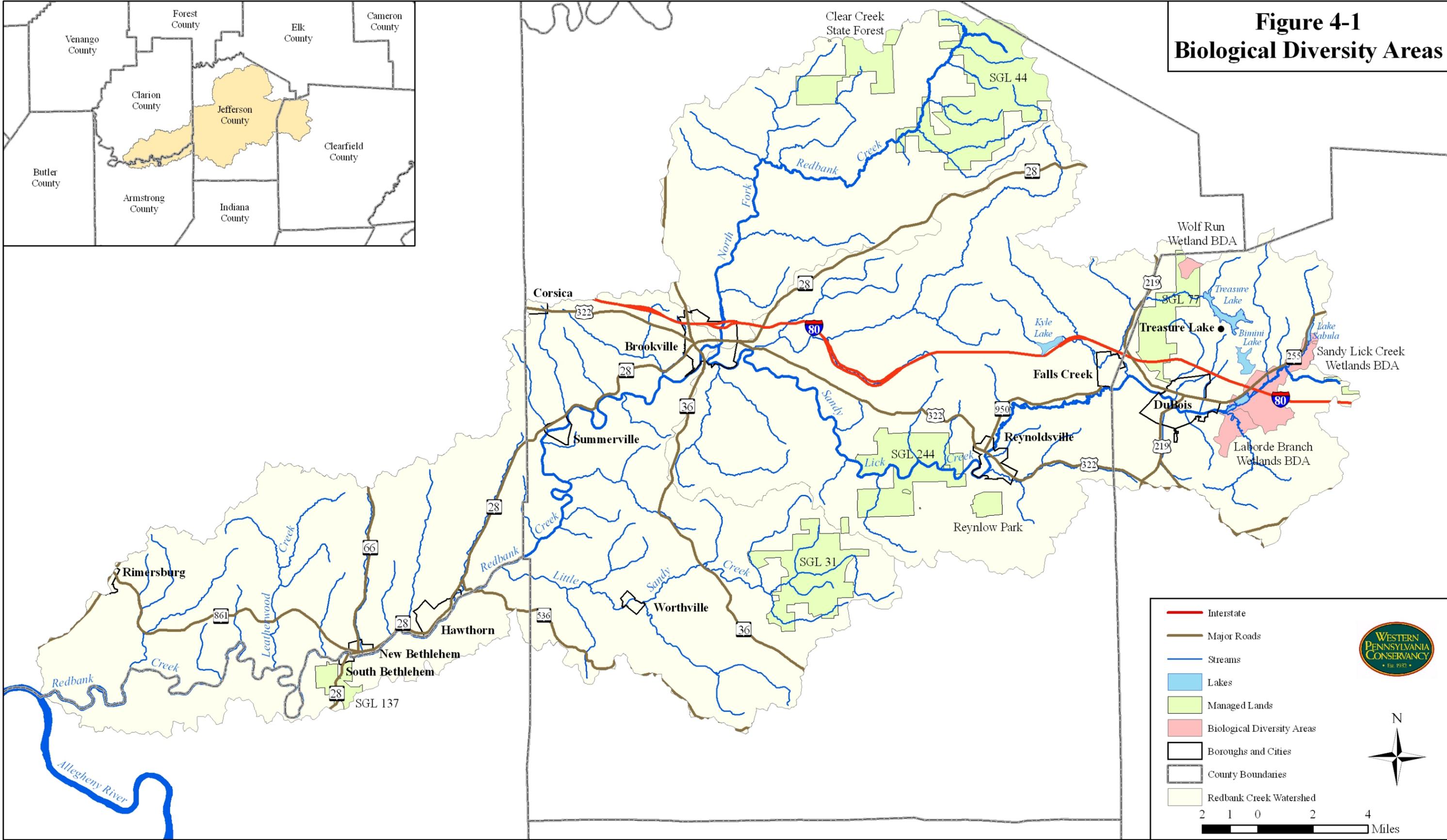
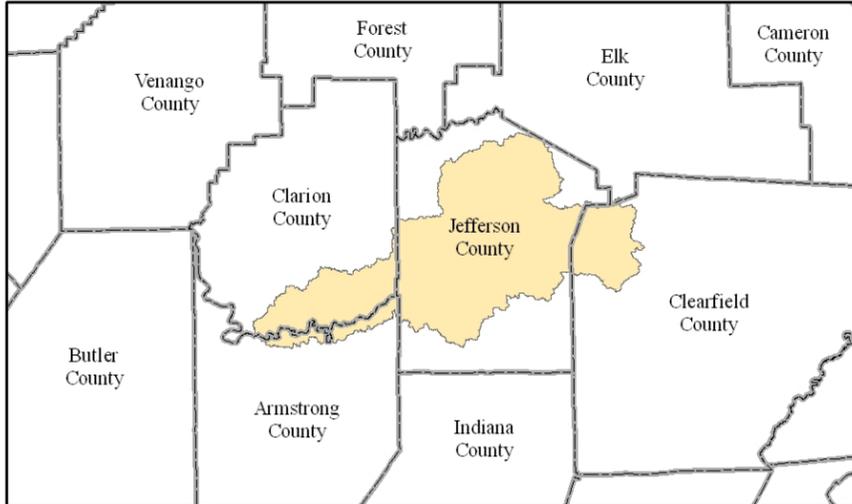
WESTERN PENNSYLVANIA CONSERVANCY  
 • Est. 1937 •

N

**Figure 3-5  
Impaired Streams**



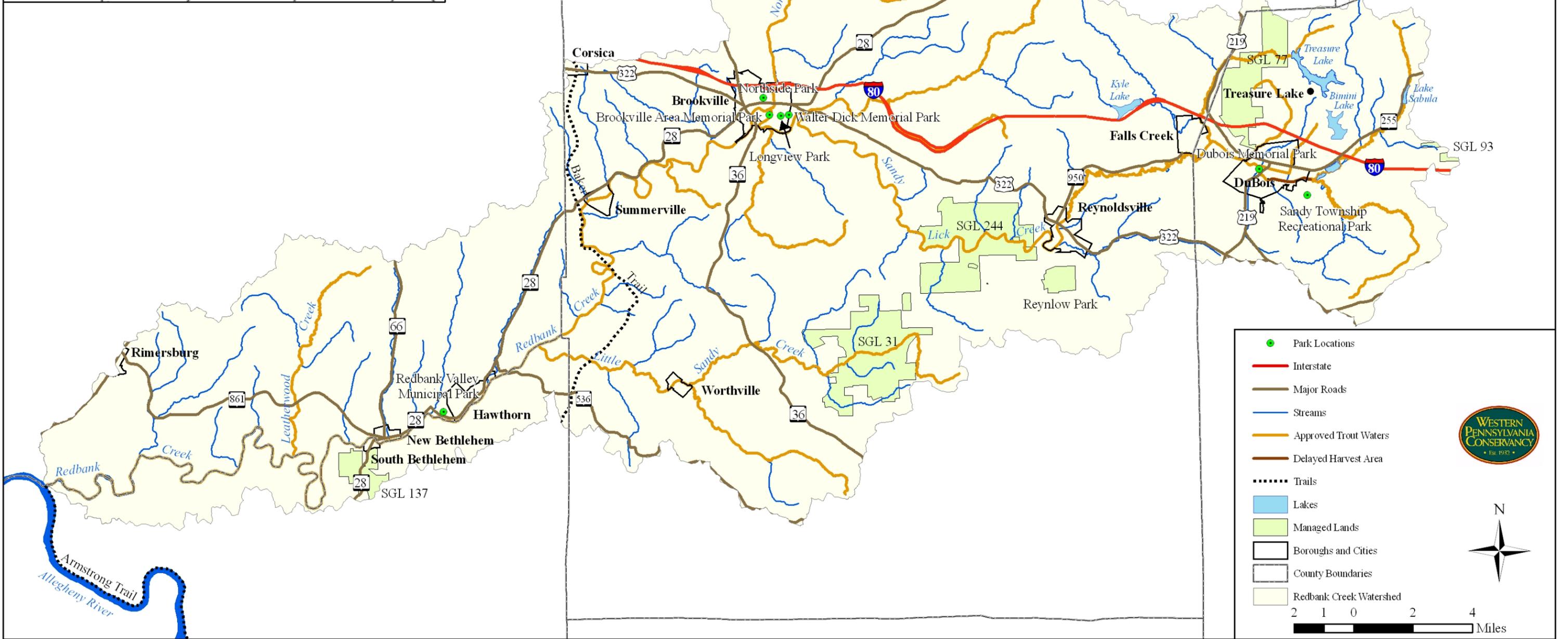
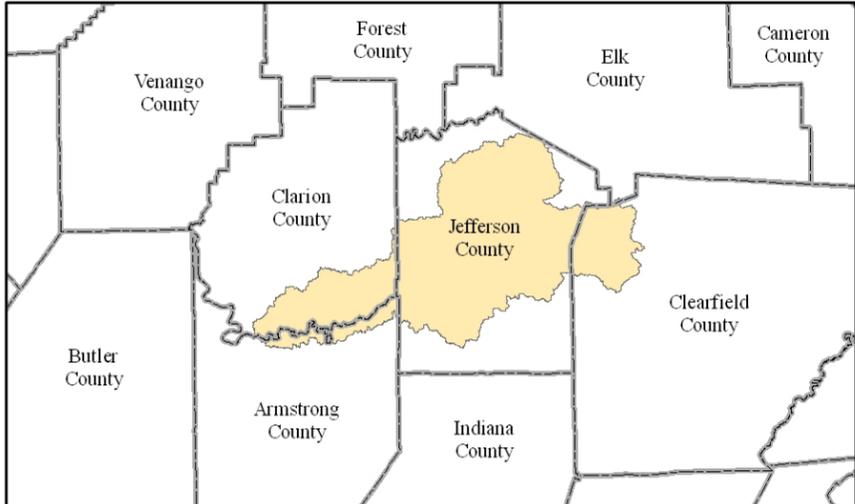
**Figure 4-1  
Biological Diversity Areas**



— Interstate  
— Major Roads  
— Streams  
■ Lakes  
■ Managed Lands  
■ Biological Diversity Areas  
 Boroughs and Cities  
 County Boundaries  
 Redbank Creek Watershed

  
 N  
  
 2 1 0 2 4  
 Miles

**Figure 5-1  
Recreational Facilities**



- Park Locations
- Interstate
- Major Roads
- Streams
- Approved Trout Waters
- Delayed Harvest Area
- - - - Trails
- Lakes
- Managed Lands
- Boroughs and Cities
- County Boundaries
- Redbank Creek Watershed



WESTERN PENNSYLVANIA CONSERVANCY  
• Est. 1937 •

N



2 1 0 2 4  
Miles